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Developing a Culturally Sensitive Training Program for Recognition of Hypoxic Ischemic Encephalopathy in Rural India#

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Abstract

Background: Birth asphyxia is a major cause of neonatal deaths in the developing world. The management of an asphyxiated infant includes effective resuscitation at birth and treatment of subsequent hypoxic ischemic encephalopathy (HIE). HIE is frequently under recognized in this setting and this contributes to early infant mortality and morbidity.

Methods: We present the evolution of a HIE recognition training program for rural India. The development of this program involved close community interaction, expert content analysis, and preparation and field-testing of a video education package.

Results: A 10-point assessment method was finalized (3 points for history, and 7 examination markers). An education workshop was developed which included prior assessment of knowledge, a video education package and a formal feedback form. The workshop was well received by the participants.

Conclusions: We believe that for the provision of supportive neonatal management or introduction of novel definitive therapies for HIE, the recognition program will be vital in low resource settings and needs to be integrated into the routine responsibilities of the local community health workers. This will ensure timely treatment and transfer of sick or high-risk infants to relevant health facilities and initiation of therapy.

Keywords

Birth asphyxia, Neonate, Brain injury

Introduction

Every year, an unacceptably large number of infant deaths occur in developing nations, with premature birth and birth asphyxia being the two leading causes. In India, birth-related asphyxia remains a principal leading cause of neonatal mortality and contributes to around 0.2 million deaths every year [1]. To date, approaches to improve neonatal outcome have been, justifiably, focused on ensuring that women are attended by a trained health professional in labor, and basic measures to protect the baby from infection and hypothermia [2]. However, even in low resource countries that have increasing attendance rates in labor, birth asphyxia remains the major cause of death within the first 24 hours. In India, where up to 60% of women are attended by a skilled care provider in labor [3], a third of all neonatal deaths occur within the first day of life, and of these a third are due to birth asphyxia [4]. Overall, birth asphyxia is implicated in 1 in 4 deaths within a week of birth, either as the sole cause or in association with sepsis and/or prematurity [4]. As a cause of death within the first day of life, birth asphyxia is more common than prematurity [4]. Indeed, birth asphyxia ranks eighth as a global burden of disease [5], with estimated numbers of disability-adjusted life years (DALYs) due to birth asphyxia exceeding those due to all childhood conditions preventable by immunization [6].

The provision of appropriate care for the infant who has suffered an asphyxial insult at birth relies on the timely recognition of asphyxia. Only then can adequate neonatal resuscitation soon after birth and management of the subsequent hypoxic ischemic encephalopathy be possible. A number of programs addressing improved neonatal life support have been successful in resource-limited settings [7]. However in resource-poor settings therapy for HIE soon after birth is not readily available. Moreover without early recognition, it is not possible to institute supportive management or therapies. Therapeutic hypothermia (TH) is the only definitive treatment available in the developed world and low cost alternatives for TH are becoming popular in developing nations [8,9]. However,

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even in high resource settings, TH does not provide universal benefit. There are also a number of neuroprotective alternatives to TH that are the current subject of ongoing trials both in industrialized and developing nations. In either case, the success of supportive or definitive treatment of HIE relies on its early recognition.

The recognition of HIE in developed countries relies on a number of factors. These include a corroborative history of perinatal compromise (abnormal fetal monitoring during labor, poor condition at birth such as Apgar score, need for neonatal resuscitation) biochemical evidence of circulatory compromise (low pH, lactic and metabolic acidosis), physical examination, amplitude integrated EEG monitoring and neuroimaging. Physical examination for HIE has traditionally been influenced by the Sarnat staging system [10]. A number of semi quantitative scores have also been utilized especially where a trained neonatologist is not immediately available, including the Thompson and Miller scores [11,12]. Besides identifying an infant with HIE, the scores also describe the severity of the condition and provide prognostic benefit for the future. This project aimed to assess and educate birth attendants/ health workers from diverse skill levels in resource poor settings using a training package.

The study had two objectives:

1. To assess the ability of local health workers from rural India to recognize neonatal birth asphyxia and subsequent HIE.

2. To implement a training package for recognition of birth asphyxia and early signs of HIE for these local health workers.

The lessons learned from the development of this training program will be used to inform the development and implementation of definitive therapies in a culturally appropriate and acceptable manner, bridging the challenging gap between evidence and real impact [13].

Methods

Development of the training program

Indian community: The communities chosen for the study belonged to the rural areas in and around Lucknow, Uttar Pradesh, Northern India. Most of these communities came under the health jurisdiction of primary health center facilities under the supervision of Department of Community Medicine, King George Medical University, Lucknow and Community Empowerment Laboratory, Lucknow.

Community interaction and understanding: Before a score or system could be adapted for this community, it was imperative to understand the local practice of labor monitoring, delivery, resuscitation and monitoring after birth. Even more important was to understand the documentation of the condition at birth. Two of the authors (AM, MF) spent time in every facility in the chosen communities (home, primary health center, community health center, tertiary health center) where a birth might take place. It became apparent that the only consistent information likely to be routinely available was the mode of delivery and the baby's condition at birth (immediate cry, need for help at birth). It was unlikely that reliable information about fetal monitoring, Apgar scores or details about resuscitation would be available.

Table 1: 10-point criteria for hypoxic ischemic encephalopathy used in the training program.

HIE should be considered if:
Term or near term infant (> 8 completed months of pregnancy) at birth was born in 2 out of the 3 situations (below):
1. did not cry
2. required help (resuscitation)
3. continued to require help at 10 minutes of life
And exhibited 4 out of the following 7 criteria at assessment in the first 6-12 hours of life:
4. Abnormal conscious state (Hyperalert, drowsy, depressed or unconscious)
5. Abnormal tone (Increased, decreased)
6. Abnormal posture (Floppy, hyperextended)
7. Abnormal suck (Weak, absent with poor feeding)
8. Abnormal grasp (Weak, absent)
9. Abnormal breathing (Increased respiratory rate, laboured, apnoeic)
10. Abnormal movements (Excessive jitteriness, convulsions)

Results

Video education package development

Once the points for history and condition at birth were decided and following community interaction, the next step was the examination of the infant itself. After careful consideration, the following seven were decided upon: consciousness, posture, tone, suck reflex/ feeding history, grasp reflex, breathing and abnormal movements (Table 1). These parameters are in keeping with available scoring systems [14]. The next step was development of a video education package to highlight these seven examination markers. Thirty videos of neonatal examination were obtained in collaboration with the Department of Pediatrics, King George Medical University, Lucknow. The neonates filmed included infants who were normal, some who had suffered an asphyxial insult and some who were unwell due to other reasons. These were obtained with informed (signed) parental consent and did not have any identifying information. The videos were edited in Australia and developed into an education package with emphasis on "normal" and "abnormal" finding for each examination marker described.

Educational workshop development

A 10-point assessment method was finalized (3 points for history/ condition at birth which would be obtained verbally from the parent, and 7 examination markers obtained from examination by a community health worker). An education workshop was developed which included prior assessment of knowledge and skill by conducting a pre workshop test. The test included 2 video assessments of infants, one whose examination was normal and the other showing signs of HIE. Following the pretest, a presentation on the theoretical aspects of birth asphyxia followed underpinning the causes, circumstances and consequences of the condition. Each of the seven examination markers was then presented as a block with descriptions on what to expect in a normal infant, abnormal infant and video examples of each, followed by a summary slide. Each video block lasted around 3 minutes. This was followed by a post-test evaluation similar to the pre-test assessment. Finally, written feedback was taken from participants incorporating questions with answers on a 5-point Likert scale and free text responses. The entire workshop lasted 120 minutes. The educational workshop was conducted under the ethical framework of King George Medical University, Lucknow.

Field testing/trial run-feedback and performance

Once the workshop was planned and developed, a field test was

Table 2: Feedback from the educational workshop.

Question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The education program was appropriate for me.	33	6	0	0	0
The content of the program was pitched at an appropriate level.	34	5	0	0	0
The slides/ videos were easy to follow.	35	3	1	0	0
The instructor spoke clearly.	37	2	0	0	0
There was enough time for questions.	35	3	0	1	0

Total responses - 39.

undertaken to obtain feedback of the acceptance in the community. An educational day was organized with invitations sent to a variety of local health workers including ASHA (Accredited Social Health Activist) workers, ANM (Auxiliary Nurse Midwife), TBA (Traditional Birth Attendants), nurses and doctors in primary health facilities. A total of 40 health workers attended the half-day (3 hours) workshop. This was out of a total of around 80 health workers in that municipality. The feedback was universally positive as seen in the Likert scale responses (Table 2). Free text responses also highlighted the strengths of the program (quality of videos, explanations, easy way to differentiate normal and abnormal for each parameter, 10 point check and the opportunity to mingle with educators), improvements sought (even better time management, small font and difficult language in some slides). The changes suggested for future program were integration of obstetric, neonatal and future management of sick infants, and mention of relevant transport and referral facilities available. Overall, one participant summed up the experience eloquently (translated):

"*I enjoyed the opportunity to get educated on this vital subject by experts in the field, along with our local leaders. I am sure with more programs like this we will impact change in the outcomes of these asphyxiated children.*"

Discussion

Birth asphyxia is a major cause of neonatal mortality and significant morbidity, worldwide. As a cause of global burden of disease, birth asphyxia is more important than either neonatal infections or congenital abnormalities and accounts for more Disability Adjusted Life Years (DALYs) than malaria in all age groups [5]. Approximately 10% of all child deaths before the age of 5 are due to birth asphyxia-intrapartum events [6].

The Millennium Development Goal 4 (MDG 4) [15] of reducing early (< 5 year) child death rates by two thirds cannot be achieved unless effective interventions for birth asphyxia can be developed and successfully applied. This is reflected in the 7.6 million deaths in children aged less than 5 years worldwide, with 3.1 million of these occurring in the neonatal period [16]. Within this group, intrapartum hypoxia or asphyxia results in about 700,000 neonatal deaths [17] and another 1 million stillbirths every year [18]. Almost all of these occur in low and middle-income countries. Recent studies show that in some rural settings birth asphyxia may contribute to more than 60% of neonatal mortality, far over the 25-33% previous estimate [19-21]. Factors contributing to the varied figures are a lack of registration systems from those areas where mortality is the highest [22] and deaths within the first 24 hours being under-reported or misclassified as stillbirths [18,22] with associated under recognition of asphyxia by verbal autopsy [23]. Early recognition of the cause with appropriate treatment is paramount to save newborn lives [24].

An important consideration is the need to increase a woman's access to skilled healthcare during her pregnancy and labor, including access to a safe caesarean birth. Skilled newborn care is also critical, however these measures are expensive and considered unrealistic in a worldwide setting in the immediate future. Further, even in countries with good rates of attended labors, birth asphyxia-related neonatal mortality and morbidity remain major challenges.

For this project we chose a rural setting in Utter Pradesh, India in collaboration with the Community Empowerment Laboratory (CEL), Lucknow. This region has a documented history of neonatal research in India's poorest and most populous state with the country's highest rates of infant neonatal and child mortality [2]. Neonatal death rates are estimated between 41-84 per 1000 live births [13]. The health system in this area is largely rural and dependent on a variety of health care providers, many of them not medically qualified [25]. Other projects undertaken in this area demonstrate that improved neonatal health outcomes can be achieved by simple community interventions and are directly responsible for reduced neonatal mortality [26]. The CEL therefore already holds infrastructure for community mobilization and behavioral change [27].

With a regional project manager, we engaged a diverse range of community birth attendants and health workers including ASHA workers, traditional birthing attendants and auxiliary nurse midwives from a number of villages in the area. A video simulation package developed in Australia demonstrated typical term asphyxiated neonates in the first few hours of life, neonates with illness of another cause, and healthy neonates. The package included a directed history and focused examination of the neonate. Primarily an asphyxiated neonate reflects a baby in a poor condition at birth that still requires resuscitative care at 10 minutes of age (Derived from McLennan [28]). Multiple studies have demonstrated that early Apgar scores are an unreliable predictor of asphyxia [20]. HIE was recognized according to modified Miller and Thompson scales, the individual items of which correlate well with severity of HIE [11,12]. Community understanding and perception played a major role in the adaptation of specific markers, without community involvement in program development there could have been social barriers that we did not anticipate. We tried to overcome this by using the established systems in place to have a good working relationship with the village and involved the local leaders. This led to easy acceptance of the program as demonstrated in the universally positive feedback.

This study does not contain any active intervention but is the prelude for future studies that require the recognition of birth asphyxia and subsequent HIE as a tenement. We anticipate that the recognition of birth asphyxia and HIE amongst birth attendants/ health workers will be improved by this program. The program will continue to train more health workers in other communities surrounding the initial jurisdiction chosen for the work shop. In turn, we hope that this will result in improved care, both short term (neonatal death) and long term (childhood neurodevelopment). We do not anticipate that this will be a challenge for the birth attendants/ health workers from a socio-cultural context. Ongoing programs will also improve consistency of reporting of neonatal death and allow figures to be obtained on mortality due to asphyxia. Prevention of birth asphyxia by education about universal antenatal clinic attendance, nutrition and public health is also vital in low resource communities.

We think that this study adequately answers the BCM framework for the behavioral change on newborn survival as it is targeting a key area with the appropriate people and implementing behavioral education change for this group [13]. The future plans for this study are to leverage this knowledge and expand the education so that it is an inherent behavior. It is an essential first step in the recognition of asphyxiated newborns in rural communities so as to improve the initial management of these sick infants and future outcomes.

Competing Interests

The authors declare that they have no competing interests.

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Author Contributions

AM designed the study protocol, delivered the workshop to the local community health workers and wrote the first draft of the manuscript. SLM, MF, GJ and EMW provided scientific input to the design of the protocol in Australia and edited the manuscript. JVS, PP and VK provided input into the background of the local communities, design of the protocol, study roll out and edited the manuscript. All authors approved the final draft of the manuscript.

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