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“You have to take action”: changing knowledge and attitudes towards newborn care practices during crisis in South Sudan

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Abstract: *Highest rates of neonatal mortality occur in countries that have recently experienced conflict. International Medical Corps implemented a package of newborn interventions in June 2016, based on the Newborn health in humanitarian settings: field guide, targeting community- and facility-based health workers in displaced person camps in South Sudan. We describe health workers' knowledge and attitudes toward newborn health interventions, before and after receiving clinical training and supplies, and recommend dissemination strategies for improved uptake of newborn guidelines during crises. A mixed methods approach was utilised, including pre–post knowledge tests and in-depth interviews. Study participants were community- and facility-based health workers in two internally displaced person camps located in Juba and Malakal and two refugee camps in Maban from March to October 2016. Mean knowledge scores for newborn care practices and danger signs increased among 72 community health workers (pre-training: 5.8 [SD: 2.3] vs. post-training: 9.6 [SD: 2.1]) and 25 facility-based health workers (pre-training: 14.2 [SD: 2.7] vs. post-training: 17.4 [SD: 2.8]). Knowledge and attitudes toward key essential practices, such as the use of partograph to assess labour progress, early initiation of breastfeeding, skin-to-skin care and weighing the baby, improved among skilled birth attendants. Despite challenges in conflict-affected settings, conducting training has the potential to increase health workers' knowledge on neonatal health post-training. The humanitarian community should reinforce this knowledge with key actions to shift cultural norms that expand the care provided to women and their newborns in these contexts. DOI: 10.1080/09688080.2017.1405677*

Keywords: newborn health, South Sudan, conflict, community, facility, health worker knowledge, postnatal care, displaced populations, training

Background

The first 28 days of life, the neonatal period, is the riskiest month in the human lifecycle. In 2015, an estimated 2.7 million newborns died,¹ mainly due to complications of premature birth (36%), infections (23%) and intrapartum complications (23%).^{2,3} Many of these deaths are preventable, especially in the context of weak health systems in low- and middle-income countries. There is an increasing disparity in neonatal mortality between those living in stable political settings and those experiencing conflict and violence, with 14 out of 15 of the countries with the highest neonatal mortality rate experiencing a humanitarian emergency.⁴ Humanitarian crises exacerbate challenges to health service delivery by impeding access to already at-risk populations, slowing delivery of medical supplies and drugs and worsening shortages of health workers. Pregnant, newly delivered women and their newborns are a particularly vulnerable group in conflict- and disaster-affected settings and are most in need of targeted efforts for quality care. To reach Sustainable Development Goals for reproductive, maternal and neonatal health, global health leaders need to prioritise proven interventions in these settings.⁵

Tailored intervention packages are recommended for greater effectiveness in humanitarian and fragile contexts, requiring policy, development and humanitarian communities to collaboratively integrate efforts.⁶ A result of collaboration between development and humanitarian agencies, the *Newborn health in humanitarian settings: field guide* (referred to in this paper as the *Field Guide*) released in 2016 is a compilation and summary of existing WHO standards of care and includes guidance on how to provide services for newborns in the context of a humanitarian crisis.⁷ The *Field Guide* prioritises the most critical health services and medical supplies to prevent and manage the three main causes of neonatal death, with tools for integrating neonatal health care in the context of broader reproductive health services. These interventions align with and reinforce the standards of care in the Minimum Initial Service Package (MISP) for reproductive health in crises.⁸

Demonstrations of successful translation of evidence-based guidelines to promote improved neonatal health in humanitarian contexts are largely lacking.⁹ The adoption of clinical and procedural

guidelines requires acceptance by multiple components of the health system, such as the health workforce and service delivery mechanism.¹⁰ Proctor et al define acceptability as “the perception among implementation stakeholders that a given treatment, service, practice or innovation is agreeable, palatable or satisfactory”.¹¹ Specifically, among health workers, adoption of new or existing practices is based on attitudes influenced by provider characteristics, organisational facilitators and social networks, as defined by Aaron’s Framework on the Role of Attitudes.¹² Therefore, understanding these attitudes is critical for the acceptance and implementation of the *Field Guide*.

In South Sudan, the conflict that erupted in December 2013 and escalated in July 2016 intensified mass displacement, food shortages and violence against civilians and humanitarian workers. By the end of October 2016, the United Nations estimated there were approximately 1.8 million internally displaced people (IDPs) living in South Sudan, with about 204,918 IDPs living in camps and the majority living outside of displacement camps.¹³ An additional 262,730 refugees, primarily from Sudan, reside in South Sudan.¹³ The country experiences a high number of maternal deaths (789 per 100,000 live births), neonatal deaths (39 per 1000 live births) and stillbirths (30 per 1000 total births).^{14–16} South Sudan also faces a severe shortage of health workers and has a limited number of training institutions.¹⁷ The Ministry of Health and partners including International Medical Corps (IMC) are working to improve the health workforce by training nurses and community and registered midwives;¹⁸ many local midwives are recent graduates of these programmes. The content on newborn care in these trainings was limited to the labour period, and absent from most community health worker (CHW) programmes.

We report findings from a quasi-experimental study examining the knowledge and attitudes of health workers toward the adoption of newborn care interventions before and after receiving training during an ongoing humanitarian crisis. We aimed to (1) describe the change in knowledge of newborn care among health workers, (2) explain the change in attitudes, such as the importance or intention to adopt recommended practices and (3) characterise factors that influenced health worker attitudes.

Methods

Design and setting

This study used a concurrent, mixed methods approach and was nested within a larger study examining the impact of implementing a package of neonatal health interventions in displaced person camps in South Sudan. The objective of the larger study was to measure the uptake of the interventions by health workers and programme managers using direct observation and in-depth interviews, which included the participants from this sub-study. Self-administered questionnaires and in-depth interviews were conducted in this study with CHWs and facility-based midwives and traditional birth attendants (TBAs) hired by IMC. This study was implemented from March to October 2016 in a total of four displaced person camps: two refugee camps located in Maban County (Gendrassa and Kaya), and two IDP camps located in Juba County (Juba POC) and Malakal County (Malakal POC). The camps were selected based on the availability of IMC-managed community and facility health programmes, including delivery care, that were anticipated to remain operational for the duration of this study. The population of each camp ranged from 17,000 to 40,000 displaced persons as of October 2016, with refugees originating primarily from Sudan and IDPs from South Sudan.^{19,20} In Juba, facility-based providers rotate between the hospital (operated 24/7 with skilled attendants, an in-patient department and comprehensive emergency obstetric care) and the primary health care centre (PHCC). The PHCCs outside of Juba are operated jointly by midwives and TBAs. Midwives were skilled attendants who received formal education at a midwifery college, while TBAs were unskilled attendants who had a primary education and received on-the-job training from the non-governmental organisation.

Training package

A training curriculum was designed by study partners using materials from Save the Children, WHO and UNICEF, and the American Academy of Pediatrics, including content from Helping Babies Survive with supporting educational videos by the Global Health Media Project.^{21–25} Materials were adapted for a two-day course on essential knowledge and practices to prevent and manage the three main causes of neonatal death (i.e. intrapartum complications, prematurity and infections), as

described in the *Field Guide* (Table 1). Specifically, the curriculum for facility health workers addressed danger signs during pregnancy, foetal monitoring using the partograph, neonatal resuscitation, immediate newborn care, breastfeeding support, recognition of newborn danger signs, feeding and kangaroo mother care (KMC) for small babies, management of severe infections and postnatal counselling before patient discharge. For CHWs, topics covered pregnancy identification and tracking, importance of antenatal care (ANC) and facility-based deliveries, danger signs during pregnancy and for newborns, essential care practices, breastfeeding support, home visits for newborns during the first week of life, and use of a respiratory rate timer, weighing scale and thermometer. Trainings were primarily short role-play and simulation-based practice sessions using Laerdal Medical's NeoNatalie™, PremieNatalie™ and MamaBreast™,^{26–28} introduced by brief presentations and videos.

Trainings were conducted in June 2016 with 72 CHWs (43 males and 29 females) and 25 facility health workers (9 males and 16 females). All CHWs and facility-based health workers (e.g. midwives, nurses, clinical officers and TBAs) who worked for IMC in the four camps completed the training. Facility-based TBAs were trained separately from other facility-based health workers, using the same curriculum, due to language limitations and differing level of skills and knowledge. Each group received either the facility- or community-level two-day training in their site from six male and female trainers. The trainers participated in a joint training conducted by a master trainer in Juba, and were expatriate medical coordinators or midwife supervisors from the field sites. This also allowed for supportive supervision and mentorship during the study period by these trainers. Training was limited to two days because staff could not be removed from daily operations for an extended period. Therefore, the initial training was supplemented with in-service refresher trainings and weekly supervision visits using standardised checklists starting a month after training by the trainers. Checklists were adapted from the Maternal and Child Health Integrated Programme (MCHIP) to observe newborn care practices included in our training.

Participant sampling

All CHWs and facility health workers (i.e. midwives and facility-based TBAs) who participated in the

Table 1. Key newborn care training components for community and facility-based health workers

Training components for essential newborn care	Additional training components for managing preterm complications and severe infections	Additional training components for managing intrapartum complications
Household-level (by CHWs) <ul style="list-style-type: none"> • Identify pregnant women (already being done) • Demand generation for facility-based deliveries • Use of CHW-held kit and items for distribution to women • Education on application of chlorhexidine antiseptic to the umbilical cord • Home visits in the first week to promote basic newborn care (thermal care, hygiene, cord care, exclusive breastfeeding) and assess for danger signs • Assist families to refer severely ill newborns 	<ul style="list-style-type: none"> • Assist families to refer severely ill newborns 	<ul style="list-style-type: none"> • Immediate referral of women in labour, or preparation for safe and clean delivery at home
Facility level <ul style="list-style-type: none"> • Recognition of danger signs for the newborn during pregnancy • Foetal monitoring and recording during labour • Essential newborn care in immediate postnatal period: <ul style="list-style-type: none"> ○ Delayed cord clamping ○ Thermal care including immediate skin-to-skin and delay bathing >6 hours ○ Application of chlorhexidine antiseptic to the umbilical cord ○ Early and exclusive breastfeeding ○ Handwashing and hygiene ○ Clean cord and skin care ○ Assess and counsel on danger signs ○ Weigh the baby and record ○ Identify and support newborns who need additional care ○ Provide birth notification 	<ul style="list-style-type: none"> • Complete physical exam within 2 hours • Extra thermal care through continuous KMC for stable babies <2 kg • Extra infection prevention measures and prompt treatment • Extra support for breastmilk feeding including expression as needed • Monitor and record vital signs for at least 24 hours <ul style="list-style-type: none"> ○ Temperature every 4 hours ○ Weigh daily ○ Record feedings • Prompt identification and first dose of antibiotics, plus facilitated referral (also providing guidelines for treatment if referral is not possible) • Support to family for neonatal death or disabled survivor 	<ul style="list-style-type: none"> • Immediate response to action line on the partograph or late decelerations in foetal heart rate, including referral if possible • Stimulation and bag and mask resuscitation of babies who are not breathing at birth • Support to family for stillbirth, neonatal death or disabled survivor

intervention training were asked to complete the self-administered questionnaires. For in-depth interviews, participants were recruited purposively and were stratified by health worker type (community and facility) and county (Juba, Malakal, Maban). Health workers who were available on

the interview date, aged 18 and older, spoke English or Arabic, planned to participate in the training package and gave verbal consent, were selected for a pre-training interview. Those unavailable for a second interview three months post-training were replaced with an eligible health

worker from the same cadre and location who had completed the training. Each camp organised at least two interviews among CHWs and two among midwives or TBAs at each time point. Additional participants were selected during data collection until no new information relevant to the research question was found. A total of 17 interviews were completed pre-training and 16 post-training to reach saturation across the counties and health worker types (Table 2).

Data collection

The self-administered questionnaire was used to assess knowledge of newborn care immediately before and after health workers received the training package in each county in June 2016. The questionnaire consisted of 12 and 19 multiple-choice questions for community and facility health workers, respectively (Tables 3 and 4). Facility health workers were asked two additional open-ended questions to list five newborn danger signs

Table 2. Participant characteristics for in-depth interviews, March–October 2016

Variable	Pre-training		Post-training		Total	
	No.	(%)	No.	(%)	No.	(%)
Location						
Juba	5	(29)	4	(25)	9	(27)
Malakal	4	(24)	6	(38)	10	(30)
Maban	8	(47)	6	(38)	14	(42)
Type of health worker						
Community health worker						
Male	3	(18)	5	(31)	8	(24)
Female	3	(18)	1	(6)	4	(12)
Midwife						
Male	3	(18)	3	(19)	6	(18)
Female	6	(35)	3	(19)	9	(27)
Traditional birth attendant						
Male	0	(0)	0	(0)	0	(0)
Female	2	(12)	4	(25)	6	(18)
Sex						
Male	6	(35)	8	(50)	14	(42)
Female	11	(65)	8	(50)	19	(58)
Mean age, years	31.5 ± 9.2		34.25 ± 10.9		32.8 ± 10.0	
Education completed						
Primary						
Male	1	(6)	0	(0)	1	(3)
Female	3	(18)	3	(19)	6	(18)
Secondary						
Male	2	(12)	4	(25)	6	(18)
Female	1	(6)	2	(13)	3	(9)
Certificate or higher						
Male	3	(18)	4	(25)	7	(21)
Female	7	(41)	3	(19)	10	(30)
Mean time employed by IMC, years						
Male	1.6 ± 1.6		1.3 ± 0.9		1.4 ± 1.2	
Female	1.7 ± 1.4		2.0 ± 1.3		1.8 ± 1.3	

and five newborn health educational messages; CHWs were asked the same questions on danger signs using multiple choice. The tool was designed using standard knowledge assessments used in similar contexts from existing newborn training packages such as *Helping Babies Survive*.²⁴ Research supervisors administered questionnaires to illiterate CHWs and TBAs, and those who needed translation support.

In-depth interviews were conducted pre-training (March–April 2016) and three months post-training (September–October 2016). Interviews were conducted in a private location near an IMC facility, audiotaped and lasted an average of 63 minutes. The interviewer was a study co-investigator who had prior training and field experience in qualitative research in humanitarian contexts. Locally based supervisors, who received training on research ethics and data quality as part of the larger study, translated discussions with non-English speaking participants. Due to the escalation of conflict in South Sudan in July 2016, the study co-investigator had limited access to study sites for post-training interviews. Consequently, interviews were conducted by the supervisors after receiving a five-day training in Uganda by the co-investigator to re-orient them to qualitative research methods and the study instruments.

A semi-structured interview guide was designed by the study team based on factors identified in prior studies to capture attitudes toward the adoption of evidence-based interventions (e.g. delayed cord clamping, promotion of skin-to-skin contact, measuring newborn's temperature) in the training package.^{11,29,30} Pile-sorting, a more structured technique, was used to assess attitudes, such as perceived level of importance of each practice (very, somewhat or not important) and intention to adopt each practice (low, medium or high likelihood). Participants were probed for factors that influenced their attitudes. The post-training guide was modified to capture how the crisis in July affected participants' intentions to adopt practices. Characteristics, such as participant's age, sex, education status and years working at IMC, were gathered during the interview. Facilitators documented non-verbal observations and reflexive thoughts on the data collection process. Interviews were then translated and transcribed into English and reviewed by the study team for accuracy. Ethical approval by the Republic of South Sudan Ministry of Health was received.

Analysis

Data from the self-administered questionnaires were initially entered in Microsoft Excel (Version 15.31), then exported to Stata (StataCorp LLC, Version 13.1) for analysis. Questionnaires that were completed by nurses or clinical officers were excluded from this analysis, which focuses on CHWs, midwives and TBAs. Multiple-choice and free-listing questions were analysed as a binary (correct/incorrect) variable. Missing responses were coded as "don't know" and analysed as incorrect. We present descriptive statistics for health worker knowledge stratified by type of health worker.

For the in-depth interviews, thematic analysis followed a two-step process where interviews were coded and recoded into categories and sub-categories to discern patterns emerging from the data. First, inductive coding was used to identify prevalent themes that emerged from interviews with health workers. We used the initial coding to develop the subthemes for the codebook, and grouped these codes using the Conceptual Framework of the Role of Attitudes in Evidence-Based Practice Implementation.¹² The codes were categorised into four main themes that influence attitudes toward evidence-based newborn practices: (1) personal characteristics, (2) intervention complexity, (3) organisational facilitators and (4) external environment (Table 5). Second, we employed focused coding to recode all transcripts in NVivo (QSR International, Version 11.4.0) using the final codebook. A research assistant simultaneously coded a subset of the transcripts and compared analytical memos with the first author for additional insight. Of the 16 post-training interviews, 10 were conducted among those with a pre-training interview and 6 were among individuals not interviewed prior to training. We compared findings between those with both pre/post interviews and those with only a post-interview, and found them to be similar. Participant quotes illustrate examples of common responses. Responses from the pile-sorting exercises were tabulated by the levels for importance or intention, and examined qualitatively to understand the overall shift of attitudes.

We present the quantitative findings from the pre–post knowledge questionnaires followed by qualitative data on attitudes toward the adoption of newborn health interventions before and after

Table 3. Correct response to questionnaire to assess CHW knowledge, pre-post-training (N = 72)

Variable	Pre-training		Post-training	
	No.	(%)	No.	(%)
Pregnancy, labour and birth				
1. Why is it important to identify pregnant women in your community?	55	(76.4)	68	(94.4)
2. Why is it important for women to deliver their babies in a health facility?	42	(58.3)	58	(80.6)
Postnatal care				
3. Which of the following is a sign that a baby is breastfeeding adequately?	35	(48.6)	49	(68.1)
4. When should a baby be given liquids other than breast milk?	26	(36.1)	48	(66.7)
5. What is the most important reason for weighing all babies soon after birth?	46	(63.9)	52	(72.2)
6. Why is it important to place a baby on the mother's bare chest after delivery?	38	(52.8)	64	(88.9)
7. Why is it important to apply chlorhexidine gel to the umbilical cord of a baby?	34	(47.2)	52	(72.2)
8. What is the normal temperature range for a healthy baby?	33	(45.8)	71	(98.6)
9. How soon after birth can a healthy baby be bathed?	21	(29.2)	65	(90.3)
10. How fast should a normal baby breathe?	12	(16.7)	67	(93.1)
11. What are the key messages you should tell parents of a healthy newborn?	25	(34.7)	61	(84.7)
12. What are newborn danger signs?	28	(38.9)	55	(76.4)

the training with factors influencing non-adoption. Findings were analysed separately for community and facility health workers.

Results

Knowledge on newborn care practices and danger signs

From the self-administered knowledge tests, facility health workers demonstrated a higher average percentage of correct responses (73.0%) in comparison to CHWs (48.3%) prior to receiving the training package. Overall, health workers showed increased knowledge on newborn care practices and danger signs after participating in the training (Tables 3 and 4). For CHWs, the mean number of correct responses increased from 5.8 (SD = 2.3) pre-training to 9.6 (SD = 2.1) post-training. Among CHWs, knowledge increased by 40% or more on questions about normal temperature range, normal respiration rate, delayed bathing and key newborn health messages. While facility health workers experienced a similar trend with their mean number of correct responses increasing from 14.2 (SD = 2.7) pre-training to 17.4 (SD = 2.8) post-training, improvements for individual questions were lower in magnitude, largely a

result of higher baseline scores, limiting the scope for large absolute gains. In addition, on two questions (timing of cord clamping for babies requiring resuscitation, and frequency of breastmilk expression) the proportion of workers with correct answers dipped slightly. For questions related to knowledge on the length of time for initial skin-to-skin, normal temperature range and newborn danger signs, however, scores for facility workers increased by 40% or more.

Changing attitudes toward care during pregnancy, labour and birth

Results from the in-depth interviews describe the change in health worker attitudes pre- and post-training. Before participating in the training, midwives and TBAs perceived most newborn care practices during pregnancy, labour and birth as very important and they retained similar attitudes after training. After the training, several providers recognised that events such as bleeding and premature rupture of membranes held risk for newborns, in addition to pregnant women. Similarly, prior to the training, participants were aware of the benefits of partograph use for maternal health.

Table 4. Correct response to questionnaire to assess facility health worker knowledge, pre-post-training (N = 25)

Variable	Pre-training		Post-training	
	No.	(%)	No.	(%)
Pregnancy, labour and birth				
1. How many times do you need to record the fetal heart rate on the partograph?	22	(88.0)	22	(88.0)
2. What supplies do you need to have available in the delivery room for every delivery?	24	(96.0)	25	(100.0)
3. If a baby requires resuscitation, where do you place the mask on the baby?	17	(68.0)	20	(80.0)
4. If a baby requires resuscitation, when do you clamp and cut the baby's cord?	16	(64.0)	11	(44.0)
Postnatal care				
5. Why is it important to begin breastfeeding as soon as possible after birth?	15	(60.0)	20	(80.0)
6. When should a newborn be given liquids other than breast milk?	14	(56.0)	17	(68.0)
7. Babies with which problem might benefit from breastmilk feeding from a cup?	18	(72.0)	20	(80.0)
8. How often should a mother express milk for a baby who cannot feed at the breast?	20	(80.0)	17	(68.0)
9. What is the most important reason for weighing all babies soon after birth?	22	(88.0)	24	(96.0)
10. Why is it important to place a baby on the mother's bare chest after delivery?	21	(84.0)	24	(96.0)
11. How long should initial skin-to-skin care be provided by healthy mothers of well babies?	8	(32.0)	20	(80.0)
12. How should a baby be kept warm after skin-to-skin care?	22	(88.0)	23	(92.0)
13. How soon after birth can a healthy baby be bathed?	21	(84.0)	24	(96.0)
14. How fast should a normal baby breathe?	20	(80.0)	23	(92.0)
15. What is the normal temperature range for a healthy baby?	11	(44.0)	21	(84.0)
16. At 90 minutes after birth, a 2700 gram baby has a temperature of 35.8 °C. What should you do next?	17	(68.0)	20	(80.0)
17. When should a baby be treated with antibiotics?	21	(84.0)	24	(96.0)
18. You have determined that a baby with a birthweight of 1800 grams needs antibiotics. How much ampicillin (200 mg/mL) should you give?	16	(64.0)	19	(76.0)
19. What do you apply to a baby's cord after it is cut?	8	(32.0)	17	(68.0)
20. List five different important basic newborn care practices that mothers should receive education about.	6	(24.0)	13	(52.0)
21. List five different newborn danger signs that require immediate action.	9	(36.0)	20	(80.0)

“The partograph can help you detect obstructed labour so then you can make early decisions. You decide whether the mother can be referred and what could be the management in case of any problem because when it gets to the stage of action line you have to take action.” (Juba, female midwife, post-training)

Participants who took the training expressed greater appreciation of the partograph as an intervention that could detect foetal distress in addition to prolonged labour, and those in Juba had high intention to use the partograph for foetal monitoring. Similarly, CHWs felt it was important to identify women early in pregnancy before

Table 5. Summary of in-depth interviews' emergent themes for non-adoption	
Theme	Emergent sub-theme
Personal characteristics	Personal knowledge of benefit for mothers and/or newborns Personal beliefs or values placed on the importance of task
Intervention complexity	Comfort reflected by perceived difficulty or ease of task through use or knowledge Length of time taken to complete task Lack of clarity on how to implement steps required for task
Organisational facilitators	Relevant trainings or topics that need further training Organisational clinical protocols that either facilitate or hinder delivery Level of resources dedicated for tasks or ongoing operations Reference to the availability of staff for implementing tasks Level of supervision or feedback communicated to staff Network with other referral facilities including aspects of the referral process
External environment	Perceived acceptance by the community towards the task Effect of conflict on health care system

the training, given the poor nutritional status of women in the camp and negative impact on pregnancy outcomes. However, CHWs were often reluctant to adopt this practice given social stigma of disclosing pregnancy. Post-training, CHWs expressed that establishing trust and educating women of reproductive age regarding benefits of ANC would result in early identification. Other practices such as the promotion of facility-based deliveries was an existing activity for CHWs prior to the training, and CHWs continued to perceive this as the most important intervention to prevent maternal and newborn deaths.

“A good community health worker should not say that you are pregnant. You have to look to the community. They are the ones to help you identify pregnant mothers. If you educate them, [then] they will respect what you're telling them and they will be the ones to help your search for pregnant mothers.” (Juba, male CHW, post-training)

Newborn resuscitation was consistently seen as a lifesaving intervention and facility-based providers felt the training improved their confidence to use the newborn bag and mask without assistance. Two female midwives in Maban, prior to receiving the training, were hesitant to delay cord clamping past 1 minute, with one stating *“we might not need to delay much ... because the blood is still moving in the cord so maybe there is a risk of mother to child transmission of infection.”* Providers better

understood the benefits of delayed cord clamping to increase iron and blood cells after receiving the training, although they failed to describe the need for immediate clamping during newborn resuscitation.

Changing attitudes toward postnatal care

Exclusive breastfeeding, clean cord and skin care, and counselling on newborn danger signs were universally considered very important among facility-based providers both before and after the training. While several participants were aware of benefits arising from exclusive breastfeeding (for example, infection prevention or birth spacing), the importance of early initiation for bonding, nutrition and postpartum blood loss were new concepts for many facility health workers. As awareness of benefits of quickly establishing breastfeeding increased through training, providers expressed intent to promote skin-to-skin contact in the first hour after delivery. Other interventions such as weighing the newborn, providing a birth notification and delaying the first bath gained importance among providers after receiving the training; initially, these actions were less important because they were not perceived to prevent any danger to the newborn. As one female midwife explained prior to receiving the training, *“weighing the baby can be important, but it's not an emergency”*. After the training providers described the benefit of recording weight for identifying low birth weight babies who need

additional care. CHWs carried over their experience from providing care for children under five and applied this to their attitudes toward the importance of postnatal care practices. Initially measuring respiratory rate, temperature and weight were regarded as essential for detecting illness among older children given the indications for health and nutrition, but CHWs understood the specific risks for newborns after receiving the training.

“There are some children that are delivered and they weigh less than 2.5 [kg]. That is not a good weight for a newborn and [the baby] needs to be taken care of by the hospital and not at home. This is why I am saying weighing the newborn is very important.” (Malakal, male CHW, post-training)

New interventions such as counselling mothers on newborn danger signs and postnatal visits were perceived by CHWs, prior to training, to be activities that could be integrated into their existing work. Three months later CHWs reported that they had adopted most postnatal practices, although it was not consistently done in the first week of life. Several health workers attributed uptake of these practices to positive reinforcement during supervisory visits. A CHW in Juba described her experience after receiving the training, “[we] report daily and [this]... enable[s] us to know where we need to improve, like for example if there is something we [were] unable to do as the supervisor wish[es], then he will tell us.”

Changing attitudes toward care of small and sick newborns

Perceptions toward the importance and adoption of practices, such as timely physical exams, measuring the newborn’s temperature, breastmilk expression and KMC varied among facility-based providers prior to receiving the training. While KMC can be used in the absence of incubators and indeed is the highest standard of care for stable preterm babies,³¹ these providers attributed low importance to a preference for incubators (which were not available in any of the facilities) to prevent hypothermia, while low adoption of KMC was due to a lack of clinical training and caregiver acceptance. A female midwife in Maban reported, “*what they call incubator is not there at all and I really feel comfortable to use [incubators] for small babies... in a well set up clinic, there used to be incubators for every premature baby.*”

Following the training, a female midwife described this shift in attitude: “*according to the KMC method, if the mother delivers a premature baby, because the skin alone of the baby cannot gain temperature, you put it together with the skin of the mother to get the warmth of the mother.*”

Facility-based providers were widely aware of sepsis as a severe illness that could lead to death, prior to our training. Infection prevention practices were frequently adopted in the facility, but the administration of a first dose of antibiotic prior to referral for newborns with suspected sepsis was uncommon among providers prior to receiving the training. Facility health workers who received training described feeling more comfortable with care for small and sick newborns. Post-training, CHWs commonly reported that they intended to refer newborns to the facility because they now had knowledge on how to use weight and temperature to identify the small and sick; other danger signs were not brought up by CHWs in the discussion.

Factors influencing attitudes toward non-adoption of newborn practices after training

Intervention complexity among health workers

Participants identified several obstacles to adopting certain newborn care interventions even after training. Perceived difficulty of the elements of neonatal care and the additional time this care required were key themes identified through in-depth interviews. As one female midwife in Maban reported, “*assuming it’s a low birth weight baby you need to give more attention, then you have to ignore the ANC (antenatal care) mothers.*” Facility-based TBAs were unable to adopt the partograph because of illiteracy; therefore, midwives in these facilities did not use the partograph because a woman’s labour extended into evening shifts, which are covered by TBAs. Managing newborns with a fever, serious infection or poor feeding remained challenging for both midwives and TBAs. They emphasised that a two-day training was not sufficient and requested more intensive training on these practices. Likewise, some CHWs also perceived respiratory rate and weight to be difficult to measure due to the poor design of the timer and weighing scale.

Organisational barriers

Lack of newborn-specific clinical and referral protocols, resources, supervision and ongoing training persisted to hinder the adoption of the facility- and community-based newborn care practices post-training. These bottlenecks were most common when caring for small and sick newborns. Organisational protocols led maternity staff to refer any child with feeding problems to the nutrition department, which posed challenges for monitoring progress among small babies who required different care compared to older children with acute malnutrition. Several practices, such as referral or intramuscular injections, were often delayed because they required a clinical officer or physician. Inadequate staffing and lack of space in the maternity ward were the key barriers for caring for small babies in the hospital. The shortage of beds to monitor premature babies beyond 6 hours in the Juba hospital was exacerbated during the July crisis as the hospital was destroyed and labour/delivery services were shifted to primary health care clinics. CHWs cited lack of staffing and prioritisation as the main barriers to conducting timely home visits, particularly with competing activities such as vaccination campaigns or disease surveillance. Weekly timetables included mental health and other sectoral activities, but newborn care was inconsistently integrated with these other routinely scheduled activities.

External environment

Interventions that required social and behavioural changes among caregivers remained unlikely to be adopted even after the introduction of the training package. Health workers in the facility expressed that mothers' resistance to exclusive breastfeeding, breastmilk expression and prolonged skin-to-skin contact lowered health workers' intention to promote these practices. The perceived burden of time involved with these KMC interventions was widely reported as the main complaint among mothers. Lack of community acceptance remained among the key reasons for not weighing a newborn. To address this, CHWs explained that additional time was needed to work with the community to reduce apprehension around handling new babies. A male CHW in Juba stated,

“as a community health worker who is professional ... you have to win the confidence, you have to build the trust with the family because it is difficult until

they allow you access to the child ... families do not allow even the father of the child in the first month to enter the house ... but through the intensification of the health messages it is changing.”

Despite positive attitudes among health workers toward most newborn care interventions, the effect of the conflict across South Sudan was one of the most widely discussed factors influencing low adoption. Limited movement caused by the fear of attack on humanitarian workers prevented the availability of skilled birth attendants (SBA) to manage complications and ambulances to refer families. One female midwife in Maban said,

“the midwife assistants [facility-based TBAs] we have on the ground don't know how to write and read, so what they know is to deliver the mother only [if] normal delivery [and] they cannot identify the complications ... then like for four, five days we shall have no recordings of all the mothers who have delivered.”

Birth attendants in Juba were unable to set up infection prevention measures and adhere to standard precautions among newborns or manage small babies when services were integrated with the outpatient department after the destruction of the maternity ward. Health workers expressed concern that there had been an increase in the number of sepsis cases and delivery of small babies during this time of escalated conflict. Health education on reproductive health was also neglected during crises because of the limited availability of all health workers, and CHWs focused outreach activities on mental health and gender-based violence. CHWs also found it increasingly difficult to locate or contact mothers during household visits. Another male CHW in Juba described,

“those people [who] were affected, when I resume my work, I could not find them ... they run for safety ... then you see, it makes it difficult for me to track, to see who is here and who is there ... there was really inaccessibility to those people.”

Discussion

Although substantial progress has been made in recent years in understanding how to implement neonatal health interventions, few studies have been conducted in settings with ongoing humanitarian crises.³² Our study on health workers' knowledge and attitudes toward evidence-based newborn interventions in South Sudan provides

evidence on factors that influence the adoption of newborn care practices among health workers. We assessed implementation research outcomes¹¹ such as acceptability and adoption of these interventions after receiving training in a rapidly changing context. Despite the short length of the training, primarily due to constraints of removing essential staff from service delivery, health workers successfully improved their knowledge on newborn danger signs following the training. Although weekly supervision visits aimed to maintain knowledge and practices following the training, organisational and external factors were the main barriers to adoption. Differences were not found between male and female health workers at the community or facility level.

Postnatal interventions were new responsibilities for CHWs, whereas identifying pregnant women and promoting facility-based deliveries were part of their existing work. This likely led to the disparities between practices in pre-training knowledge scores. Conversely, midwives and TBAs have a more defined role from the antenatal to postpartum period and were found to have a higher level of knowledge than CHWs at baseline. While scope to improve among facility workers was more limited due to higher baseline scores, both cadres improved their overall knowledge immediately after training, with particular improvements in recognition that danger signs, such as fast breathing, hypothermia, or fever, require immediate action. Knowledge on the timing of cord clamping for babies requiring resuscitation may have reduced post-training due to the emphasis on delayed cord clamping during the training. However, the reduction in knowledge on the frequency of breast-milk expression may reflect a poor understanding of the question. The follow-up qualitative interviews demonstrated that, after the two-day training, some positive changes in health worker attitudes were also found. They better understood the health benefits of practices such as skin-to-skin contact and early initiation of breastfeeding. Midwives and TBAs gained confidence to conduct resuscitation without additional support, while accepting KMC (vs. incubators) as a readily available, low-cost intervention that can save small babies was more challenging. Meanwhile CHWs, despite the barriers for conducting timely home visits, expressed understanding of the key neonatal health messages during the postnatal period and did intend to measure temperature and respiration rate to identify danger signs and refer newborns for care.

The observed improvements in knowledge, however, did not necessarily ensure acceptance or adoption of an intervention. Knowledge among both groups of health workers improved immediately after the training but three months later male and female health workers remained unlikely to adopt certain practices, particularly those that required challenging cultural norms, such as postnatal visits in the community in the first week of life, and those practices requiring access to SBAs, like caring for small or sick newborns in the facility. Similarly, a pre–post study in Tanzania found significant improvements in health worker knowledge of neonatal resuscitation yet skills did not improve.³³ This suggests that improved knowledge alone is insufficient to ensure the adoption of guidelines.

Interventions during the labour and delivery period have the greatest impact on neonatal mortality.³⁴ The interventions addressing this critical period were the most widely accepted by facility health workers. Admittedly, the TBAs did not have the skill set to monitor foetal heart rate using the partograph or manage complicated deliveries following training. Several studies even in non-crisis settings have found the partograph as a low-adoption intervention,^{35,36} but the factors influencing use in this study were perceived by midwives to be continuous access to SBA during operating hours. In this study, conflict limited the movement of non-local staff in evening hours or during acute moments that resulted in lack of staffing of SBAs at the health facilities. We did not find negative attitudes among CHWs toward identifying pregnant women or promoting facility-based deliveries after receiving the training.

Similarly, most postnatal interventions were acceptable among community- and facility-based health workers if they were perceived to be lifesaving. The low value placed on birth registration likely impedes adoption among midwives and TBAs, which has implications for safeguarding child rights particularly in displaced populations where identity is critical for protecting a child's access to services.^{37,38} Home visits in the first week of life were unlikely to be adopted by CHWs during periods of mass displacement due to an inability to locate households and limited staffing to manage competing priorities. Evidence from development contexts identified challenges in community-level care for newborns, which can be heightened in settings with cholera outbreaks and sudden displacement.³⁹

Adoption of interventions for small and sick babies was influenced primarily by organisational factors. We found that midwives were disempowered to provide injectable antibiotics for sepsis or feeding support for these newborns and often referred them to other departments or organisations that were perceived to have higher-level practitioners or infrastructure. Policies adopted in development contexts for small and sick newborns, such as the Every Newborn Action Plan,⁴⁰ can provide guidance for humanitarian organisations that may have increased access to a qualified health workforce and commodities.

Limitations

The generalisability of our findings is limited by the time points and context when data were collected. Our measurement of participants' knowledge was limited to immediately before and after the training while attitudes were measured three months after training. Factors influencing attitudes toward adoption of improved practices may be highly susceptible to change, particularly in an ongoing humanitarian crisis. Participants who met the inclusion criteria for an interview were selected based on availability and those unavailable for a second interview were replaced by another health worker. A sub-analysis of the 10 health workers who participated in a pre- and post-interview reflected the overall results, so we do not anticipate this posed a major threat to the validity of our findings. Finally, we focused on provider knowledge and attitudes; we were unable to measure actual change in practices following the training.

Conclusions

Despite challenges faced by ongoing conflict, health workers' knowledge on neonatal health increased following our two-day training. Moving forward, the use of a two-day training has the potential to be adopted in unstable settings experiencing protracted conflict, together with trainee follow-up and mentorship. However, the humanitarian community must reinforce this knowledge

with key actions such as community empowerment to shift cultural norms and organisational resources such as up-to-date clinical protocols and supervision that expand the care provided to women and their newborns in these contexts. Midwives and CHWs delivering care in displaced person camps in South Sudan affirmed it is important to address organisational and external factors, in addition to training and supplies, in order to improve the adoption of high-quality neonatal care. This study highlights the need to implement evidence-based newborn interventions during acute crisis, with innovative strategies and additional resources to ensure continuous care.

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Résumé

Les taux les plus élevés de mortalité néonatale se produisent dans les pays qui ont récemment connu un conflit. En juin 2016, International Medical Corps a mis en œuvre un ensemble d'interventions pour le nouveau-né basé sur le manuel *Newborn Health in Humanitarian Settings : Field Guide (Santé du nouveau-né dans les crises humanitaires : guide pratique)* et qui visait les agents de santé communautaires ou employés par une institution dans les camps de personnes déplacées au Soudan du Sud. Nous décrivons les connaissances et attitudes des agents de santé quant aux interventions de santé néonatale, avant et après avoir reçu une formation clinique et des fournitures, et nous recommandons des stratégies de diffusion pour une meilleure application des directives pendant les crises. Une approche à méthodes mixtes a été utilisée, comprenant des tests des connaissances avant et après, et des entretiens approfondis. Les participants à l'étude étaient des agents de santé communautaires ou employés par des institutions dans deux camps de déplacés internes situés à Juba et Malakal et deux camps de réfugiés à Maban, de mars à octobre 2016. La moyenne des résultats des connaissances pour les pratiques de soins néonataux et les signes de danger a augmenté chez 72 agents de santé communautaires (avant la formation : 5,8 [écart type : 2,3] et après la formation : 9,6 [écart type : 2,1]) et 25 agents de santé employés dans un centre (avant la formation

Resumen

Las tasas más altas de mortalidad neonatal ocurren en países que recientemente han sufrido conflicto. En junio 2016, el Cuerpo Médico Internacional aplicó una serie de intervenciones de atención del recién nacido, basadas en *Newborn Health in Humanitarian Settings: Field Guide (Salud del recién nacido en situaciones humanitarias: guía de campo)*, dirigida a trabajadores de salud en comunidades y unidades de salud, en campos de personas desplazadas en Sudán del Sur. Describimos los conocimientos y las actitudes de los trabajadores de salud hacia las intervenciones de atención del recién nacido, antes y después de recibir capacitación clínica e insumos, y recomendamos estrategias de difusión para mejorar la aceptación de las directrices relativas al recién nacido durante crisis. Se utilizó el enfoque de métodos combinados, que incluyó exámenes de conocimientos iniciales y finales y entrevistas a profundidad. Los participantes del estudio fueron trabajadores de salud en comunidades y unidades de salud, en dos campos de personas desplazadas internamente situados en Juba y Malakal, y en dos campos de refugiados en Maban, desde marzo hasta octubre 2016. Las puntuaciones medias de conocimientos de las prácticas de atención neonatal y signos de peligro aumentaron entre 72 trabajadores de salud comunitarios (pre-capacitación: 5.8 [SD: 2.3] vs. post-capacitación: 9.6 [SD: 2.1]) y 25 trabajadores de salud en

: 14,2 [écart type : 2,7] et après la formation : 17,4 [écart type : 2,8]). Les connaissances et les attitudes relatives aux principales pratiques essentielles, comme l'utilisation du partogramme pour évaluer les progrès du travail, le démarrage précoce de l'allaitement maternel, le placement du bébé directement sur la peau de la mère et la pesée du nourrisson, se sont améliorées chez les accoucheuses qualifiées. En dépit des difficultés rencontrées dans les environnements touchés par les conflits, les cours de formation ont le potentiel d'élargir les connaissances des agents de santé sur les soins néonataux. La communauté humanitaire devrait renforcer ces connaissances avec des mesures essentielles pour modifier les normes culturelles et étendre les soins prodigués aux femmes et à leurs nouveau-nés dans ces contextes.

unidades de salud (pre-capacitación: 14.2 [SD:2.7] vs. post-capacitación: 17.4 [SD: 2.8]). Los conocimientos y las actitudes hacia las prácticas esenciales clave, tales como el uso del partograma para evaluar el progreso del trabajo de parto, la iniciación temprana de lactancia materna, el cuidado de piel a piel y pesar al bebé, mejoraron entre los asistentes de parto calificados. A pesar de los retos en entornos afectados por conflicto, brindar capacitación tiene el potencial de incrementar los conocimientos de los trabajadores de salud acerca de la salud neonatal post-capacitación. La comunidad humanitaria debe reforzar estos conocimientos con medidas clave para cambiar las normas culturales que amplían la atención brindada a las mujeres y sus recién nacidos en estos contextos.