

The impact of an educational intervention on neonatal care and survival

Author

Emmanuel, Andy, Kain, Victoria, Forster, Elizabeth

Published

2023

Journal Title

The Journal of Perinatal & Neonatal Nursing

Version

Accepted Manuscript (AM)

DOI

[10.1097/JPN.0000000000000686](https://doi.org/10.1097/JPN.0000000000000686)

Rights statement

© 2023 Wolters Kluwer Health, Inc. This is a non-final version of an article published in final form in The Journal of Perinatal & Neonatal Nursing, 37 (2), pp. 138-147, 2023. Reproduced in accordance with the copyright policy of the publisher. Please refer to the journal link for access to the definitive, published version.

Downloaded from

<http://hdl.handle.net/10072/416328>

Griffith Research Online

<https://research-repository.griffith.edu.au>

The impact of an educational intervention on neonatal care and survival

Andy Emmanuel, RN, BNSc, MSc, PhD ^{1,2}

Victoria J. Kain, RN, MN, NICC, PhD¹

Elizabeth Forster, RN, BN, GradCert Higher Ed, MN, PhD, SFHEA¹

¹ School of Nursing and Midwifery, Griffith University, Australia

² Department of Nursing Science, College of Medical Sciences, University of Jos, Nigeria.

Corresponding author: Andy Emmanuel, Health sciences (N48), School of nursing and midwifery, Griffith University, 4111 Australia. andy.emmanuel@griffithuni.edu.au
/andyemma62@yahoo.com

Funding- The study and writing of this paper was funded Griffith University through Griffith University Postgraduate Research Scholarship, Griffith University Postgraduate International Research Scholarship and Publication Assistance Scholarship -5068140.

Competing interest- None declared.

List of abbreviations used

1. UNICEF- United Nations International Children's Fund.
2. NPC- National Population Commission.
3. TBA's-Traditional Birth Attendants
4. WHO -World Health Organisation.
5. JUTH-Jos University Teaching Hospital.

6. SCBU- Special Care Baby Unit
7. SPSS-Statistical Package for Social Sciences.
8. HIV- Human Immunodeficiency Virus.
9. WMA-World Medical Association.
10. ACNO-Assistant Chief Nursing Officers.
11. CNO - Chief Nursing Officers.

The impact of an educational intervention on neonatal care and survival.

Abstract.

Under-five mortality has declined globally, however, proportion of under-five deaths occurring within the first 28 days after birth has increased significantly. This study aims to determine the impact of an educational intervention on neonatal care and survival rates in Nigeria.

Sequential exploratory mixed methods design involving 21 health workers in the pre-intervention phase, while 15 health workers and 30 mother-baby dyads participated in the post-intervention phase. Data were collected using semi-structured interviews and non-participatory observation. Qualitative data were analysed using thematic analysis, while quantitative data were analysed using descriptive and inferential statistics. Healthy newborns were routinely separated from their mothers in the pre-intervention period. During this time, non-evidence-based practices, such as routine nasal and oral suctioning were performed. Skin-to-skin contact, and early initiation of breastfeeding was frequently interrupted. After the intervention, 80.6% were placed in skin-to-skin contact with their mothers, and twenty of these babies maintained contact with the mother until breastfeeding was established. There was decline in neonatal deaths post intervention. Independent T test analysis of the day of neonatal death demonstrates a significant difference in mean ($P=0.00$, 95% CI -5.629; -7.447-4.779). Newborn survival can be improved through regular training of maternity health worker in evidence-based newborn care.

Introduction

In 2013, it was reported that one in three neonates died on the day they were born, and that the proportion of deaths among children under the age of five years during the neonatal period was

1 increasing globally¹. A recent study demonstrated that almost half (46%) of under-five deaths globally
2 occurred during the neonatal period, and that eight in ten deaths were associated with preventable and
3 treatable causes². This highlights the need for urgent action to identify evidence-based neonatal care
4 strategies and to scale up these strategies in regions where high neonatal mortality rates are reported.
5
6 Although there are global guidelines for newborn health care, it is important to consider local contexts
7
8 when implementing such guidelines. Nigeria's under-five and neonatal mortality rates are one of the
9
10 highest in the world. A recent demographic and health survey by the National Population Commission
11
12 (NPC) of Nigeria indicated that one in every eight children died before their first birthday, and the
13
14 neonatal mortality rate was 39 deaths per 1000 live births³. Compared to the global estimate of 19
15
16 deaths per 1000 live births⁴, the Nigerian estimate is twice the global rate. This paper presents the
17
18 impact of an educational intervention on newborn care and neonatal survival in a Nigerian University
19
20 Teaching Hospital.
21
22
23
24
25
26

27 To date, there have been several childbirth and newborn care initiatives in the form of education
28
29 packages developed and trialled in Africa. For example, in Malawi, a one-month training package was
30
31 developed and implemented for 81 Traditional Birth Attendants (TBAs) in antenatal and perinatal
32
33 care. This package promoted safe deliveries, recognition of high-risk pregnancies and indications for
34
35 referral, and resulted in improved knowledge and understanding among the birth attendants⁵. In a
36
37 Tanzanian study by Ersdal *et al.*⁶ to determine the impact of a one-day resuscitation training course on
38
39 53 health workers, the proportion of participants who passed the simulated routine care scenario
40
41 improved from 41% to 74% ($p=0.016$), while those who passed the neonatal resuscitation scenarios
42
43 improved from 18% to 74% ($P<0.0001$). These represent significant improvements.
44
45
46
47

48 Similarly, Bookman *et al.*⁷ evaluated a three-hour training program of neonatal resuscitation in
49
50 Ghana. Using a 27-point score performance-based evaluation, these researchers assessed 14
51
52 midwives, and discovered that the percentage of resuscitation items performed correctly on practical
53
54 evaluation skills increased from 58% pre-training to 81% post-training ($p<0.01$).
55
56

57 In a randomised control trial to determine the effect of a one-day resuscitation training on health
58
59 workers practices in Kenya⁸, trained health workers demonstrated a higher proportion of adequate
60
61

1 initial resuscitation steps compared to the control group (trained 66% vs control 27%; RR2.45, 95%
2 CI 1.75-3.42, p=0.001). The frequency of inappropriate and potentially harmful practices also reduced
3
4 as a result of training⁸. These harmful practices included oxygen being given via oxygen tubing
5
6 directly into the nostril; blowing exhaled air into the baby's face; shaking the baby; patting/slapping
7
8 the baby's back; flicking/slapping the baby's feet; vigorously rubbing the chest and the back;
9
10 squeezing the chest; and turning the baby upside down while patting the back⁸.

11
12
13 Similarly, Enweronu-Laryea *et al*⁹. evaluated the effect of a two- to three-day neonatal resuscitation
14
15 training program for 271 health workers in Ghana and reported a significant improvement in post-
16
17 training scores (p<0.001). The median post-training scores for the various categories of health
18
19 workers improved significantly as a result of the training. Likewise, a randomised control trial in
20
21 Zambia¹⁰ evaluated the impact of a two-week training course on resuscitation and assessment of need
22
23 for referral to a health centre. The result indicated a 63% decline in neonatal deaths due to asphyxia
24
25 and a 45% decline in neonatal mortality.

26
27
28 Neonatal mortality caused by asphyxia, sepsis and prematurity reduced by 44%, 28% and 23%
29
30 respectively, following a one-year intervention that included improving infrastructure, equipment and
31
32 training in Mozambique¹¹. Ellard *et al*.¹² interviewed 36 medical officers and nurses/midwives in
33
34 Tanzania to understand the impact of a three-year intervention that involved upgrading knowledge,
35
36 skills and clinical leadership. They concluded that training had resulted in an increase in knowledge
37
38 regarding newborn care.

39
40
41 In Malawi, Ellard *et al*¹³. conducted a cluster randomised control trial of a three-year training package
42
43 focused on improving skills and knowledge related to emergency obstetric and newborn care. Their
44
45 study revealed that neonatal mortality reduced by 31% as a result of training. However, a pre- and
46
47 post-intervention assessment of a three-year training program that focused on upgrading the
48
49 knowledge, skills and the clinical leadership skills of health workers, found an increase in fresh
50
51 (normal) and macerated (not intact skin) still births by 7% and 14% respectively. This suggests a
52
53 delay in the referral of complicated cases to a higher level of health care by district hospitals¹⁴.

54
55
56 Similarly, a skills assessment following eight hours of coursework related to newborn care for 118
57
58
59
60

1 health workers in Rwanda demonstrated a high practical skill improvement immediately after the
2 training¹⁵. The mean score obtained on a post skill evaluation was 89±9%. The evaluation was
3
4 performed using simulation involving 18 questions on HBB through objective structured clinical
5
6 examination. However, there was a reduction in practical skills (83%) three months after the training,
7
8 which indicates that these skills were not retained.
9

10
11 The World Health Organisation (WHO) essential newborn care package has been implemented in
12 various ways in Africa. For example, a study in Zambia and Tanzania indicated an improvement of 19
13
14 and 30% in newborn care respectively^{16,17}. Knowledge was evaluated through the administration of
15
16 multiple choice questions before and after training and calculation the percentage of correct answers.
17
18 A multicentre study involving seven African countries, including Somalia, Kenya, Malawi,
19
20 Swaziland, Zimbabwe, Tanzania and Sierra Leone, demonstrated a 100% improvement in newborn
21
22 care skills¹⁸. This was measured through the percentage of score in an objective structured
23
24 examination before and after training.
25
26
27
28
29

30 Furthermore, the WHO essential newborn care package had yielded positive results in terms of
31
32 reducing neonatal mortality in Africa^{19,20,21,22}. Carlo *et al.* (2010) revealed a reduction in neonatal
33
34 mortality from 11.5 to 6.8 deaths per 1000 live births, while Chomba *et al.*²¹ reported a 45% decline.
35
36 Similarly, Manasyan *et al.*²² reported a decline in neonatal mortality from 11.5 to 6.8 per 1000 live
37
38 births following an educational intervention using the WHO essential newborn care package, whereas
39
40 neonatal mortality reduced by 17.6% and 11.1% in two intervention sites following a two-day training
41
42 program on essential newborn care in Ghana¹⁹.
43
44
45

46 No study about the impact of the WHO newborn care package was identified from the Nigerian
47
48 context. Furthermore, no paediatric study could be identified that utilized a systematic and robust
49
50 framework in Africa. Due to the paucity of the literature about this topic, this study was initiated to
51
52 determine the impact of an educational intervention on newborn care practices and neonatal survival
53
54 in the Nigerian context.
55
56
57
58
59
60
61
62
63
64
65

Methods

Design

A sequential exploratory mixed methods study design was used to determine the impact of an intervention on the quality of newborn care and neonatal survival at Jos University Teaching Hospital (JUTH) in Plateau State, Nigeria. The level of newborn care was assessed before the intervention by conducting individual interviews with maternity health workers, while the level of care after the intervention was assessed by means of participatory observation. Furthermore, neonatal deaths six months before and six months after intervention were measured to determine the impact of the intervention on the neonatal survival rate.

Intervention

The intervention focused on training health care workers in observing standard precautions, resuscitating newborn babies, breastfeeding newborns, overcoming breastfeeding difficulties, kangaroo mother care and care of the newborn at the time of birth, because the interview data suggested gaps in relation to these areas. These topics were determined as areas of urgent training need, and hence modified from the WHO essential newborn care package in order to fit the program into a one-day program.

Participants and recruitment

Nurses/midwives (prepared at diploma and bachelor levels) from the labour ward, the postnatal ward, and the special care baby unit (SCBU) participated in the pre-intervention assessment stage of the study. Recruitment of the health workers from the three wards was done through the various ward managers. Participants were invited to submit their contact details to the ward manager, if they were interested in participating in the study. Details of the intended study were provided to them through the participant information sheet, which contained the contact details of the researcher and the study; they could study these details at their leisure and ask any questions or even make suggestions. Participants were assured that their decision to participate in the study would not negatively affect their employment in any way. A total of thirty-seven (37) potential participants (out of 46) indicated interest by submitting their names and consented to take part in the study.

1 All the Nurses/midwives in the labour ward (n=15) participated in the post-intervention phase of the
2 study, which was limited to the labour ward. In addition, thirty women who came to deliver their
3 babies participated in the post-intervention phase of the study. They were recruited by the
4 participating health workers, who gave the women in labour a verbal briefing and obtained their
5 consent to participate in the study. The health workers always introduced the observer to the woman
6 in labour and advised them that he would be observing the health workers' practice. They were
7 always told that the observer would be documenting the care using an assessment tool, and that this
8 would only be for two hours after birth. They were invited to ask any questions they might have about
9 the study and were reassured that their decision (whether to allow the observer to enter the delivery
10 room or not) would have no effect on the care they would receive at this hospital. Additional
11 information sheets were left with the consenting women, in case they wanted to read more about the
12 study.

23 **Data collection and analysis**

24 *Pre-intervention*

25 Interviews were conducted with participants to understand current practices around newborn care in
26 the study area. Twenty-one health care workers were interviewed before data saturation was
27 reached²³. The data generated after 21 interviews was considered enough for a comprehensive and
28 credible analysis²⁴.

29 The telephone interviews commenced with the health workers in the labour ward, followed by those
30 in the postnatal ward and finally those in the SCBU. Participants' identities were protected by coding
31 their names with numbers. At the beginning of each interview, background information of the specific
32 health worker was obtained, including their age, years of practice, current rank and professional
33 qualifications. During the interview, participants were asked to describe how they cared for neonates
34 in their various wards. There were further questions and probes around how infection control was
35 observed, how babies were kept warm, how resuscitation was performed and what breastfeeding
36 support was given. Each participant was then given a short survey to determine their learning

1 priorities in relation to the WHO ENC package and this was analysed using the Statistical Package for
2 Social Sciences (SPSS)²⁵.

3
4
5 Demographic information of health workers, such as their age, years of practice, qualification, and
6
7 years spent studying were analysed using descriptive statistics.
8
9

10 In order to ensure the researcher's immersion in the data, transcripts were prepared and read several
11 times to become familiar with the data. After listening to the recordings, transcripts were prepared and
12
13 uploaded to NVivo 12 for coding. The process of immersion continued, with the researcher beginning
14
15 the process of open coding (or line-by-line coding), where meaningful statements were reduced into
16
17 discreet concepts or codes. By constantly comparing data, the researcher was eventually able to start
18
19 grouping or clustering 'like' codes. Once the initial coding had been done, two individuals went
20
21 through the initial themes generated and made comments. Sensitising concepts from the WHO
22
23 newborn health recommendations²⁶ guided the analysis and included care of the newborn immediately
24
25 after birth, postnatal care, newborn immunisation, newborn resuscitation, management of suspected
26
27 neonatal sepsis, care of preterm and low-birth-weight newborns, care of the newborn of an HIV-
28
29 infected mother, and management of other severe conditions²⁶. Participants' responses to training
30
31 needs were analysed using frequency tables and percentages.
32
33
34
35
36

37 ***Post-intervention***

38
39
40
41 A tool developed by Sobel *et al.*²⁷ to assess the care provided to newborns was used in the post-
42
43 intervention phase. This assessment tool was designed for use in the first 2 hours after birth; it thus
44
45 contained information about preparation for birth, the birth itself, cord clamping and dressing, drying
46
47 of the baby, washing of the baby, kangaroo care, initiation of breastfeeding, eye prophylaxis,
48
49 anthropometrics, full physical examination, and rooming in with the mother.
50

51
52
53 Furthermore, a retrospective audit of perinatal and neonatal mortality was undertaken six months
54
55 before and six months after the training program was implemented. The data collected using the
56
57 assessment tool were analysed using SPSS. Frequency tables and percentages were used to analyse
58
59 and present the data.
60
61

1 Data retrieved from the hospital records were presented in table 4. The neonatal mortality for the pre-
2 and post-training periods was compared. Descriptive analysis of early neonatal (0-6 days) and late (7-
3 27 days) neonatal periods between the six months pre- and post-intervention was undertaken.
4
5 Independent T tests were used to analyse neonatal deaths before and after the intervention.
6
7

8 9 **Ethical Considerations**

10 Ethical clearance was obtained from Griffith University in Australia and the State Ministry of Health
11 in Nigeria for the study.
12
13

14 To minimise the impact of the study on the mental and social integrity of the subjects²⁸, participants
15 were assured prior to their participation in the study that their personal information would remain
16 confidential, and this was maintained. Furthermore, in order to ensure justice and fairness, all health
17 care workers (nurses and midwives) and expectant mothers presenting at the time of the study were
18 given the opportunity to participate in the study.
19
20
21
22
23
24
25
26
27

28 29 **Results**

30 31 **Characteristics of participants**

32 Prior to the intervention, a total of 21 health care workers employed at the Jos University Teaching
33 Hospital (JUTH) participated in a telephone interview. The mean years of practice were 13.8 ± 3.7 ,
34 while age reported by the participants was 41.7 ± 6.5 years. The majority (61.9%) of the health workers
35 held a bachelor's degree in nursing. More than half (52.4%) of the participants were either Assistant
36 Chief Nursing Officers (ACNO) or Chief Nursing Officers (CNO). CNO is the highest rank in the
37 clinical area before an individual is promoted to the directorate cadre, i.e. Deputy Director and
38 Director of Nursing
39
40
41
42
43
44
45
46
47
48
49

50 The mean gestational age of babies observed was 37.8 ± 3.3 weeks. There was no observed congenital
51 malformation among the neonates. The gender distribution of babies born was 15 males and 16
52 females. The average weight of babies observed was 2.9 ± 1.7 kg.
53
54
55
56
57
58
59
60
61
62
63
64
65

Newborn care before intervention

1
2 Details of qualitative data analysis are presented as a supplementary material. Below is a summary of
3
4 the interview data analysis.
5

6
7 Infection control was generally achieved by keeping the practice environment clean. Health workers
8
9 in the labour ward engaged in standard precautions during labour and delivery.
10

11
12 Cord care was initiated in the labour ward and continued in the postnatal ward or the SCBU. It was
13
14 performed according to the procedure manual (a document prepared in the hospital to guide practice
15
16 of staff). Women who came to the birth suite with a ruptured membrane were placed on antibiotics to
17
18 prevent infection. Neonates born to this category of women were also placed on antibiotics. This
19
20 practice is consistent with current evidence, which recommends the use of prophylactic antibiotics in
21
22 newborns with risk factors for infection^{29,30}. These risk factors include early rupture of membrane
23
24 >18 hours before birth, mother having a fever >38 degrees before delivery or during labour, and
25
26 amniotic fluid being foul smelling or purulent. However, the current practice manual did not specify
27
28 these factors as indicators for antibiotics prophylaxis, hence the need for an urgent review to reflect
29
30 current evidence.
31
32
33
34

35
36 Regular examination of a woman during delivery is essential in monitoring the progress of labour and
37
38 well-being during the perinatal period. Health workers in the study setting accordingly performed a
39
40 routine assessment of foetal well-being on labour admission, as recommended by the WHO²⁹. Skin-
41
42 to-skin contact in the first hour of life is strongly recommended^{29,30}. Unfortunately, participants in this
43
44 study reported immediate separation of the baby from the mother after birth for cleaning, resuscitation
45
46 (if required) and dressing. The procedure manual also recommends skin-to-skin contact with the
47
48 mother, although it did not categorically state when and for how long. Early and prolonged separation
49
50 of the baby from the mother without any medical reason has negative implications for optimal
51
52 breastfeeding and for the prevention of hypothermia²⁷. Early initiation of breastfeeding and prevention
53
54 of hypothermia could in fact be compromised in the current setting.
55
56
57
58
59
60
61
62
63
64
65

1 The WHO recommends that suctioning of the mouth and nose should not be performed in neonates
2 born through clear amniotic fluid who are able to start breathing on their own after birth³⁰. The
3
4 practice of routine nasal and oral suctioning is in fact not recommended²⁹, however, health workers
5
6 reported that they were clearing airways by suctioning the nose and mouth routinely, even if the baby
7
8 was crying.
9

10
11 It is recommended that 1 mg of vitamin K be administered one hour after delivery for haemorrhagic
12
13 disease prophylaxis^{29,30}. However, it was found that this practice was only prevalent in the SCBU. It
14
15 was not always available in the delivery suite and not routinely administered.
16
17
18

19 **Newborn care after intervention: Observational Data**

20 *Care throughout labour and birth*

21
22
23 The observational data indicated that all the women were admitted to the labour ward in the active
24
25 phase of the first stage of labour, as recommended by the WHO³⁰. Women were routinely assessed to
26
27 determine the wellbeing of the baby. The data demonstrated, however, that the room temperature was
28
29 not determined during labour for all the observed deliveries. When asked, the health care workers
30
31 confirmed that there was no room thermometer available for use in the delivery suite. Fortunately,
32
33 however, there was no feeling of a draft during the observations of the 31 deliveries, as all the
34
35 windows were closed. All the deliveries were thus conducted under relatively warm conditions, hence
36
37 laying a good foundation for keeping the baby warm.
38
39
40
41
42

43
44 Routine vaginal cleansing for the purpose of preventing infection is not recommended³⁰; however, all
45
46 the women had their perineum cleaned with Savlon as a way of limiting the spread of infection to the
47
48 baby. All women delivered their babies in a supine position. Fundal pressure was not applied on any
49
50 woman. Furthermore, all the women had perineal support and had a spontaneous vaginal delivery.
51
52 The placenta was delivered through cord traction for all deliveries. Table 1 summarises the other
53
54 aspects of care given to the mother and her baby before and during delivery.
55
56
57
58
59
60
61
62
63
64
65

Care of the newborn in the immediate postpartum period

1
2
3 Table 2 demonstrates that eight babies (25.8%) had their mouth suctioned and were given additional
4
5 stimulation. Practices such as chest compressions, aspiration of the baby's stomach, slapping or
6
7 flicking the baby's soles, holding the baby upside down, slapping the baby's back, squeezing the chest
8
9 (to remove secretions from the airway), or giving sodium bicarbonate were not observed. See table 2.
10

11
12 Table 3 indicates that all babies were breastfed, with the baby's chest facing the mother's chest. The
13
14 mean duration of initial separation of the baby from the mother was 11.2 ± 1.9 minutes.
15
16

Postnatal care

17
18
19
20
21 The data demonstrates that all babies were immediately dried and dressed and no baby was placed on
22
23 a cold surface. The body temperature of 19 babies (61.3%) was checked within the first two hours
24
25 after delivery. No Vitamin K prophylaxis or immunizations such as, hepatitis B vaccination, BCG,
26
27 Polio vaccine, and eye prophylaxis (antibiotics applied on the baby's eyes after delivery to prevent
28
29 infection²⁷)– were given in the labour ward.
30
31

Neonatal deaths before and after the intervention

32
33
34
35 Data were collected and analysed six months before the intervention (i.e. from November 2017 to
36
37 April 2018 for the pre-training period) and six months after the intervention (i.e. from June 2018 to
38
39 November 2018 for the post-training period).
40

41
42 Neonatal deaths refer to the deaths of infants during the neonatal period (i.e., during the first 28 days
43
44 of life), while the neonatal mortality rate is the number of neonatal deaths per live births³¹. Babies
45
46 born at different hospitals and referred to JUTH were excluded from the study, because they did not
47
48 benefit from changes associated with the intervention.
49
50

51
52 A total of 712 deliveries were conducted in the labour ward between November 2017 and April 2018
53
54 (six months before the intervention). There were more births in the post-intervention period which
55
56 recorded 801 births.
57
58
59
60
61
62

Neonatal deaths during the six months before the intervention

The average number of live births in the pre-intervention period was approximately 116 births. Table 4 demonstrates that the number of live births declined from 143 births in the sixth month before the intervention (November 2017) to 66 births per month before the intervention (April 2018). The reason for this trend is unclear. Overall, 37 neonatal deaths occurred between November 2017 and April 2018, representing 5.3% (53/1000 live birth) of babies born alive in this period.

Neonatal deaths during the six months after the intervention

The average number of live births between June 2018 and November 2018 was 126 births per month. Overall, 28 neonatal deaths occurred between June 2018 and November 2018, which represents 3.7% (37/1000) of live births. This suggests a reduction in neonatal deaths when compared with the pre-intervention figures.

Independent T test analysis of neonatal deaths before and after intervention

Early neonatal mortality refers to the number of neonatal deaths that occurred during the early neonatal period, which is 0-6 days from birth, while late neonatal mortality refers to the number of neonatal deaths during the late neonatal period, which is 7-28 days from birth⁴. The quality of early neonatal care is reflected in the survival of neonates beyond the early neonatal period.

Independent T test analysis of the day of neonatal death demonstrates a significant difference in mean (P=0.00, 95% CI -5.629; -7.447- -4.779). The mean values for the day of neonatal death in the pre- and post-intervention periods were 3.35 ± 2.2 and 9.46 ± 3.2 days after birth, respectively. This implies that most of the deaths in the pre-intervention period occurred in the early neonatal period, while most of the deaths that occurred in the post-intervention period occurred in the late neonatal period. This finding suggests that this intervention could potentially reduce early neonatal mortality in Nigeria.

Discussion

1
2 An estimated 2.9 million infants die every year globally, largely as a result of the poor quality of care
3 they receive³²; this means, however, that many babies could in fact be saved, if the quality of newborn
4 care in hospitals and clinics was improved, especially in regions of high child mortality rates.
5
6

7
8
9 This study has contributed to the body of evidence about newborn care and professional development
10 in Nigeria and Africa at large. The educational intervention presented in this study resulted in an
11 improvement in the quality of newborn care by health care workers at JUTH. After the training
12 intervention, newborns enjoyed better care in the areas of thermoregulation, skin-to-skin care, delayed
13 cord clamping, cleaner deliveries and better infection control measures, early breastfeeding initiation
14 and dealing with breastfeeding difficulties. These together reduced the degree of exposure to factors
15 associated with increased newborn morbidity and mortality, likely contributing to improved neonatal
16 survival when compared with the pre-intervention data. In a study in Kenya³³ argued that the quality
17 of neonatal care can be improved considerably if nurses and midwives' experiences and challenges
18 with neonatal care were better understood, and if they were involved in identifying ways and
19 strategies for improving the quality of care for neonates.
20
21
22
23
24
25
26
27
28
29
30
31
32

33
34 There were general changes in behaviour following the intervention. Such positive changes in
35 behaviour are consistent with the findings reported in previous studies^{16,17,18}. However, the way in
36 which behaviour change was assessed in those studies differed from the current study. While in this
37 study interviews were initially conducted to determine current practice, followed by non-participatory
38 observation after the intervention, the other studies used standard checklists to assess participants by
39 using mannequins and direct observations. Just like the current study, these studies^{16,17,18} generally
40 demonstrated an improvement in the care of newborns immediately after birth in the post-intervention
41 period.
42
43
44
45
46
47
48
49
50
51

Impact of intervention on neonatal care

52
53 Before the educational intervention, participants reported that babies were immediately separated
54 from their mothers, cords were clamped immediately, babies were cleaned with olive oil under radiant
55 heat, babies were kept away from their mothers in postnatal wards, oral and nasal suctioning was
56
57
58
59
60
61
62
63
64
65

1 routinely used after birth, Vitamin K was only given to babies in the SCBU, methylated spirits was
2 predominantly used in cord care, and initiation of breastfeeding was routinely delayed. Such practices
3 are inappropriate and potentially harmful to the babies and reduce their chances of survival.
4
5

6
7 Post-intervention data, which were generated from observing 31 deliveries, demonstrates an
8 improvement in most of the gaps identified in the pre-intervention period, except for the use of
9 methylated spirits in cord care and the administration of Vitamin K, which requires inter-professional
10 collaboration and hospital management to ensure that Vitamin K is available and that all babies are
11 given this at birth in the labour ward.
12
13
14
15
16
17

18
19 The care that mothers received during labour and delivery is also important, as this could affect the
20 wellbeing of the baby. Infection control strategies, such as the administration of antibiotics to women
21 with broken membranes and more regular monitoring of such cases, were observed. Furthermore,
22 most health workers removed the first gloves used after delivering the baby, before separating,
23 clamping and cutting the cord. However, only a few health workers used chlorhexidine in cleaning the
24 cord, as recommended by the WHO²⁶.
25
26
27
28
29
30
31
32

33 Oral and nasal suctioning of babies was not routinely practiced in the post-intervention period, and
34 only a few babies who did not cry after birth had their mouth suctioned. This reflects that, post-
35 intervention, participants largely adhered to the WHO's recommendations of avoiding routine oral
36 and nasal suctioning²⁹. In addition, cord clamping was delayed for about one minute, as
37 recommended²⁶.
38
39
40
41
42
43
44

45 Another aspect of improvement observed in the post-intervention period was the prevention of
46 hypothermia. The windows and doors of the delivery rooms were kept closed, to keep it warm, and no
47 baby was placed on a cold surface. Most babies were thoroughly dried after delivery and their
48 temperature was monitored. Furthermore, most babies had immediate skin-to-skin contact with their
49 mothers after birth. The few that were not in contact immediately after birth were taken away quickly
50 for resuscitation. These findings indicate an improvement in care, when compared with the pre-
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

1 training period, which meant that neonates enjoyed better quality care and increased chances for
2 survival.

3
4
5 There was also timely initiation of breastfeeding after birth, which was attributed to the immediate
6 skin-to-skin contact that was maintained immediately after birth. Such a timely initiation of
7 breastfeeding has a positive implication on neonatal nutrition and survival.
8
9
10

11 **Impact of intervention on neonatal survival rate**

12
13
14 The records of deaths of neonates that were born in the facility six months before and six months after
15 the intervention were compared. There were 697 deliveries in the pre-intervention period, and 755
16 deliveries in the post-intervention period. The findings suggest a reduction in neonatal mortality from
17 5.3% in the pre-intervention period to 3.7% in the post-intervention period. However, this reduction in
18 the neonatal mortality rate cannot be attributed exclusively to the intervention, because of the absence
19 of a control in the study.
20
21
22
23
24
25
26

27
28 The existing literature on the impact of training interventions on newborn care in Africa is growing,
29 and this study adds to this body of knowledge^{19, 20, 21, 22}. The findings from this study is consistent with
30 studies conducted in Zambia^{20, 21, 22} and Ghana¹⁹, where neonatal deaths were reduced by 11 to 45% as a
31 result of intervention. These findings demonstrate the potential impact of training interventions on
32 neonatal survival; they give hope that, if cost effective, efficient and sustainable educational
33 interventions are identified and implemented in sub-Saharan Africa, significant progress can be made
34 to achieving the Sustainable Development Goals. A recent study in South Africa demonstrated the
35 possibility of reducing neonatal deaths from preventable causes by implementing neonatal policies
36 and plans, improving programs to deliver low-cost but high-impact interventions and providing
37 adequate and well-trained health workers in neonatal units³⁴. The current study has laid the foundation
38 for identifying high-impact and cost-effective intervention in the Nigerian context.
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53

54 In the current study, the proportion of babies that died within the first week of birth (early neonatal
55 deaths) have certainly reduced. Most deaths in the post-intervention period occurred during the late
56 neonatal period (7-28 days). This implies that most early deaths were averted, although much still
57
58
59
60
61
62
63
64
65

1 needs to be done in the late neonatal period. Most women at this time are discharged to go home,
2 except for those whose babies require admission to the SCBU. There is thus an urgent need for a
3 follow-up system that will ensure that women care for their neonates appropriately once they are
4 discharged and return home.
5
6
7

8 9 10 **Conclusion**

11 Training of health workers on essential newborn care resulted in quantifiable improvements in the
12 quality of newborn care in this Nigerian hospital. A reduction in neonatal deaths was also noted in the
13 6 month period following the educational intervention. Whilst this reduction in neonatal deaths
14 cannot be exclusively attributed to the intervention it is a promising finding. There is hope that, if
15 cost-effective, efficient and sustainable educational interventions are identified and implemented in
16 sub-Saharan Africa, significant progress can be made towards achieving the SDG.
17
18
19
20
21
22
23
24
25

26 **References**

- 27
28
29 1. United Nations International Children’s Fund. *Committing to Child Survival: A*
30 *Promise Renewed*. Progress Report 2014. 2014; United Nations International
31 Children’s Fund.
32
33
34
35
- 36 2. Alamneh, Y., Adane, F., Yirga, T. & Desta, M. Essential Newborn Care Utilization
37 and Associated Factors in Ethiopia: A Systematic Review and Meta-analysis. *BMC*
38 *Pregnancy and Childbirth*, 2020; 20:124. <https://doi.org/10.1186/s12884-020-2804-7>.
39
40
41
42
43
- 44 3. National Population Commission (NPC) [Nigeria] and ICF International. *Nigeria*
45 *Demographic and Health Survey 2018*. 2019; Abuja, Nigeria, and Rockville,
46 Maryland, USA: NPC and ICF International.
47
48
49
50
- 51 4. World Health Organization. *Neonatal and Perinatal Mortality: Country, Regional*
52 *and Global Estimates*. 2006; Geneva, World Health Organization. Retrieved from
53 <https://apps.who.int/iris/handle/10665/43444> on 13/7/2017
54
55
- 56 5. Chen, S.C., Wang, J., Ward, A.L., Chan, C., Chen, P., Chiang, H. *et al*. The
57 effectiveness of continuing training for traditional birth attendants on their
58
59
60
61
62
63
64
65

1 reproductive health-care knowledge and performance. *Midwifery*. 2011; 27 (5): 648–
2 653.

- 3
4
5 **6.** Ersdal, H.L., Vossius, C., Bayo, C., Mduma, E., Perlman, J., Lippert, A. *et al.* A one-
6 day “Helping Babies Breathe” course improves simulation performance but not
7 clinical management of neonates. *Resuscitation*. 2013; 84: 1422–1427.
- 8
9
10
11 **7.** Bookman, L., Engmann, C., Srofenyoh, E., Enweronu-Laryea, C., Owen, M.,
12 Randolph, G. *et al.* Educational impact of a hospital-based neonatal resuscitation
13 program in Ghana. *Resuscitation*. 2010; 81: 1180–1182.
- 14
15
16
17 **8.** Opiyo, N., Were, F., Govedi, F., Fegan, G., Wasunna, A., & English, M. Effect of
18 Newborn resuscitation training on Health Worker Practices in Pumwani Hospital,
19 Kenya. *PLoS ONE*. 2008; 3 (2): e1599. doi: 10.1371/journal.pone.0001599.
- 20
21
22
23
24
25
26
27 **9.** Enweronu-Laryea, C., Engmann, C., & Osafo, L.B. Evaluating the effectiveness of a
28 strategy for teaching neonatal resuscitation in West Africa. *Resuscitation*. 2009;80:
29 1308–1311.
- 30
31
32
33
34 **10.** Gill, C.J., Phiri-Mazala, G., Guerina, N.G., Kasimba, J., Mulenga, C., MacLeod, W.B.
35 *et al.* Effect of training traditional birth attendants on neonatal mortality
36 (Lufwanyama Neonatal Survival Project): Randomised controlled study. *British*
37 *Medical Journal*. 2011; 342: d346. doi: 10.1136/bmj.d346.
- 38
39
40
41
42
43
44 **11.** Cavicchiolo, M.E., Lanzoni, P., Wingi, M.O., Pizzo, D., Daverio, M., Da Dalt, L. *et*
45 *al.* Reduced neonatal mortality in a regional hospital in Mozambique linked to a
46 quality improvement intervention. *BMC Pregnancy and Childbirth*. 2016;16 (1): 366.
47 doi: 10.1186/s12884-016-1170-y.
- 48
49
50
51
52
53
54 **12.** Ellard, D.R., Shemdoe, A., Mazuguni, F., Mbaruku, G., Davies, D., Kihaille, P. *et al.*
55 A qualitative process evaluation of training non-physician clinicians/associate
56 clinicians (NPC/ACs) in emergency maternal, neonatal care and clinical leadership,
57
58
59
60
61
62
63
64
65

1 impact on clinical services improvement in rural Tanzania: The ETATMBA project.
2 *British Medical Journal Open*. 2016; 6 (2): e009000. doi: 10.1136/bmjopen-2015-
3
4 009000.
5
6

7 **13.** Ellard, D.R., Chimwaza, W., Davies, D., Simkiss, D., Kamwendo, F., Mhango, C. *et*
8
9 *al.* Up-skilling associate clinicians in emergency obstetric, neonatal care and clinical
10
11 leadership: The ETATMBA cluster randomized controlled trial. *British Medical*
12
13 *Journal Global Health*. 2016; 1: e000020. doi: 10.1136/bmjgh-2015-000020.
14
15

16
17 **14.** Ellard, D.R., Shemdoe, A., Mazuguni, F., Mbaruku, G., Davies, D., Kihale, P. *et al.*
18
19 Can training non-physician clinicians/associate clinicians (NPC/ACs) in emergency
20
21 maternal, neonatal care and clinical leadership make a difference to practice and help
22
23 towards reduction in maternal and neonatal mortality in rural Tanzania? The
24
25 ETATMBA project. *British Medical Journal Open*. 2016; 6 (2): e008999.
26
27 doi: 10.1136/bmjopen-2015-008999.
28
29
30

31
32 **15.** Musafili, A., Essen, B., Baribwira, C., Rukundo, A., Persson, L. Evaluating Helping
33
34 Babies Breathe: Training for health workers at hospitals in Rwanda. *Acta Paediatrica*.
35
36 2013; 102: e34–e38.
37
38

39
40 **16.** Makene, C.L., Plotkin, M., Currie, S., Bishanga, D., Ugwi, P., Loui, H. *et al.*
41
42 Improvements in newborn care and newborn resuscitation following a quality
43
44 improvement program at scale: Results from a before and after study in Tanzania.
45
46 *BMC Pregnancy and Childbirth*. 2014;14: 381. Available at:
47
48 <http://www.biomedcentral.com/1471-2393/14/381>. Accessed on 5/12/2017.
49
50

51
52 **17.** McClure, E.M., Carlo, W.A., Wright, L.L., Chomba, E., Uxa, F., Lincetto, O., Bann,
53
54 C. Evaluation of the educational impact of the WHO Essential Newborn Care course
55
56 in Zambia. *Acta Paediatrica*. 2007; 96: 1135–1138.
57
58
59
60
61
62
63
64
65

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
18. Grady, K., Ameh, C., Adegoke, A., Kongnyuy, E., Dornan, J., Falconer, T., Islam, M., & Van den Broek, N. (2011). Improving essential obstetric and newborn care in resource-poor countries. *Journal of Obstetrics and Gynaecology*, 31 (1): 18–23.
doi: 10.3109/01443615.2010.533218.
 19. Brantuo, M.N.A., Cristofalo, E., Mira, M., Mehe, M.M., Ameh, J., Brako, N.O., *et al.* Evidence-based training and mentorship combined with enhanced outcomes surveillance to address the leading causes of neonatal mortality at the district hospital level in Ghana. *Tropical Medicine and International Health*. 2014; 19 (4): 417–426.
 20. Carlo, W.A., McClure, E.M., Chomba, E., Chakraborty, H., Hartwell, Y., Harris, M.S., *et al.* Newborn Care Training of Midwives and Neonatal and Perinatal Mortality Rates in a Developing Country. *Paediatrics*. 2010; 126 (5): e1064–e1071.
doi: 10.1542/peds.2009-3464.
 21. Chomba, E., McClure, E.M., Wright, L.L., Carlo, W.A., Chakraborty, H., & Harris, H. Effects of WHO newborn care training on neonatal mortality by education. *Ambulatory Paediatrics*. 2008; 8 (5): 300–304.
 22. Manasyan, A., Chomba, E., McClure, E.M., Wright, L.L., Krzywanski, S., Carlo, W.A. *et al.* Cost-effectiveness of Essential Newborn Care Training in Urban First-Level Facilities. *Paediatrics*. 2011; 127: e1176–e1181.
 23. O’Reilly, M. & Parker, N. Unsatisfactory Saturation: A critical exploration of the notion of saturated sample sizes in qualitative research. *Qualitative Research*. 2012; 13 (2): 190–197.
 24. Kerr, C., Nixon A., & Wild, D. Assessing and demonstrating data saturation in qualitative inquiry supporting patient-reported outcome research. *Expert Review Pharmacoeconomic and Outcome Research*. 2010; 10 (3): 269–281.

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
25. Muijs, D. *Doing Quantitative Research in Education with SPSS*. 2011; New Delhi: Sage Publication.
 26. World Health Organization. *WHO recommendations on newborn health*. 2017; Geneva, World Health Organization.
 27. Sobel, H.L., Silvestre, M.A.A., Jacinto Blas, V., Mantaring, J.B.V., Oliveros, Y.E., & Nyunt-U, S. Immediate newborn care practices delay thermoregulation and breastfeeding initiation. *Acta Paediatrica*. 2010; 100 (8): 1127–1133.
 28. World Medical Association. World Medical Association Declaration of Helsinki: Medical principles for medical researcher involving human subjects. 2013; Available at: www.wma.net/en/30publications/10policies/b3/17c.pdf. Accessed 5/06/2015.
 29. World Health Organization. (2012). *Guidelines on basic neonatal resuscitation*. 2012; 2012; Geneva, World Health Organization.
 30. World Health Organization. *WHO Recommendations: Intrapartum care for a positive Childbirth Experience*. 2018; Geneva, World Health Organization.
 31. World Health Organization. *World Health statistics 2016: Monitoring Health for the SDG*. 2016; Available at: https://www.who.int/gho/publications/world_health_statistics/2016/en/ Accessed on 23/09/2016.
 32. Renfrew, M.J., Mcfadden, A., Bastos, M.H., Campbell, J., Channon, A.A., Cheung, N.F. *et al.* Midwifery and quality care: Findings from a new evidence-informed framework for maternal and newborn care. *Lancet*. 2014; 20 (384): 1129–1145.
 33. Nyikuri, M., Kumar, P., Jones, C & English, M. “But you have to start somewhere.....”: Nurses’ perception of what is required to provide quality neonatal care in selected hospitals, Kenya. *Wellcome Open Research*. 2020; 4 (195): 1–22.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

34. Rhoda, N.R., Velaphi, S., Gebhardt, G.S., Chauchali, S. & Barron, P. Reducing neonatal deaths in South Africa: Progress and Challenges. *South African Medical Journal*. 2018; 108 (3): S9–S16.

Table 1: Care before and during delivery.

Activity	Yes	No
Mother supported during labour	25 (80.6) [Female companion 21 (84) Father of baby 4 (16)]	6 (19.4)
Mother allowed to drink	25 (80.6)	6 (19.4)
Mother walked during labour	19 (61.3)	12 (38.7)
Perineum shaved	28 (90.3)	3 (9.7)
Use of separate gloves before clamping cord	25 (80.6)	6 (19.4)
Episiotomy	11 (35.5)	20 (64.5)
Perineal massage	29 (93.5)	2(6.5)
Mother pushing between contractions	7 (22.6)	24 (77.4)
Uterine massage	29 (93.5)	2(6.5)
Cold compress		31
Repair performed	13 (41.9)	18 (58.1)

Table 2: Care immediately after birth.

Signs 15 to 30 seconds after birth	
No crying	6 (19.4)
Small baby	3 (9.7)
Crying	22 (71)
What was done/action taken	
Mouth was suctioned and additional stimulation	8 (25.8)
First glove removed	
yes	23 (74.2)
no	8 (25.8)
Time before cord clamp	46.6 ± 20.3 seconds
Cord care	
Alcohol	24 (77.4)
Chlorhexidine	7 (22.6)
First glove removed	

Table 3: Breastfeeding practices.

	Yes	No
Baby's chest is facing mother chest	31	0
Attachment		
Chin touching breast	13 (41.9)	
Suckling is slow and deep	18 (58.1)	
Action to ensure proper attachment	13 (41.9)	18 (58.1)

Table 4: Distribution of live births and neonatal deaths six months before and six months after intervention.

Months	Live births	Neonatal deaths	Percent
Before intervention			
November 2017	143	0	0
December 2017	131	7	5.3
January 2018	149	11	7.4
February 2018	105	8	7.6
March 2018	103	8	7.8
April 2018	66	3	4.5
Total	697	37	5.3
After intervention			
June 2018	83	2	5.3
July 2018	127	3	2.4
August 2018	120	7	5.8
September 2018	123	4	3.3
October 2018	125	4	3.2
November 2018	177	8	4.5
Total	755	28	3.7



Click here to access/download

Supplemental Data File (.doc, .tif, pdf, etc.)
supplementary materia-Qualitative data..pdf

