Selected Summaries

Can traditional birth attendants be trained to reduce neonatal mortality rate? Lessons from Lufwanyama Neonatal Survival Project

Gill CJ, Phiri-Mazala G, Guerina NG, Kasimba J, Mulenga C, Macleod WB, Waitolo N, Knapp AB, Mirochnick M, Mazimba A, Fox MP, Sabin L, Seidenberg P, Simon JL, Hamer DH. (Center for Global Health and Development, Boston University, Boston; Lufwanyama District Health Management Team, Kalulushi, Zambia; Department of Public Health and Community Medicine, Tufts University School of Medicine, Boston; Department of Pediatrics, Women and Infants Hospital, Providence, Rhode Island; Department of International Health, Boston University School of Public Health, Boston; Department of Pediatrics, Boston University School of Medicine, Boston; Section of Infectious Diseases, Department of Medicine, Boston University School of Medicine, Boston; Centre for International Health and Development Zambia (CIHDZ), Lusaka, Zambia; Department of Epidemiology, Boston University School of Public Health, Boston, Massachusetts, USA.) Effect of training traditional birth attendants on neonatal mortality (Lufwanyama Neonatal Survival Project): Randomized controlled study. *BMJ* 2011;**342:**d346.

SUMMARY

A cluster-randomized, controlled effectiveness trial (cluster RCT) was conducted in Lufwanyama district in Zambia between June 2006 and November 2008. The district had an estimated population of 63 185. The public health delivery system in the district had 12 rural centres managed by nurse midwives or clinical officers. The objective was to determine the effect of skill-based training which targeted traditional birth attendants (TBAs) on neonatal mortality rate (NMR; deaths within 28 days of birth/1000 infants delivered). Also, the secondary outcomes reported in the trial were differences in rates of stillbirths (babies born after 6 months of gestation without any movement, spontaneous breathing, or heartbeat during or after delivery) and mortality at different time periods within 28 days in the two study arms. There were 60 intervention TBAs and an equal number of control TBAs who were randomly assigned to either group. Each cluster in the trial was defined by including all births managed by a particular study TBA. The intervention package focused on building competencies of TBAs in essential newborn care, especially to handle birth asphyxia, hypothermia and sepsis. Two initial training workshops of 1 week duration were organized for intervention TBAs and, every 3–4 months, refresher trainings were organized for the entire duration of the trial.

The intervention TBAs were trained in neonatal resuscitation protocol (modified version endorsed by the American Academy of Pediatrics and American Heart Association). The protocol consisted of the following steps: drying of neonate after birth, wrapping in second dry cloth, suctioning of mouth and nose with a soft rubber suction bulb, proper positioning, assessment of breathing, stimulation by gentle massaging over back or feet and provision of positive pressure ventilation for neonates with inadequate or absent respiratory effort using a reusable resuscitator mask. The tube and mask used in the study was small-sized equipment fitted with a silicone rubber face cup. Also, skills for identifying sepsis in newborns within the first week and administration of single dose of oral amoxycillin coupled with prompt referral of the neonate to a nearby health facility were taught to intervention TBAs. Both groups of TBAs received clean delivery kits to conduct deliveries, and control TBAs continued to provide normally practised care to both mothers and newborns at birth. Sixteen data collectors were deployed for maintaining and compiling all records related to births and their survival outcomes at the end of 1 month. These data collectors were allocated TBAs according to their geographical presence in the district. For all neonatal deaths, a verbal autopsy was conducted and presumptive cause of death assigned by a blinded panel of neonatologists from Boston. The final analysis for the study included data pertaining to 1961 deliveries conducted by intervention TBAs and 1536 deliveries conducted by control TBAs. There were significantly more deliveries (average difference 9.8) conducted by intervention TBAs than by control TBAs during the study duration.

Most of the essential newborn care skills as part of the intervention package subsequent to the trainings were utilized by the intervention TBAs. Drying of baby and then wrapping in a separate cloth was reported in 98.4% of deliveries by intervention TBAs as opposed to 88% by control TBAs. Clearing of mouth and nasal secretions with suction bulb was reported in 96.5% of intervention TBA deliveries compared with around 60% by control TBAs who cleared secretions by cloth. Correct method of stimulation by rubbing back or tapping feet was reported to be used in 15% of intervention TBA deliveries whereas slapping back or buttocks as a measure of stimulation was reported in 12.4% of deliveries by control TBAs. Assisted breathing by pocket resuscitator was utilized in 6.1% of deliveries in the intervention arm, whereas in the control arm, mouth-to-mouth respiration was reported in 7.7% of deliveries. There was 97% higher referral of neonates to health centres made by intervention TBAs compared to control ones. Also, use of amoxycillin by intervention TBAs was reported for 202 occasions.

The NMR was significantly lower (45%) among births attended by intervention TBAs as compared to control TBAs (cluster adjusted rate ratio 0.55, 95% CI 0.33–0.90). The significant reduction persisted after making statistical adjustments for observed baseline differences between types of TBAs in the study groups and after performing sensitivity analysis accounting for neonatal dropouts and hence their missing information. Most neonatal deaths that occurred in the 2 arms were due to sepsis or birth asphyxia. The intervention arm reported significantly lower (63%) deaths due to asphyxia (rate ratio 0.37, 95% CI 0.17–0.81). Also the mortality in the intervention group was significantly lower (81%) in the first 2 days after birth (rate ratio 0.19, 95% CI 0.07–0.52). Death rates due to sepsis were similar in both groups. There were also reductions in deaths reported, although statistically non-significant, both in week 1 and weeks 2–4 of the neonatal period. The intervention made no difference to the stillbirth rates in both groups.

COMMENT

India has a high burden of neonatal deaths. It contributes to one-fourth of the global neonatal mortality.[1] The current NMR in India is 35/1000 live births. During the period 2004–08, not much progress has been made in reducing the NMR in India; the NMR has decreased from 37 to 35/1000 live births.[2] A multicentre study done by the Indian Council of Medical Research (ICMR) reported that three-fourths (74.1%) of neonatal deaths and half (50.8%) of infant deaths occurred in the early neonatal period (first 7 days of

life), 39.3% occurred on the first day of life and 56.8% during the first 3 days.[3] The early neonatal mortality rate (ENMR) for India is 27/1000 live births. Recent evidence suggests that the ENMR has increased by 1 during 2004–08.[2] A nationally representative mortality study—million death study—reported 3 major causes of neonatal deaths: prematurity and low birth weight, neonatal infections and birth asphyxia and birth trauma underscoring the vital need to address these causes of deaths.[4]

The Lufwanyama study addresses the critical neonatal period and has shown reduction in NMR by enhancing the skills of TBAs. The results are relevant to India where addressing causes of neonatal mortality is an urgent need. The study supports training frontline workers in essential newborn care skills especially neonatal resuscitation to combat birth asphyxia. Studies with a similar research question have been conducted in the past[5–8] but usually were quasi-experimental designs either with lack of random allocation of groups or before–after studies with no control group; both designs have potential biases.

In India, studies have reported the effect of training TBAs and other field-level workers in using bag and mask and preventing neonatal deaths. A pilot prospective study project was conducted in Raipur Rani Community Development Block, where a group of TBAs were trained to use mucus extractor and bag and mask ventilation. After receiving training, TBAs changed their practices in favour of modern resuscitation procedures. Perinatal mortality among babies delivered by trained TBAs was 19% lower than the rate observed by TBAs who had received only conventional training.[7] Training of grassroots-level health providers in a Chinese county in methods of newborn resuscitation led to a reduction in case-fatality from 7.1% to 0.45%.[8]

A field trial in Gadchiroli district in Maharashtra (1996–2003) used semi-skilled village health workers (VHWs) to provide home-based neonatal care. These workers were trained for 3 days in resuscitation with subsequent practice sessions every 2 months on dummy dolls. During the different phases of this field study, workers were trained in different methods of resuscitation—in earlier years using tube and mask and then later bag and mask. This was compared with indicators during the baseline years when TBAs used mouth-to-mouth resuscitation. These workers were present with the TBAs at the time of deliveries to provide basic newborn care. There was 55.3% reduction in case-fatality in severe asphyxia, 64.8% reduction in asphyxia-specific mortality rate/1000 live births, and 26.9% reduction in stillbirth rate compared with baseline after introducing bag and mask ventilation. The study reported superiority of bag and mask over tube and mask in achieving best reductions.[9] The Lufwanyama study used tube and mask as intervention equipment for resuscitation.

The Lufwanyama study did not find differences in stillbirth rate between the two groups. This is in contrast to a recent study that used the before–after design testing the impact of the WHO essential newborn care course on mortality outcomes with the help of birth attendants (TBAs, nurses, midwives and physicians) in 7 countries. In this study there was a significant reduction in the stillbirth rate (RR with training 0.69; 95% CI 0.54–0.88, $p<0.003$) though there was no significant reduction from baseline in ENMR. A subgroup of the study in 6 countries was a cluster randomized trial involving 88 clusters, with 43 clusters receiving special 3-day training in neonatal resuscitation protocol with repeat training after 6 months. This did not lead to any reduction in ENMR, stillbirth rate and perinatal death. One of the features of this trial was that both the study groups attendants received initial essential newborn care training with supply of bag and mask equipments, which could have balanced the effect of special resuscitation training.[10] Also the baseline ENMR in this study was about 20/1000 live births, much lower than that in the study from Zambia. It is possible that the effect of training TBAs at places where there is high baseline NMR (say 30–35/1000 as in India), and limited access to facility-based interventions, may be larger than those in settings with a low baseline NMR and no access problems. Thus, the present tested intervention also is conditional to the context and region, as the case is with many other public health interventions.

Also, the effect on sepsis-related mortality in newborns was not profound in this study. The authors explain this due to lack of facility-based neonatal care interventions within the district. This suggests that community- and facility-based interventions supplement each other. Expecting a reduction in neonatal mortality addressing all prime causes (sepsis, prematurity and asphyxia) would require a holistic approach encompassing components both at the community and facility level.

A recently published systematic review synthesized available evidence pointing to the role of training community-level workers including TBAs in immediate newborn assessment, stimulation and newborn resuscitation in reducing NMR.[11] This review included 8 studies—2 cluster RCTs including the present study from Lufwanyama, 2 quasi-experimental studies, 3 before–after studies and 1 study with two components—before–after study followed by a cluster RCT. There was considerable heterogeneity among the studies owing to variations in concurrent interventions, case definitions, study designs and reported outcomes. The quality of evidence ranged from very low to moderate. Significant reduction in all-cause neonatal or perinatal mortality was observed in 4 studies ranging from 25% to 61% and asphyxia-specific mortality was reduced in 4 studies ranging from 61% to 70%.

The approach of training community-level workers in essential newborn care seems promising and requires experience from more parts of the world in view of two recent cluster RCTs with opposite results. Further implementation research studies with robust study designs are required to resolve these conflicting results and building faith for scaling up of such interventions. One of the reasons behind the positive results in terms of practising and retaining skills of newborn resuscitation by TBAs impacting reduction in NMR in this study and previous studies reported here was due to refresher trainings organized throughout the study period. Re-training and refresher components in the form of practice drills at repeated intervals after the initial induction training are vital components of such essential newborn care training interventions including a resuscitation protocol. Programme implementers must plan and schedule this while initiating such interventions in the field. A critical question remains about the duration of initial training and the frequency of refresher trainings.

Despite the gaps in our confidence with this intervention, it seems appropriate that our grassroots workers be equipped with skills related to essential newborn care including the resuscitation protocol, especially when we have local evidence through the Gadchiroli trial and other projects such as ANKUR.[12] Under the National Rural Health Mission implemented in India, with *Janani Suraksha Yojna*, an increase in institutional deliveries has been reported. Yet, 27% of deliveries happen at home and are attended by TBAs.[13] The scope exists to improve their skills in rendering essential newborn care. Recent incorporation of essential newborn care component has been done in modules 6 and 7 of Accredited Social Health Activist (ASHA).[14] This is getting rolled down to districts in a phased manner and currently master trainers are in the process of receiving training. Meticulous training with a constant

vigil and support for use of skills by ASHA coupled with opportunities for refresher trainings will be imperative for witnessing positive results in terms of reductions in early neonatal mortality rate.

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SUMIT MALHOTRA
SANJAY P. ZODPEY
Indian Institute of Public Health–Delhi
Public Health Foundation of India
New Delhi
drmalhotrasumit@gmail.com

Diabetes mellitus: A risk factor for cancer and non-vascular disease deaths too

Emerging Risk Factors Collaboration, Seshasai SR, Kaptoge S, Thompson A, Di Angelantonio E, Gao P, Sarwar N, Whincup PH, Mukamal KJ, Gillum RF, Holme I, Njølstad I, Fletcher A, Nilsson P, Lewington S, Collins R, Gudnason V, Thompson SG, Sattar N, Selvin E, Hu FB, Danesh J. (University of Cambridge, Cambridge, UK; St George's University of London, London, UK; Harvard University, Boston; Centers for Disease Control and Prevention, Atlanta, USA; Ullevål University Hospital, Oslo; University of Tromsø, Tromsø, Norway; London School of Hygiene and Tropical Medicine, London, UK; Lund University, Lund, Sweden; University of Oxford, Oxford, UK; Icelandic Heart Association and the University of Iceland, Reykjavik, Iceland; Medical Research Council Biostatistics Unit, Cambridge, UK; University of Glasgow, Glasgow, UK; Johns Hopkins University, Baltimore, USA; Harvard University, Boston, USA; ERFC Coordinating Centre at the Department of Public Health and Primary Care, University of Cambridge, Strangeways Research Laboratory, Cambridge, UK.) Diabetes mellitus, fasting glucose, and risk of cause-specific death. *N Engl J Med* 2011;**364:**829–41. Erratum in: *N Engl J Med* 2011;**364:**1281.

SUMMARY

The Emerging Risk Factors Collaboration (ERFC) is an international collaboration established for conducting detailed re-analyses of worldwide data for molecules with sufficient data for potential exploration. ERFC has established a central database of over 1.2 million participants by collating more than 110 prospective population-based studies. After an initial focus on several lipid and inflammatory markers, in 2009, ERFC extended its scope to the association of diabetes and other metabolic markers with the risk of vascular disease and cause-specific death. In this study it attempted to determine reliable estimates of any independent associations of diabetes mellitus and fasting blood glucose level with the risk of death from cancer or other non-vascular conditions from 97 prospective studies. These studies (i) had complete information about age, sex, smoking status, body mass index (BMI), diagnosis of diabetes or fasting blood glucose level at baseline, (ii) did not select participants with previous chronic disease, (iii) recorded cause-specific mortality using well-defined criteria and (iv) accrued more than 1 year of follow up. The contributing studies classified deaths according to the primary cause (or in its absence, the underlying cause) using codes from the International Classification of Diseases (ICD) to at least 3 digits (or using study-specific classification system) and ascertainment was based on death certificates supplemented by medical records and autopsy findings. Hazard ratios (HR) for cause-specific death according to baseline diabetes status and fasting glucose level were estimated using a 2-stage approach. In the first stage, HRs were calculated for each study using Cox proportional-hazard regression model stratified by study, sex and trial arm. In the second stage, estimates of adjusted exposure-risk relationships (study specific $\log_e$ HRs), and interactions derived from the first stage were combined using random-effects meta-analysis. Cumulative survival from 35 years of age and older were estimated by applying the HRs (specific to age at risk and sex) for cause-specific mortality associated with diabetes to the cause-specific mortality data for 35 years of age and older residents of European Union in 2000. Among the 820 900 participants included in the analyses of diabetes status or fasting glucose level, the mean (SD) age at baseline was 55 (9) years; 48% were women and the large majority were enrolled in Europe (58%) and North America (36%). A total of 715 061 participants were included in the analyses of diabetes status. Among them 40 116 (6%) had diabetes at the time of enrolment, 32.8% were smokers, 33.9% were alcohol users and 19.1% were physically inactive. During the 12.3 million person-years at risk, a total of 123 205 deaths were recorded: 41 320 from cancer, 44 407 from vascular disease, 27 661 from other causes and 9817 from ill-defined causes. After adjustment