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ORIGINAL ARTICLE

National neonatal resuscitation training program in Nigeria (2008-2012): A preliminary report

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Abstract

Background: Routine institutional training of doctors and nurses on newborn resuscitation have commenced, to improve the quality of resuscitation available to high-risk babies, in Nigeria, as a means of reducing newborn deaths in the country. Perinatal asphyxia contributes to 26% of newborn deaths in Nigeria. Perinatal asphyxia results when babies have difficulty establishing spontaneous respiration after birth.

Materials and Methods: Between 2008 and 2012, doctors and nurses drawn from all the geo-political zones were trained using the Neonatal Resuscitation Training (NRT) manual of the American Heart Association and the American Academy of Pediatrics. Questionnaire-based, cross-sectional surveys of doctor and nurse trainees from the six geo-political zones in Nigeria were conducted eight months after the primary training, to evaluate the post-training neonatal resuscitation activities.

Results: Over the period of study, 357 doctors and 370 nurse/midwives were primarily trained in NRT. The overall ratio of step down training was 1:22 with 1:18 for doctors and 1:26 for nurses. In 2008, the delivery attendance rates were 11 per doctor and 9 per nurse/midwife. These rates increased to 30 per doctor and 47 per nurse in 2012. Between 88 and 94% of the doctors and between 72 and 93% of the nurses successfully used bag and mask to help babies breathe in the post-training period. The nurses used bag and mask for infant resuscitation more frequently, compared to doctors, with the rate fluctuating between two-to-one and four-to-one. Over the years, 87 to 94% of the doctors and 92 to 97% of the nurses/midwives trained other birth attendants.

Conclusion: The NRT in Nigeria is well-subscribed and the frequency of secondary training is good.

Key words: Birth asphyxia, birth attendants, delivery room care, neonatal resuscitation training, perinatal mortality

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Introduction

Nigeria has a total fertility rate of 5.4.[1] With about five to six million births annually, the majority of these births occur outside the hospitals and are unsupervised.[1] In addition, the health care system is poor, especially at the community level. It is, therefore, no surprise that the national neonatal mortality rate is 39/1000 live births in Nigeria.[2] An estimated absolute number of 255,500 newborns die annually and over 700 per day, making Nigeria the country with the highest number of neonatal deaths in Africa.[3] This is unacceptable, considering the country's comparatively higher natural and human resources among most of the African countries.[3]

The estimated major causes of newborn deaths in Nigeria are birth asphyxia (26%), complications of preterm birth (25%), severe infections (22%), and neonatal tetanus (8%).[4] Several studies within the country have established the prime role of perinatal asphyxia and other adverse perinatal

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events in the causation of newborn deaths in Nigeria.[5-7] In addition, perinatal asphyxia continues to be a major cause of morbidities among hospitalized newborns in Nigeria.[8-10]

It is instructive that most of the morbidities and mortality in perinatal asphyxia also occur among infants delivered outside the orthodox health facilities, particularly in homes, traditional birth homes, and spiritual birth homes.[6,9,11] Therefore, it is attractive to postulate that the absence of birth attendants, skilled in neonatal resuscitation, may contribute to the burden of perinatal asphyxia in the country. The inability to establish spontaneous breath at birth requires the immediate intervention of a skilled person present at the birth and this underlines the need to train and retrain all birth attendants. A recent systematic review of literature, suggests that intrapartum-related events may be decreased by training birth attendants.[12] This makes routine neonatal resuscitation training (NRT) an essential step toward the reduction of the burden of perinatal asphyxia in the developing world. In many countries with the established national neonatal resuscitation program, there have been remarkable reductions in deaths from intrapartum-related events.[13]

In Nigeria, localized institutional training of health workers in neonatal resuscitation was commenced over a decade ago. More recently, the Pediatric Association of Nigeria, in the past five years, has initiated a regular yearly training on neonatal resuscitation for doctors and nurses/midwives drawn from all the geo-political zones of the country, beginning as a preconference workshop during its annual conference. During the training, packs of neonatal resuscitation kits (manikins, ambu bags, bulb syringes, laryngoscopes, endotracheal tubes, and training manuals) are distributed to every health institution represented during each NRT, to ensure continuity of practice and training. The number of packs of kits distributed to the institutions is in proportion with the number of participants trained per institution.

The objective of this study is to describe the post training neonatal resuscitation activities of doctors and nurses/midwives in Nigeria.

Materials and Methods

This is a cross-sectional survey. The respondents include health workers (doctors and nurses/midwives), who participated in the annual Neonatal Resuscitation Training (NRT), organized as part of the annual scientific conference of the Pediatric Association of Nigeria (PAN) (comprising of pediatricians, pediatric trainees, and pediatric nurses) between 2008 and 2012. The NRT workshops are held as pre-conference events, on a yearly basis. The participants are mostly resident doctors in pediatrics and nurses with specialty training in midwifery and pediatric nursing, drawn from the six geo-political zones of the country. Nigeria is constitutionally divided into six geo-political zones as follows: North east, North central, North west, South west, South east, and South south. The participants are drawn from the secondary and tertiary levels of care in these zones, in no particular order, as attendance is totally voluntary. The types of participants or types of participating health facilities are not pre-determined. Other non-PAN participants include doctors in anesthesia, family medicine, and obstetrics.

During the training workshop, the participants had didactic lectures conducted in modules, as well as hands-on skills. More time was allocated to hands-on skill acquisition. The curricula for training the participants were drawn from internationally recognized publications–the Neonatal Resuscitation Program Textbook and the Skilled Birth Attendants Training Manual.[14,15] Table 1 depicts the scope and contents of the training modules for doctors and nurses. Pre-test and post-test assessment of participants was conducted using Multiple Choice Questions, prepared and standardized by members of the sponsoring organization, the Latter Day Saint Charities, who were renowned neonatologists and neonatal nurses. The questions, which were drawn from the Neonatal Resuscitation Program Textbook, a publication of the American Academy of Pediatrics and the American Heart Association, had previously been pre-tested and standardized by a team of experts. The Neonatal Resuscitation Program Textbook and Skilled Birth Attendant Training Manuals were standard texts, recommended for both training and assessment

Table 1: Scope of Neonatal Resuscitation Training in Nigeria

		Nurses/Midwives	Doctors
Training Modules	Lectures	Overview of cardiopulmonary changes at birth	Overview of cardiopulmonary changes at birth
		Initial steps in neonatal resuscitation	Initial steps in neonatal resuscitation
		Positive Pressure Ventilation	Positive Pressure Ventilation
		Chest compression	Chest compression
			Endotracheal intubation
			Medications
			Special considerations
	Hands-on Skill Acquisition	Four sessions (one hour)	Six sessions (two hours)
Training materials		Skilled Birth Attendant Neonatal Resuscitation Training Manual	Neonatal Resuscitation Program Textbook

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of trainees. On each occasion, the training session was concluded with practical assessment in the Objective Structured Clinical Examination formats. Performances were adjudged as satisfactory only with a minimum pass mark (at least 80% score in the multiple choice questions and at least 80% score in the hands-on tasks), in addition to compulsory acquisition of the basic bag and mask resuscitation skills.

Ethical clearance was not required for this study, but permission to conduct the survey was given by the two bodies involved in the training program–the Latter Day Saint Charities and the Pediatric Association of Nigeria. Each year, a telephone-survey of the participants at that year's NRT workshop was carried out between six and eight months after the primary training. These telephone surveys were carried out strictly for the purpose of evaluating the impact of the trainings. Only primary trainees, who were reachable on mobile phone and gave informed consent were surveyed. Consent was obtained just before the interviews were conducted. In the telephone survey, a ten-item semi-structured questionnaire, previously field tested, was administered to the available participants.

The survey was done by three to four selected representatives of the NRT facilitators (doctors and nurses/midwives), who had been trained in the methodology of the survey. Interviewers were instructed to contact all the participants on the registration list for that year on mobile telephone, making attempts at different times of the day, until all the prospective respondents were contacted. It was discontinued only when all efforts at reaching the participants by phone had been exhausted, and at least five attempts at different times had been made. A timeline of six weeks was given to the interviewers to contact the prospective respondents and conduct the interviews. The survey described the post-training neonatal resuscitation experience (number of infant deliveries attended, as well as, the frequency of bag and mask use in the month preceding the survey) of the primary trainees. The types of deliveries attended and the outcome of the resuscitation were not recorded in detail.

The primary trainees were required to indicate the type and scope of training delivered to the secondary trainees at their home institutions, as depicted in the NRP training manuals. The same training modules were to be used to train the secondary trainees, but the number of secondary trainees per primary trainee in each institution was not pre-determined. The primary trainees were asked to indicate the number of secondary trainees they had trained and the extent to which the secondary trainees were putting the tenets of NRP (especially with respect to the use of bag and mask) to use in their routine clinical duties.

The data gathered were analyzed with the Microsoft Excel® program, using simple descriptive statistics. The data for doctors and nurses/midwives were processed separately.

Results

Over a five-year period (2008 to 2012), a total of 727 health workers [doctors (357; 49.1%) and nurses/midwives (370; 50.1%)] were primarily trained in Neonatal Resuscitation skills. These primary trainees also trained a total of 16,325 (doctors (6,595; 40.4%) and nurses/midwives (9,730; 59.6%)) during the same period. Each year, an immediate post test showed improved knowledge of the primary trainees on newborn resuscitation from an average of 65.4 to 95.9% and 66.6 to 88.0% for doctors and nurses/midwives, respectively, as shown in Figure 1.

Post-training survey

Figure 2 shows that between 60 and 85% of the primary doctor trainees as well as 69 to 85% of the primary nurses/midwife trainees were available for the post-training surveys. The nurses/midwives were generally more available for the post-training survey, as compared to doctors.

Availability of equipment in the delivery rooms

Between 80 and 98% of the primary trainees confirmed the availability of infant resuscitation kits in their various institutions, in each year of study.

Attendance of deliveries by the respondents in the month preceding the survey

A total of 8,009 deliveries were attended by the respondents in the month preceding the survey. As shown in Figure 3, the total number of attended deliveries increased progressively until 2012, when a dip occurred. Overall, the doctors and nurses/midwives attended 3,300 and 4,709 deliveries, respectively, over the five-year period. For the period between 2008 and 2010, the doctors attended 2,035 deliveries, while nurses/midwives attended 1,723 deliveries. For 2011 and 2012, doctors and nurses/midwives attended 1,265 deliveries and 2,986 deliveries, respectively.

Figure 4 shows the proportions of doctors and midwives who attended infant deliveries at least once after attending the NRT. In 2008, 65% of the doctors and 42.6% of the nurses/midwives were involved in 449 and 265 infant deliveries, respectively, giving delivery attendance rates of eleven per doctor and nine per nurse/midwife. These rates increased in 2009 to 14 per doctor (415 deliveries by 30 persons) and 69 per nurse/midwife (482 deliveries by seven persons). The increment was fairly maintained in 2010, with rates of 12 per doctor (438 deliveries by 35 persons) and 55 per nurse/midwife (937 deliveries by 17 persons). Subsequently, the delivery attendance rates further increased for doctors in 2011 (22 per doctor; 724 deliveries by 33 persons) and 2012 (30 per doctor; 541 deliveries by 18 persons), whereas,

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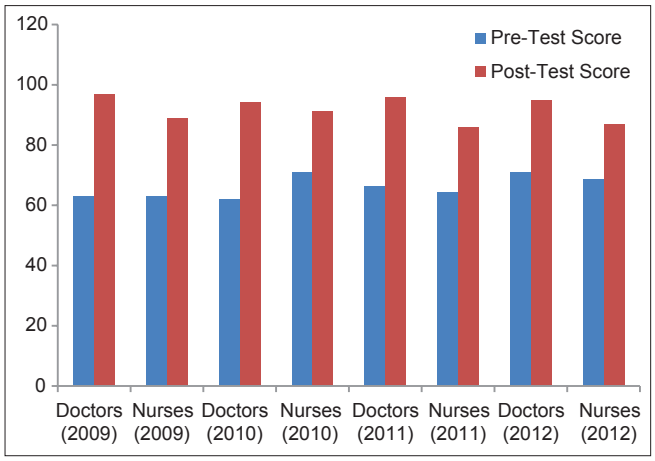


Figure 1: Cognitive performance of primary trainees during newborn resuscitation training (2009-2012)

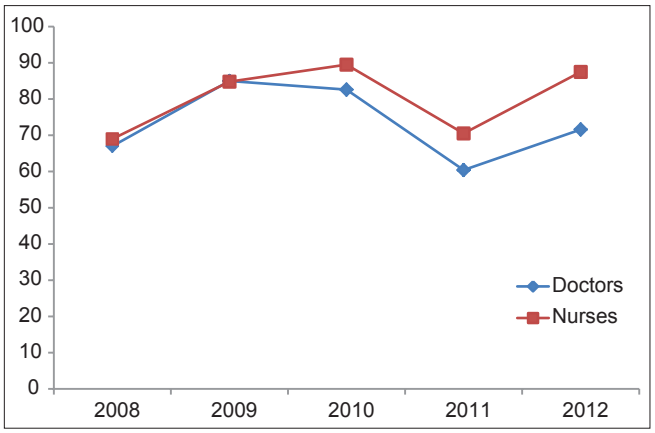


Figure 2: Proportions of primary trainees who were available for post-training survey on a yearly basis

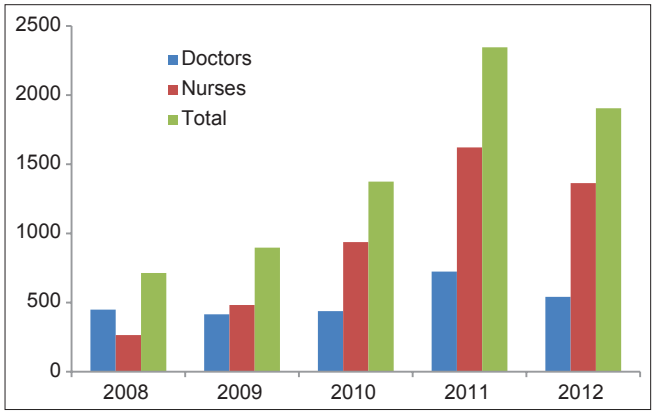


Figure 3: Number of deliveries attended by the respondents in the month preceding the survey

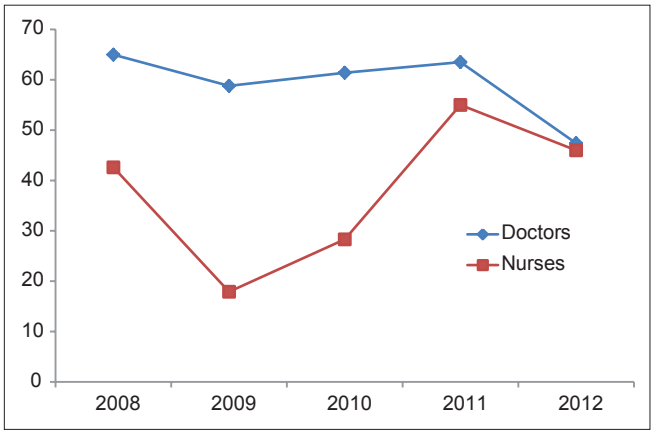


Figure 4: Proportions of doctors and nurses/midwives who attended infant deliveries at least once afterattending the NRT

the delivery attendance rates for nurses/midwives dropped to 37 per midwife (1622 deliveries by 33 persons) in 2011 and 47 per midwife (1364 deliveries by 29 persons) in 2012.

Use of bag and mask for infant resuscitation

Over the successive years of study, between 88 and 94% of the doctors and between 72 and 93% of the nurses/midwives successfully used the bag and mask to help babies breathe, in the entire post-training period as shown in [Figure 5].

Between 20 and 33% of each group of participants had not used a bag and mask in the month immediately preceding the survey in each year. Higher proportions of doctors had not used bag and mask for infant resuscitation compared to nurses/midwives over the period of study. Over time, the nurses/midwives used the bag and mask for infant resuscitation more frequently compared to doctors, with the rate fluctuating between two-to-one and four-to-one.

Frequency of training of other birth attendants

Over the years, 87 to 94% of doctors and 92 to 97% of nurses/midwives trained other birth attendants in newborn resuscitation skills following the yearly primary trainings. However, the bulk of the secondary trainings were done by rather small proportions of the primary trainees: 15% of doctors and 19% of nurses/midwives in 2008, 10% of doctors and 18% of nurses/midwives in 2009, 12% of doctors and 24% of nurses/midwives in 2010, 8% of doctors and 22% of nurses/midwives in 2011, and 5% of doctors and 21% of nurses/midwives in 2012. Using the principle of extrapolation, a total of 4,912 birth attendants were secondarily trained within the post-primary training period in 2008; 2,070 in 2009; 2,763 in 2010; 3,172 in 2011 and 2,896 in 2012. These exceeded the set yearly targets of 700 in 2008 by 700%, 1000 in 2009 by 107%, 1000 in 2010 by 176%, and 2700 in 2011 by 17.5%. However, the actual extrapolated number of secondary trainees in 2012 fell short of the set target number of 3000 by 3.5%.

Type and spectrum of training provided to other birth attendants

Figure 6 shows that 34 to 52% of doctors and 40 to 79% of nurses/midwives reported conducting training in formal settings, while the remaining reported in-service or informal on-the-job training.

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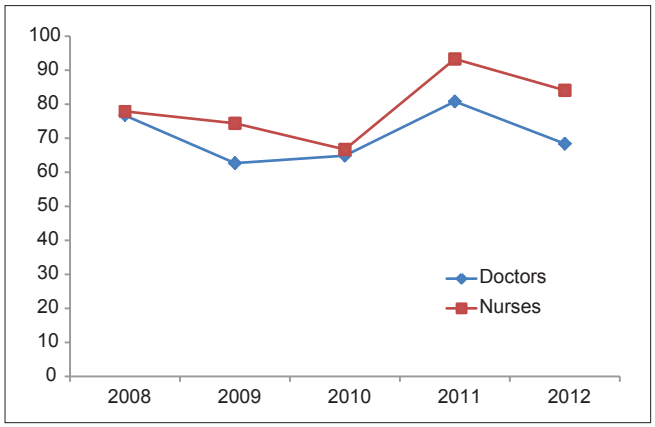


Figure 5: Proportions of doctors and nurses/midwives who had used bag and mask to resuscitate at least one infant within the month preceding the survey

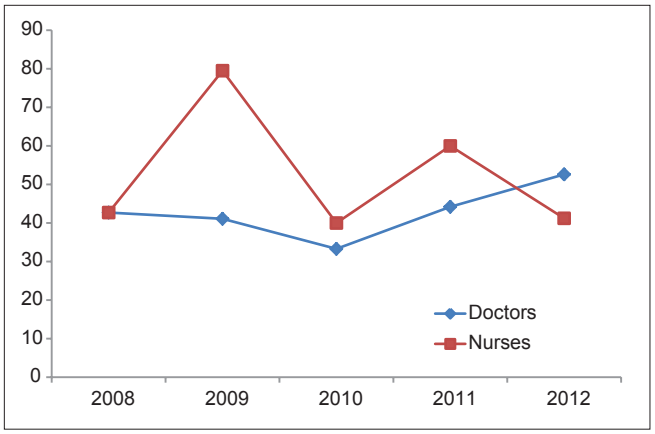


Figure 6: Proportions of primary trainees who organized formal NRT for other birth attendants

Over the years, between 25 and 47% of the doctors and between 38 and 82% of the nurses/midwives reported using all the lessons and skills in the training manual during secondary training. On the other hand, between 35 and 61% of the doctors and between 13 and 50% of nurses/midwives reported conducting only 'hands-on' resuscitation skills.

Frequency of bag and mask use by the secondary trainees

Over the successive years of study, 28 to 60% of the doctors and 64 to 80% of the nurses/midwives reported that all the secondary trainees were using the bag and mask for infant resuscitation.

Discussion

The Pediatric Association of Nigeria's NRT is well-subscribed, as the set training target for each year (2008 to 2011) had improved remarkably, as indicated earlier. Such trainings are veritable tools for improving the skills of health workers in clinical duties, such as, newborn resuscitation. An earlier study on the knowledge of nurses/midwives in south western Nigeria had shown relatively good knowledge about the recognition of babies requiring help immediately after birth, but low knowledge about the appropriate interventions for neurologically depressed babies.[16] This implies that without the training of health workers, who are likely to attend infant deliveries, babies may not receive effective resuscitation at birth and this may contribute to the persistently high perinatal mortality rates in this part of the world. Therefore, the NRT organized by the Pediatric Association in Nigeria is an important intervention in improving the quality of help available to babies at the point of birth.

In the present study, the immediate post-training cognitive performances of the participants at the NRT were remarkably higher than the pre-training performances of both the doctors and nurses/midwives over the five-year period. This suggested a high uptake rate, as observed earlier in Ethiopia.[17] However, it remains unclear how well such knowledge and skills were retained several months after training in the Nigerian setting. This was important because studies have shown significant depreciation of cognitive performances at six months and one year post training.[18,19] Therefore, it is important for the Pediatric Association of Nigeria and the organizers of the NRT in Nigeria to explore the logistics of organising refresher courses at six months and one year, preferably on-site, in order to improve the retention of neonatal resuscitation skills. In addition, the training of others (these included secondary trainees who may be doctors, nurses/midwives, medical students, and nursing students) is a form of revision for the trainers and helps in improving their own skills as well.

In Kenya and Pakistan, the 'Helping Babies Breathe' project has been seen to be effective in improving knowledge about neonatal resuscitation.[20] The findings in Kenya and Pakistan highlighted the need to lay more emphasis on bag and mask ventilation during training. The Nigerian version of NRT actually emphasized the use of bag and mask, both in terms of didactic lectures and hands-on skills. However, it may be more desirable to have zonal training coordinators, who will supervise re-trainings in the six geo-political zones in Nigeria.

The step-down trainings conducted by the primary trainees in the Nigerian NRT, over five years, have also been remarkable, with an overall ratio of 1:22; the rate for doctors has been 1:18 compared to 1:26 for nurses/midwives. The skewed distribution in favor of the nurses/midwives is most likely derived from the differential population of nurses/midwives compared to doctors in an average health institution. It is important to add that the bulk of participants are from specialist and teaching hospitals, while a few are from the secondary levels of care. Although, the data are presently not available, it is not unlikely that even the secondary trainees have trained a few others. In this

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manner, it is expected that with continuous monitoring and evaluation, more doctors and nurses/midwives attached to training and specialist health facilities will receive some form of NRT over time. Obviously, this trend may translate to an improved survival rate among newborn babies in the country.

Good step-down trainings have accounted for the success of neonatal resuscitation training programs in other countries such as China, where the American Academy of Pediatrics collaborated with the China Ministry of Health and professional bodies to propagate NRT and recorded remarkable success.[21] Improving the magnitude, quality, and impact of step-down or secondary NRT in Nigeria is desirable. This is likely to be achieved if the Pediatric Association of Nigeria successfully spearheads similar collaborations between health policy makers in Nigeria and committed international bodies such as the American Academy of Pediatrics.

On the basis of the present survey, about half the trainees reported that they did not perform any deliveries in the month preceding the survey. This could be explained in terms of job placements of the primary trainees. As the NRT workshops were sponsored by the Pediatric Association, there was a natural draw from the pediatric professional community (doctors and nurses attached to the Pediatric and Neonatal Intensive Care Units). However, in terms of reducing neonatal deaths due to perinatal asphyxia, the labor and delivery ward nurses' need for training outweighs that of the Neonatal Intensive Care Unit nurses currently being trained. In view of the above, the Pediatric Association of Nigeria needs to collaborate with the National Association of Nigerian Nurses and Midwives as well as the Society of Obstetricians and Gynecologists of Nigeria for more training of midwives in the labor wards of all secondary and tertiary institutions. The attendance of the NRT in a year may be adapted as a pre-requisite for the renewal of practicing licenses by the various regulatory bodies. This will enhance the subscription of more doctors and nurses/midwives at all levels of healthcare delivery to the NRT. This is essential in view of the regular redeployment of these cadres of health workers from clinical duty posts, as pointed out by the respondents in the present study. It is a common occurrence to find a nurse/midwife attached to the antenatal clinic this year redeployed to the labor ward the following year. Thus, it is important that NRT is not restricted only to the staff presently attached to the Maternity and Neonatal Units. In addition, incorporating NRT into the curricula of Schools of Medicine, Nursing and Health Technology, will further enhance the impact of neonatal resuscitation programs in the country.

Interestingly, while a large percentage of respondents were not involved in infant deliveries in the month preceding the surveys, a very high proportion of both doctors and nurses did use a bag/mask for infant resuscitation. More than four-fifths of the respondents reported using the bag and mask successfully within the eight-month post-training period, but the rate was less among nurses/midwives. Several of the nurses/midwives indicated deployment to units other than the Maternity and Neonatal Units after the training as a reason for less frequent use of the bag and mask. The other reasons given among respondents were: (1) Working in clinic settings where deliveries and high-risk infants were uncommon; (2) being re-assigned to clinical areas outside the newborn and maternity services; (3) being administrators, and therefore, having no opportunity for 'hands-on' work; and (4) non-provision of appropriate opportunities by the hospital administration. These factors had restricted them from getting involved in infant deliveries or resuscitation in their daily routine. On the other hand, many of the attending doctors at teaching and specialist hospitals were specialists, whose jobs focused on stabilizing newborns following initial resuscitation. There was, therefore, the need to ensure that medical workers who needed the training were getting it.

In addition, the nurses/midwives reported using the bag/mask more frequently within the month preceding the survey than did the doctors, reflecting in part the nature of the Nigerian system for infant deliveries and care. Except for high-risk pregnancies, midwives are usually responsible for uncomplicated deliveries. Doctors are typically only present where there is an impending danger in the delivery or when an abnormal labor indicates a Cesarean section. This gives the average nurse/midwife higher chances of being involved in infant delivery and resuscitation.

The advantage of drawing the participants for the NRT workshops from the teaching and specialist hospitals was the large numbers of medical and nursing/midwifery students available for step-down training, in addition to the large number of doctors and nurses/midwives practicing in such institutions. A large proportion of the secondary training was reportedly done in informal 'on-the-job' settings with one or more colleagues. Emphasis was rightly placed on the actual practical 'hands-on' resuscitation skills. There was a high correlation between the proportion of respondents, who carried out formal training, and the teaching of 'all lessons and skills' in the American Heart Association-American Academy of Pediatrics NRP textbook. It was encouraging to observe that 25 to 50% of the doctors and 35 to 80% of the nurses/midwives reported having taught all the lessons and skills, thus, enhancing the quality of the training. It was not surprising that there was also a high correlation between 'on-the-job' training and 'hands-on' resuscitation skills.

The non-availability of data on the perinatal outcomes of the babies delivered and resuscitated by the respondents in these surveys is a limitation to the study. Perhaps, it would be more helpful to provide data on the trends of the early

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neonatal mortality rates from the various institutions, which have benefited from the NRT carried out in the last few years in the country. The positive effect of training on the burden of perinatal asphyxia and hypoxic-ischemic encephalopathy, as a complication of asphyxia, was demonstrated in a chart review conducted in Turkey.[22] A similar trend was observed in the Chinese population when the nationwide training of midwives in resuscitation, between 2004 and 2009, resulted in reduction in the incidence of low one-minute Apgar scores and improvement in the rate of intrapartum-related delivery room deaths.[23] Indeed, the Pediatric Association of Nigeria and her affiliate organization, the Nigerian Society of Neonatal Medicine have commenced 'Helping Babies Breathe' trainings at the community level in many parts of the country. This step will complement the NRT, presently being conducted mainly at the secondary and tertiary levels of care in the country.

With improved sponsorship and involvement of the Federal Government of Nigeria, the trend of an alarmingly high perinatal mortality from asphyxia in Nigeria is likely to be reversed in the near future. However, future projects include better funding for training and service delivery equipment for a national scale-up, enhanced funding of NRT programs by the government, at all levels, generation of baseline data, and continuous collection of adequate data for post-training impact assessment, and better logistics involved in scaling up, to reach rural communities, where only the primary health care exists and most births occur in Nigeria.

Conclusion

The NRT in Nigeria is well-subscribed and the frequency and scope of step-down trainings are good. Remarkably high proportions of the participants had attended infant deliveries, helped babies breathe with bag and mask, and also trained other birth attendants in the NRT tenets, within eight months of receiving the primary training. In most step-down training cases, hands-on training was conducted in health institutions, where medical and nursing students were being trained. Therefore, further entrenchment of the ongoing cascades of training will improve the chance of survival for many more babies in Nigeria. The subsisting performance can be improved upon through better funding, inclusion of NRT in the academic curricula of Medical and Nursing Schools, and continual evaluation in terms of the trend of perinatal mortality in the country.

Competing interests

We declare sponsorship of the primary training of health workers by the Latter Day Saint Charities (LDSC), Salt Lake City, USA, and the Pediatric Association of Nigeria (PAN). The LDSC belongs to a religious body, while the PAN is a professional body. They are neither sponsoring the publishing of this manuscript nor gaining financially from the publishing of this research. We declare no other allegiance to any other body or agency, which may gain financially or socially from this research.

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