

**Aneji U Chiamaka**  
**Okeke Chiemelu**  
**Muomalulu Chinwe**  
**Agwu Ebere**  
**Okoli Chimuanya**  
**Umeh Rich**  
**Ajah RN Uzoma**

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# What happens after helping babies breathe training is complete? A prospective cohort study of Nigerian health care workers

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Aneji U Chiamaka (✉)  
 McGovern Medical School at the  
 University of Texas Health Science  
 Center at Houston  
 6431 Fannin Street, Houston Texas  
 77030 USA  
 Email:  
 Chiamaka.Aneji@uth.tmc.edu

Muomalulu Chinwe  
 Okeke Chiemelu, Agwu Ebere  
 Ajah RN Uzoma, Umeh Rich  
 Obijackson Women and Children's  
 Hospital  
 2 Madonna University Road, Okija,  
 PMB 496, Ihiala  
 Anambra State Nigeria

Okoli Chimuanya  
 Georgia Southern University  
 1332 Southern Drive  
 Statesboro, GA 30458

## Abstract: Background

Neonatal mortality remains disturbingly high in Nigeria. Helping Babies Breathe (HBB) is an evidence-based neonatal resuscitation (NR) educational program designed to teach NR in resource-limited areas. There is no information in Nigeria on what happens after health care workers (HCWs) complete HBB training.

*Aim:* To determine if HCWs who received HBB training utilized the acquired knowledge and skills (K&S) and engaged in any ongoing peer training. In addition, we studied HCW turnover one year after HBB training completion.

*Subjects and Methods:* Seventy-two HCWs were trained in HBB, and surveyed 1 year later using a 10-item questionnaire. Data analysis used measures of central tendency and t testing.

*Results:* Most HCWs reported the use of HBB daily. The commonest NR method used was suctioning (89.5 %), followed by drying

and positioning (86%), however there was 0% reported use of bag-mask-ventilation. Most HCWs (98%) reported sharing K&S with colleagues. Following training, 100% HBB trainers remained at original employment but 53% HBB providers moved to new employment and did not utilize their HBB K&S at their new employment site.

*Conclusion:* Frequent, brief, refresher practice sessions and implementation of a system for training new hires may improve HCW readiness for NR and their peer mentoring capabilities. Ensuring adequate equipment availability is critical for HCW to utilize acquired K&S. Significant HCW turnover occurred within a year of training. Trained HCW who left to new employment subsequently had limited impact at their new place of employment.

**Keywords:** Neonatal resuscitation, Helping Babies Breathe, Health care workers

## Introduction

Globally, neonatal deaths account for 3.1 million of the 7.7 million deaths in children under five years of age.<sup>1</sup> Nearly 99% of these neonatal deaths occur in low- and middle-income countries.<sup>2</sup> More than 80% of all neonatal deaths globally are due to infections, complications of preterm birth and birth asphyxia.<sup>3</sup> Previous studies have shown that the global decline in neonatal mortality rates has been slower compared with infant and under five years of age mortality rates, especially in the sub-Saharan African region.<sup>4,5</sup>

Neonatal mortality remains disturbingly high in Nigeria, despite the significant decline in other low- and middle-income countries, including countries like Ghana and Uganda.<sup>6</sup> In 2012, approximately half the world's estimated 6.6 million deaths in children aged less than five

years occurred in sub-Saharan Africa, and Nigeria accounted for approximately 13% of these deaths.<sup>6</sup>

The Nigeria Demographic and Health Survey (NDHS) 2013 estimated Neonatal Mortality Rate (NMR) as 37 per 1000 live births, which constituted about 54% of infant mortality.<sup>6,7</sup> Ezech et al<sup>8</sup> in their study, determinants of neonatal mortality in Nigeria, identified birth to mothers residing in rural areas as a factor. Akinyemi et al<sup>9</sup> reported little improvement in neonatal survival in Nigeria in over two decades, also, rural NMR is higher compared to urban NMR. This is due, in part to the inadequate health facilities, insufficiently skilled health professionals and lack of modern medical equipment which have undermined the Nigerian healthcare system, particularly in rural areas.<sup>10</sup>

Neonatal resuscitation (NR) programs are low-cost interventions that effectively reduce perinatal mortality up

to 30%.<sup>11-17</sup> There are several formal NR training programs globally. Helping Babies Breathe (HBB) is an evidence-based educational program designed to teach resuscitation techniques in resource-limited areas. Nigeria is one of the countries where HBB has been introduced.

To the best of our knowledge, there is no information in the literature on HBB provider post-training utilization of acquired skills/knowledge and on-going peer mentoring. Also there is no information on HBB trainer retention of facilitation capabilities and post-training job mobility of HBB providers and trainers. Given the persistently high Nigerian neonatal mortality, it is important to assess issues that can help inform ongoing and future trainings, especially on a national scale.

The study objectives were to determine since training completion, if trained health care workers (HCW) are utilizing HBB skills and knowledge in daily practice. Also, assess on-going peer training and mentoring occurring at the providers' workplace and ascertain the mobility of HBB providers and trainers one year after training.

## Methods

The study design was a prospective cohort study, conducted in a rural part of Ihiala Local Government Area (LGA), southeast Nigeria. Three physicians and one nurse at an area women and children's hospital were trained as trainers. Subsequently, they organized and implemented a series of one-day long HBB provider training course workshops for HCW from 19 surrounding Primary Health Care Centers (PHCCs) and Maternity hospitals in Ihiala LGA. Leadership at each facility nominated two HCWs involved in delivery room resuscitation for the training. The busiest of these facilities have on average, 25 deliveries/month.

The HBB workshops were conducted from July 2016 through December 2016.

A validated ten-question survey questionnaire was used to assess HCW utilization of HBB skills and knowledge in daily practice, on-going peer training and mentoring occurring at the providers' workplace and to ascertain the mobility of HCW. Each provider was contacted a year after training and the questionnaire administered by a trained interviewer either in person or telephone.

Continuous and dichotomous data were collected. Measures of central tendency, paired and unpaired t tests, where appropriate were used for data analysis. The relevant institutional review boards in Nigeria and the United States of America approved the study.

## Results

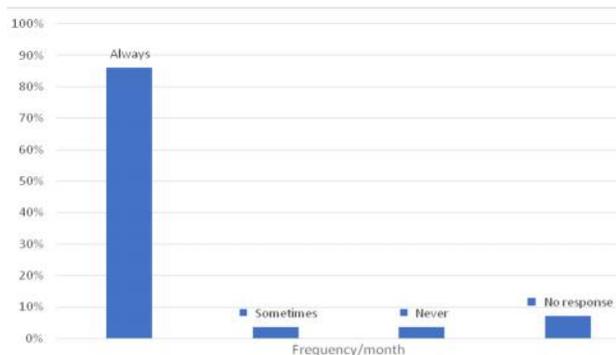
Seventy-two HCWs in total were trained, 4 HBB trainers and 68 providers. The survey was completed for 57 (79%) HCWs. Ten HCW were lost to follow up, three declined study participation, while two surveys were incomplete.

Only nine of 57 HCWs (16%) had received any formal NR training before the training workshops in 2016-2017. Of the fifty-seven surveyed participants, ninety-eight percent of the study participants were actively involved in delivery room neonatal resuscitation.

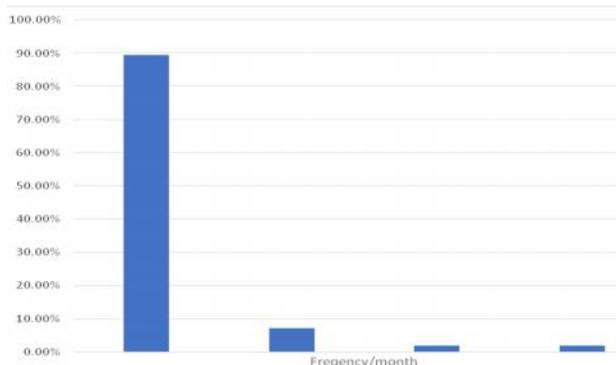
The use of suctioning and vigorous drying with positioning in the delivery room was the most common intervention reported by majority of HCW (Figure 1 and 2). None of the HCW surveyed reported bag and mask ventilation (BMV) use at any delivery in the past year. Within a year of the HBB training, more than half of trained HBB providers had left their place of employment (Figure 3). In contrast, all the HBB trainers remained at their place of employment and continue to facilitate HBB provider courses on average once a year.

Almost all subjects reported sharing their knowledge and skills with other birth attendants at their employment facility at the time of training. However, of all the HCWs who had moved to new places of employment, none reported using or sharing HBB skills and knowledge with co-workers at their new work location (Figure 4).

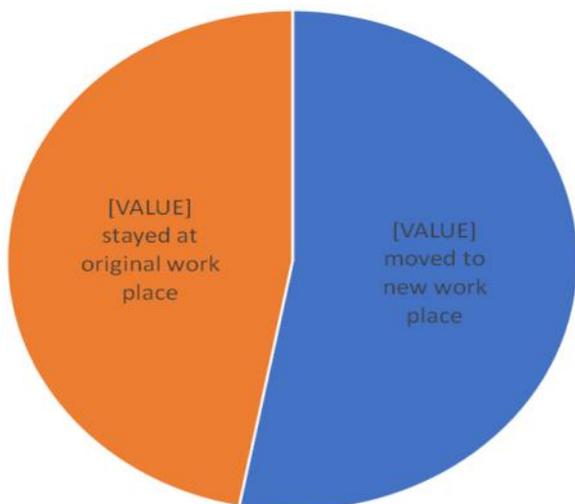
**Fig 1:** Frequency of vigorous drying and positioning as part of neonatal resuscitation by the study participants.



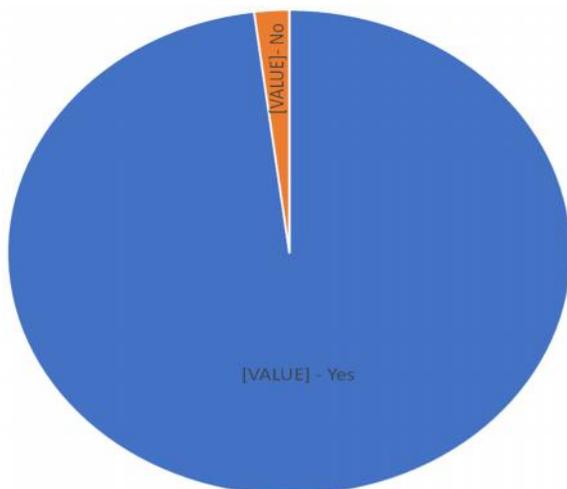
**Fig 2:** Frequency of mouth/nose suction as part of neonatal resuscitation by study participants



**Fig 3:** Job mobility of study participants 1 year after HBB training



**Fig 4:** Have you shared your skills with your co-workers?



## Discussion

To the best of our knowledge, this study is the first in Nigeria that shows what happens following trainer and provider training. We found that mainly midwives attend deliveries and provide NR at the health facilities surveyed. The commonest interventions provided in the delivery room were drying, positioning and suctioning. None of the HCWs reported the uses of BMV, this finding was surprising, given the training reviewed and reported incidence of intrapartum related events with continued hospital referrals for neonatal asphyxiain Nigeria. The reasons for no reported BMV use among the HCWs included lack of ambu-bags at their facility. However, where available, the ambu-bags were not functioning or not recyclable. In addition, attrition of BMV skill and HCW self-report of 'not feeling confident' they could effectively provide ventilation in the critical time necessary contributed to their not initiating BMV attempts.

These findings are concerning because effective and timely ventilation of a baby who is not breathing or crying following birth is the most important intervention that can reverse secondary apnea and decrease neonatal morbidity and mortality. Stressing the importance of timely and effective BMV use among HCW in the delivery room during HBB training and ensuring on-going skill retention by frequent practice sessions may lead to more willingness and confidence among HCWs to use this critical skill. Also, peer mentoring and support with ongoing on-the-job training/retraining may enhance HCWs confidence in providing this critical life-saving intervention in the delivery rooms

More than half of the trained providers had left their original work by one-year follow up and none who had moved was using their knowledge or skills at their new location, a missed opportunity for dissemination and propagation of life-saving skills and knowledge. These findings provide several improvement opportunities.

Neonatal deliveries attended by skilled birth attendants is associated with a 20% reduction in stillbirths.<sup>15</sup> However, there is long-standing issue of brain drain, with migration of skilled HCWs from low-resource areas particularly sub-Saharan Africa, Asia, and Pacific countries to more urban settings and high-resource areas. This has contributed to a strikingly disproportionate allocation of HCWs and increased patient to provider ratio, most stark in rural areas.

Given the need for more skilled workers and the importance of a skilled person present at every delivery, more midwives, nurses, CHEWs, and physicians should be trained through a systematic national NR program that tracks trained providers, incorporates mandatory periodic refresher classes and ongoing peer-mentoring to ensure sustainability and consistent quality. A viable process for traditional birth attendant education has to be part of this due to the significant proportion of home births that occur especially in the rural areas of Nigeria and other LMICs.

All babies should be positioned in sniffing position immediately to keep their airways open, dried, stimulated and all wet linen removed following birth. It is very important to keep them warm following birth because hypothermia is known to significantly increase adverse neonatal outcomes including death. This study showed a need to improve the frequency of this simple but effective, low-cost intervention. Respondents reported frequent use of suctioning. Though this can be potentially harmful if done too vigorously or excessively. A two-year study on 12 clinics and 37 hospital providers carried out by Tabangin et al. showed rapid loss of skills barely 1 month after HBB training. The study recommends ongoing skills practice and monitoring with refresher training to maintain these skills.<sup>16</sup> HBB training conducted in Ghana on midwives showed that a refresher course administered one year after initial training resulted in HBB

knowledge improvement.<sup>17</sup>

It is important for facilities that take newborn deliveries to be equipped with functioning and recyclable ambu bags. In addition, any group undertaking HBB or other newborn resuscitation training must have as part of its plan, ongoing skills training, supply and maintenance of equipment and ensuring they are in clean, working condition, ready for any emergencies.

There was a turnover of more than half of the trained provider cohort. We did not delve into specific reasons for job mobility for our participants but in Nigeria, people move jobs for better living conditions and better pay among other reasons. Bang et al in their multi-country study noted that there was a turnover of birth attendants leading to the need to train up replacements. It, however, did not identify the reasons for this turnover,<sup>20</sup> similar to our study. It is important to have a system of efficient and effective training in place for incoming HCWs. This will ensure they have the requisite skills and knowledge to provide skilled delivery room care.

The trained providers almost all reported sharing their knowledge and skills with their colleagues at their workplace. However, this willingness abruptly stopped when they moved to a new place of work. The reasons are unclear but this will result in limited dissemination of skills and knowledge, an essential aspect of adult learning that will add to the maintenance of skills and knowledge.

Our study found that 84% of HCWs had no previous NR formal training despite the fact that almost all of them attended deliveries daily. This finding was similar to those of the large multinational pre-post study carried out by Bang et al. on 835 active birth attendants, which showed 76% of study participants had no prior resuscitation training despite the fact that they regularly attended deliveries.

Study limitations include a 21% loss to follow up, and we did not assess the providers for skills or retest their knowledge at the time of the survey.

More HCWs are being trained through various mechanisms including collaboration between Ministries of Health and volunteer trainers. It is critical to ensure all trained HCWs have ready access to life-saving resources like recyclable ambu-bags and clean, dry linen. Frequent, brief, refresher practice sessions and implementation of a training plan for all new hires may improve HCW confidence and readiness to apply learned skills like a bag- mask ventilation. In addition, emphasizing the value of peer mentoring may help in sustaining and disseminating NR education.

Further evaluation of the impact of HBB in Nigeria and other LMICs is needed to better plan further training. As several LMIC have shown an improvement in neonatal resuscitation, efforts should be aimed at nationally propagating the HBB program in a systematic manner in order to continue toward the MDG 4.<sup>19,20</sup>

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