

# The growing use of the WHO Safe Childbirth Checklist: Lessons learned at the Yaoundé Gynaeco-Obstetric and Paediatric Hospital, Cameroon

**Julius Sama DOHBIT**

Universite de Yaounde I

**Namanou Ines Emma WOKS** (✉ [emmawoks@gmail.com](mailto:emmawoks@gmail.com))

Hopital gyneco-obstetrique et pediatrique de Yaounde <https://orcid.org/0000-0003-3793-6737>

**Carlin Héméry KOUDJINE**

Universite de Yaounde I

**Willy TAFEN**

Hopital gyneco-obstetrique et pediatrique de Yaounde

**Pascal FOUMANE**

Universite de Yaounde I

**Lucienne BELLA ASSUMPTA**

Hopital gyneco-obstetrique et pediatrique de Yaounde

**Rosemary Nkemdilim OGU**

University of Port Harcourt

**Fru Fobuzshi ANGWAFO III**

Hopital gyneco-obstetrique et pediatrique de Yaounde

---

## Research article

**Keywords:** Safe Childbirth, Checklist, World Health Organization, Cameroon

**Posted Date:** September 2nd, 2020

**DOI:** <https://doi.org/10.21203/rs.2.14441/v5>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

**Version of Record:** A version of this preprint was published at BMC Pregnancy and Childbirth on July 8th, 2021. See the published version at <https://doi.org/10.1186/s12884-021-03966-4>.

## Abstract

**Background:** Safe childbirth remains a daunting challenge, particularly in low middle-income countries, where most pregnancy-related deaths occur. Cameroon's maternal mortality rate, estimated at 529 per 100,000 live births in 2017 is significantly high. The WHO Safe Childbirth Checklist (SCC) was designed to improve the quality of care provided to pregnant women during childbirth. It was implemented at the Yaoundé Gynaeco-Obstetric and Paediatric Hospital to improve the quality of care during childbirth.

**Methods:** A retrospective study to determine the adoption rate of the SCC and its association with maternal (eclampsia, perineal tears, post-partum haemorrhage) and neonatal (foetal death, neonatal asphyxia and neonatal death) complications. Data was collected six months after the introduction of the SCC at the maternity. The Chi-square test was used to compare categorical variables, while the student's T-test was used to compare continuous variables.

**Results:** Out of 1611 deliveries conducted, 1001 records were found, giving a retrieval rate of 62%. Twenty-five records were excluded. During the study period, checklists were used in 828 of 976 clinical notes, giving a mean adoption rate of 84.8% and utilization rate of 93.9% at six months. Severe pre-eclampsia/eclampsia were associated with the non-use of SCC (2.1% Vs 5.4%, p = 0.017). Stillbirth, neonatal asphyxia, and neonatal death rates were not statistically different between checklist and non-checklist groups. However, in all neonatal outcomes, the proportion of complications was less when the checklist was used.

**Conclusion:** The use of the safe childbirth checklist was associated with significantly reduced pregnancy complications, especially reducing severe pre-eclampsia/ and eclampsia. The use of the safe childbirth checklist increased to 93.9% of all deliveries within six months. We advocate for the use of the WHO Safe Childbirth Checklist in maternity units.

## Background

Childbirth is a moment of overwhelming expectation and anxiety for the family and the couple in particular. Safe childbirth remains a daunting challenge, particularly in low-resource settings, where most pregnancy-related deaths occur. Achieving the desired reduction in global maternal mortality ratio to less than 70 per 100,000 live births is one of the Sustainable Development Goals' (SDG) healthcare targets [1]. Maternal mortality is a global health problem. The World Health Organization (WHO) in 2017, reported 295 000 maternal deaths due to pregnancy and childbirth complications [2]. The majority of these women died of preventable causes in Low-Middle Income Countries (LMIC). Further, for each case of maternal death, many more women experience life-threatening complications or Severe Maternal Morbidity (SMM) [3]. Cameroon's Maternal Mortality Ratio (MMR), estimated at 529 per 100,000 live births in 2017 is still unacceptably high [4]. More than 50% of these deaths are due to haemorrhage, hypertensive disorders, and sepsis [5,6].

The main factors responsible for SMM and preventable maternal deaths are limited access to care, poor quality services and poverty [7]. A multi-country study conducted in LMIC reported that closing the quality gap would produce substantial benefits in maternal and neonatal health at current levels of access and utilization of healthcare services [8]. Therefore, reducing maternal mortality and morbidity in Cameroon hinges on identifying and improving services that are critical to the health of women and girls, such as; Antenatal Care, Emergency Obstetric and New-born Care (EmONC), skilled birth attendance and quality healthcare before, during and after childbirth [9–13].

Poor quality of care (QoC) can occur because of the know-do gap, whereby healthcare providers' actions diverge from the knowledge of evidence-based recommendations [14,15]. According to the WHO, inadequacies in QoC provided in hospitals are responsible for unsatisfactory maternal and neonatal health indicators despite increased geographical coverage [16]. Consequently, maternity services need to ensure standard QoC to achieve expected health outcomes in women and their newborns [17]. Identifying and instituting cost-effective interventions that improve the quality and safety of childbirth is beneficial. Facility-based checklist interventions have been successfully used to help practitioners translate recommendations into high-quality patient care [18].

This WHO Safe Childbirth Checklist (SCC) is a facility-based reminder tool comprised of 28 essential birth practices (See Table 1), which target the major causes of maternal deaths, stillbirths and neonatal deaths [19,20]. The SCC was designed to help health workers adhere to evidence-based practices associated with improved maternal and neonatal outcomes at critical moments of delivery. It consists of four pause points (or moments of care); on admission, just before pushing or caesarean, within one hour after birth, and shortly before discharge. A study conducted in India in 2016 showed significantly improved adherence to practices, six months post-training in the intervention arm [21]. Further, the BetterBirth trial in India reported an increase in providers' adherence to essential birth practices after two months of peer coaching in primary level facilities [22]. However, there are limited studies on the use of the SCC and the association between the use of the SCC and pregnancy related complications.

Maternal and neonatal mortality rates are key indicators of the health system's strength [23]. Implementing strategies with potential to increase adherence to essential birth practices is necessary to prevent pregnancy-related complications and deaths in health facilities. The Yaoundé Gynaeco-Obstetric and Paediatric Hospital (YGOPH) thus introduced the SCC at her Obstetrics and Gynaecology Service. This study assessed the SCC's use, and its association with obstetric and neonatal complications during the six-months following its introduction and staff training at the YGOPH.

## Methods

### *Aim of the study*

- Primary Objective

To determine the frequency of use of the SCC and its association with maternal and neonatal complications six months after its introduction at the YGOPH, Cameroon.

- Secondary Objectives

## **To evaluate the completion rate of the SCC during the first six months of implementation at the YGOPH, Cameroon.**

### ***Study design***

A retrospective study at the Gynaecology and Obstetrics Service of the YGOPH. Data was collected six months after the introduction of the SCC at the maternity. Six months was chosen because previous research conducted on the SCC in India [21] showed that adherence to essential birth practices could be evaluated within this period.

### ***Study setting***

Cameroon has a pyramidal health system. The YGOPH, a tertiary referral hospital specialized in maternal and child care is at the summit of the pyramid. It has one of the busiest maternities in the country, with over 3,000 deliveries annually and a 32% caesarean birth rate.

The Gynaecology and Obstetrics Service has three units: inpatient maternity, inpatient Gynaecology and outpatient Gynaecology units. The Service has 11 Gynaecologists/Obstetricians, one General Practitioner and 56 Nursing staff. Vaginal births are conducted at the maternity unit, made up of 13 admission beds. A total of 20 nursing staff mans the maternity. They are; 16 Skilled Birth Attendants (SBA), one nurse specialized in reproductive health, one State Registered Nurse (SRN), one Nursing Assistant (NA) and one Certified Nurse (CN). Two of these (SRN and SBA) are unit heads at the maternity.

### ***The characteristics of participants***

#### *Inclusion criteria*

All women who gave birth at the YGOPH from January to June 2018 with delivery records or clinical notes at the archives of Gynaecology and Obstetrics Service were assessed for eligibility. The clinical note or delivery record is the primary tool used to document care, communicate plans and provide guidance for follow-up treatment and care of a patient.

#### *Exclusion criteria*

- Women with incomplete clinical notes (without the mode of delivery mentioned)
- Women admitted in the maternity for observation or medical reasons (malaria in pregnancy, urinary infection in pregnancy, threatened preterm labour) without ensuing delivery

- Women who gave birth (delivered) before 22 weeks of gestation
- Women who delivered in other facilities and were referred to the YGOPH in the post-partum period

#### *Minimum sample size*

All women who met the eligibility criteria were included in the study. A sample size calculation was done using the formula below

**See formula 1 in the supplementary files.**

#### *Procedure*

##### *Implementation of the SCC*

The management of the Gynaecology and Obstetrics Service introduced the SCC program in December 2017. The WHO SCC was used [19]. An illustrative presentation on how to use the SCC during childbirth was done by an Obstetrician, at the monthly Service meeting. Thereafter, pilot testing of the SCC commenced at the maternity. The nursing staff of the maternity used the SCC, during the pilot phase, from October - December 2017 under the daily supervision of the two maternity unit heads who informed the service heads weekly.

The official launching of the SCC was done at a specially organized seminar in the first week of January 2018. (Appendix 1) During this one-day workshop, the SCC was slightly modified and a refresher course was given on how to use it. The modified SCC had the criterion for administration of antibiotics in premature rupture of membranes changed from more than 18 hours to above six hours. After this seminar, the maternity unit heads attached the SCC to current and new delivery records of individual patients. Supervision continued daily by the unit heads and weekly by the hospital nursing directors.

#### *Data collection tools*

Data were collected from the women's clinical notes and from the nurses providing care to the women. This paper presents the findings from the women's clinical notes. The following information was gathered from the women's clinical notes (with the complications defined as shown below):

- Identification: code, age, place of residence
- Past history: obstetric, surgical, medical
- Completion rate of the checklist for each parturient and newborn
- Clinical notes with used checklists and without used checklists
- **Mild pre-eclampsia:** The presence of a systolic blood pressure (SBP) greater than or equal to 140 mm Hg or a diastolic blood pressure (DBP) greater than or equal to 90 mm Hg or higher, occurring after 20 weeks' gestation, in addition to a urine dipstick protein of 1+ (approximately 30 mg/dL), 2+ (100 mg/d) or more.

- **Severe pre-eclampsia:** A SBP greater than or equal to 160 mm Hg or a DBP greater than or equal to 110 mm Hg or higher, occurring after 20 weeks' gestation, in addition to a urine dipstick protein of 1+ (approximately 30 mg/dL), 2+ (100 mg/d) or more.
- **Eclampsia:** The onset of grand mal seizures and/or unexplained coma during pregnancy or post-partum, during or after the 20th week of gestation in a woman with signs or symptoms of pre-eclampsia.
- **A perineal tear:** A tear or injury to the skin and/or muscles between the vaginal introitus and the anal opening.
- **Stillbirth:** Foetal demise (death) which occurred between 22 weeks' gestation and time of delivery.
- **Neonatal asphyxia:** Persistence of an Apgar score of 1-6 at the 1<sup>st</sup> and the 5<sup>th</sup> minutes.
- **Neonatal death:** The death of a newborn to mothers included in the study within the first seven days of life.
- **Primary post-partum haemorrhage (PPH):** Blood loss in excess of 500 ml from the genital tract: uterus, cervix, vagina and perineum within 24 hours of delivery.
- **Secondary PPH:** Any significant vaginal or uterine bleeding occurring between 24 hours of delivery and six weeks **post-partum**.

### ***Statistical analysis***

This was done using the SPSS version 23·0 software. Descriptive statistics were used to summarize nominal data. The Chi-square test was used to compare categorical variables, while the student's T-test was used to compare continuous variables. Multivariate analysis was done using binary logistic regression to eliminate confounders in the association between the use of the SCC and significant birth outcomes. Results were considered statistically significant at  $P < 0.05$ .

### ***Ethical approval and consent to participate***

Ethical approval and administrative authorization was obtained from the Institutional Review Board of the YGOPH. Data collection was done with strict respect for the principle of confidentiality. The identity of every participant was concealed through consecutive numbering.

## **Results**

There were a total of 1611 births during the study period. Amongst this, 1001 complete records were found giving a 62% retrieval rate. Twenty-five records were excluded: seven abortions, nine pregnancy-related pathologies discharged before childbirth and nine cases referred from other facilities after childbirth. The mean age of our study population was  $28 \pm 6$  years. The most represented age group was 25-29 years. (See Figure I) The majority of our study population was multiparous. (See Table 2)

Of the 976 records, a total of 828 contained used checklists, giving an adoption rate of 84·8%. (See Table 3) Furthermore, there was an increase in the adoption rate over time, with a peak of 93·9% in May and

June. We documented the highest proportion of clinical notes with unused checklists in January and February. Three peripartum pathologies were common in the medical history of the parturient: hypertension, gestational diabetes and post-partum haemorrhage. The most frequent pathology was hypertension. (See Table 2) Caesarean sections were the most frequent surgical procedures previously performed on the women. The proportion of delivery records with unfilled checklists was higher for caesarean than vaginal births. (See Table 4).

The completion rate of the SCC just before delivery and within one hour of birth was consistently below 10% during the first five months. By the sixth month of the study, more than 60% of used checklists were properly filled on admission and before discharge.

Of 976 delivery records retained, the YGOPH registered 149 patients with maternal complications during the study. Amongst them, 16.8% (25/149) were cases of severe pre-eclampsia/eclampsia, 28.2% (42/149) had Acute Foetal Distress (AFD), 43.6% (65/149) had perineal tears, 4.7% (7/149) presented with Post-Partum Haemorrhage (PPH) and others. The difference in the proportion of maternal complications between checklists and non-checklists cases was not statistically significant. (15.3% Vs 14.9%,  $p = 0.883$ ) (See Table 3). Further monthly analysis revealed that the percentage of adverse maternal outcomes rose during the first four months from 7.2% to 20.7% and then dropped to 6.9% during the last two months amongst cases with filled checklists. (See Figure 1) A significant reduction in the onset of severe pre-eclampsia/eclampsia was associated with the use of checklists (2.1% Vs 5.4%,  $p = 0.017$ ). Conversely, there was no significant difference between the checklist and non-checklist categories for patients with AFD, perineal tears and PPH.

Figure 2 highlights the frequency of neonatal complications encountered during the study and its association with the SCC's use. Amidst the 98 clients with adverse foetal and neonatal outcomes, 40 (4.1% of births) had stillbirths, 45 (4.6%) developed neonatal asphyxia, while three (0.3%) died within the first 48 hours of life. Stillbirth, neonatal asphyxia and neonatal death rates were not statistically different between checklist and non-checklist groups. (See Figure 2)

## Discussion

This study assessed the use of the SCC at the YGOPH and its association with obstetric and neonatal complications during the six-month period following the SCC implementation. The mean age of our study population was  $28 \pm 6$  years. Of the 976 delivery records, 828 used the checklists. Severe pre-eclampsia/eclampsia were associated with the non-use of SCC (2.1% Vs 5.4%,  $p = 0.017$ ).

In this study, the mean adoption rate of the SCC over a six-month period was 84.8% (828/976 files). This value is twice as high as the adoption rate (45.8%) reported in a tertiary care setting in Sri Lanka during a two-month prospective observational study, conducted in 2013 [24]. According to table 2, there are approximately 370 deliveries conducted in two months by a staff of 20, meanwhile at De Soysa Women's Hospital (DSWH), in Sri Lanka, the ratio of births to the number of workers is significantly higher. Therefore, the greater workload and short duration of study at the DSWH could have contributed to this

difference in adoption rates. Additionally, a deeper commitment to quality improvement by the staff of YGOPH may explain the higher adoption rate such that by June, almost all deliveries (93.9%) were managed with a filled childbirth checklist. Another study conducted in a district hospital in Rwanda also found a high Essential Birth Practice (EBP) compliance at 56% over a two-month period following staff training on the SCC implementation [25].

Our evaluation found that the SCC-based intervention at the YGOPH is associated with a significantly lower proportion (2·1% Vs 5·4%,  $p = 0\cdot017$ ) of severe pre-eclampsia/eclampsia cases. As concerns the mechanism by which this occurred, the SCC prompts the birth attendant to check the blood pressure on admission (See Table 1) and if indicated, commence prophylaxis with magnesium sulphate. This early blood pressure check ensures early identification and management, thus prevents deterioration to severe pre-eclampsia/eclampsia. This view is validated by the quasi-experimental study [26] done in Rajasthan, India, which observed a positive behavioural change in health care providers associated with the implementation of the SCC. The greatest difference (64%) was reported in early identification, management and timely referral of cases of pre-eclampsia [26]. Though, the Better-Birth study, a cluster-randomized, controlled trial in Uttar Pradesh, India, found no significant impact of the SCC intervention on maternal morbidity or mortality [27], unavailability of medications and consumables may have been responsible. Although both studies are based on the SCC, they differ in context. The Better-Birth study facilities were a combination of primary health care facilities and community health centres, whereas YGOPH is a tertiary-level facility. We posit that in the context of adequate human and material resources, the use of the SCC will be associated with a significant reduction on maternal morbidity and mortality.

After multivariate analysis, the significant variation in the proportion of severe pre-eclampsia and eclampsia cases in both SCC groups is maintained when the results are adjusted for differences in age, parity and history of hypertension. (See Table 5)

Figure 1 shows a progressive decline in the proportion of maternal complications with the use of the SCC over time. Checklists were attached to clinical notes. The percentage of adverse maternal outcomes dropped to 6.9% during the last two months amongst cases with filled checklist. As described in previous studies, the use of the SCC with regular coaching or supervision improves adherence to essential birth practices, thereby resulting in fewer complications when providers have adequate skills alongside the availability of supplies [21,22].

Stillbirth, neonatal asphyxia and neonatal death rates were not statistically different between checklist and non-checklist groups, as shown in figure 2. However, in all neonatal outcomes, the proportion of complications was less when the checklist was used. Thus, we agree with other published works that non-adherence to the essential birth practices affect the quality of care and consequently neonatal outcomes [16, 28, 29].

## **Study limitations**

This study is a review of outcomes during the implementation research in one facility to provide better quality of care during childbirth. We had no influence on the quality of data entered into the delivery records. However; measure taken to minimize this limitation was comparison with data in delivery registers and service reports. The study was only carried out in one facility.

Out of 1611 deliveries conducted during the study period, 1001 delivery records were found, giving a retrieval rate of 62%. We currently have a paper-based archiving system, and one of the limitations associated with this is the loss of files in the patient record circuit. However, the hospital is in the process of computerizing her medical records, to eradicate the problem of missing records.

## **Conclusion and recommendations**

The use (adoption rate) of the SCC increased to 93.9% of all deliveries within six months of implementation. Our study showed that the utilization of the SCC was associated with a significant reduction in the onset of severe pre-eclampsia/eclampsia. We advocate for the use of the SCC in maternity units. From the positive results obtained, we intend to continue using this reminder tool and get other health facilities on board.

## **Perspectives**

The hospital is transitioning to electronic medical records to enable better archival of her medical data.

## **Declarations**

### ***Ethical approval and consent to participate***

Ethical approval and administrative authorization were obtained from the Institutional Review Board of YGOPH. The rationale of the study was clearly explained and consent obtained. Data collection was done with strict respect of the principle of confidentiality. The identity of every participant was concealed through consecutive numbering.

### ***Consent for publication***

Not applicable.

### ***Availability of data and materials***

The datasets generated and/or analyzed during the current study are available from the corresponding author on request.

### ***Competing interests***

The authors declare that they have no competing interests.

### ***Funding***

## None *Authors' contributions*

**SJD:** introduction of the checklist at the YGOPH, manuscript revision, director and correction of work;; **NIEW:** data interpretation, write up of first manuscript, literature search;; **CHK:** study design, data collection;; **WT:** data analysis, manuscript revision; **PF:** director of the intervention and research work, manuscript revision; **BAL:** data analysis, manuscript revision;; **RNO:** research conception, the introduction of the checklist at the YGOPH, manuscript revision;; **AIIIFF:** research conception, supervisor of the research work, final corrections of the manuscript

All authors read and approved the final manuscript.

## *Acknowledgements*

The authors will like to thank the Chiefs of Service and the staff of the Maternity Unit of the Yaoundé Gynaeco-Obstetric and Paediatric Hospital.

## Abbreviations

**EBP:** Essential Birth Practices; **HGOPY/YGOPH:** Yaoundé Gynaeco-Obstetric and Paediatric Hospital; **SCC:** Safe Childbirth Checklist; **WHO:** World Health Organization

## References

1. UN General Assembly. Transforming our world. The 2030 Agenda for Sustainable Development. 2015 Oct. A/RES/70/1, pp 14
2. WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division. Trends in Maternal Mortality: 2000 to 2017. Geneva, World Health Organization, 2019
3. Grobman WA, Bailit JL, Rice MM, Wapner RJ, Reddy UM, Varner MW, et al. Frequency of and factors associated with severe maternal morbidity. *Obstet Gynecol.* 2014;123(4):804–10.
4. WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division. Trends in Maternal Mortality: 2000 to 2017. Geneva, World Health Organization, 2019.
5. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A-B, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health.* 2014;2(6):e323–33.
6. Tebeu P-M, Halle-Ekane G, Da Itambi M, Mbu RE, Mawamba Y, Fomulu JN. Maternal mortality in Cameroon: a university teaching hospital report. *Pan Afr Med J [Internet].* 2015 May 7 [cited 2020 Jan 23];21. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4561158/>
7. Kyei-Nimakoh M, Carolan-Olah M, McCann TV. Access barriers to obstetric care at health facilities in sub-Saharan Africa—a systematic review. *Syst Rev [Internet].* 2017 Jun 6 [cited 2020 Mar 21]; Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5461715/>
8. Chou VB, Walker N, Kanyangarara M. Estimating the global impact of poor quality of care on maternal and neonatal outcomes in 81 low- and middle-income countries: A modeling study. *PLOS*

Med. 2019;16(12):e1002990.

9. Kadia RS, Kadia BM, Dimala CA, Aroke D, Vogue N, Kenfack B. Evaluation of emergency obstetric and neonatal care services in Kumba Health District, Southwest region, Cameroon (2011–2014): a before-after study. *BMC Pregnancy Childbirth*. 2020;20(1):95.
10. Leke R. Reducing Maternal Mortality Through the Prevention of Unsafe Abortion and Their Complications in Cameroon. *Int J Gynecol Clin Pract*. 2018;5:144
11. Stover J, Ross J. How Increased Contraceptive Use has Reduced Maternal Mortality. *Matern Child Health J*. 2010;14(5):687-695.
12. Nour NM. An Introduction to Maternal Mortality. *Rev Obstet Gynecol*. 2008;1(2):77–81.
13. Alemu FM, Fuchs MC, Martin Vitale T, Abdalla Mohamed Salih M. Severe maternal morbidity (near-miss) and its correlates in the world's newest nation: South Sudan. *Int J Womens Health*. 2019;11:177–90.
14. Leonard KL, Masatu MC. Professionalism and the know-do gap: exploring intrinsic motivation among health workers in Tanzania. *Health Econ*. 2010;19(12):1461–77.
15. Das J, Holla A, Das V, Mohanan M, Tabak D, Chan B. In urban and rural India, a standardized patient study showed low levels of provider training and huge quality gaps. *Health Aff Proj Hope*. 2012;31(12):2774–84.
16. WHO. Standards for improving quality of maternal and newborn care in health facilities. 2016. Available from: [http://www.who.int/maternal\\_child\\_adolescent/topics/quality-of-care/definition/en/](http://www.who.int/maternal_child_adolescent/topics/quality-of-care/definition/en/) [cited 2019 Dec 31]
17. Organization WH, OECD, Bank IB for R and DW. Delivering quality health services: a global imperative for universal health coverage [Internet]. World Health Organization; 2018. Available from: <https://apps.who.int/iris/handle/10665/272465> [cited 2019 Dec 31]
18. Hales BM, Pronovost PJ. The checklist—a tool for error management and performance improvement. *J Crit Care*. 2006;21(3):231–5.
19. WHO | WHO Safe Childbirth Checklist [Internet]. WHO. World Health Organization; [cited 2020 Aug 10]. Available from: <http://www.who.int/patientsafety/implementation/checklists/childbirth/en/>
20. Dohbit J, Agala V, Chinwa-Banda P, Anane- Fenin B, Maduka O, et al. Improving Maternal Health: The Safe Childbirth Checklist as a Tool for Reducing Maternal Mortality and Morbidity. In: Chapter 6; Selected Topics in Midwifery Care, Ana Polona Mivšek (Ed). IntechOpen 2019: 87-110.
21. Kumar S, Yadav V, Balasubramaniam S, Jain Y, Joshi CS, Saran K, et al. Effectiveness of the WHO SCC on improving adherence to essential practices during childbirth, in resource constrained settings. *BMC Pregnancy Childbirth*. 2016;16(1):345.
22. Molina RL, Neal BJ, Bobanski L, Singh VP, Neville BA, Delaney MM, et al. Nurses' and auxiliary nurse midwives' adherence to essential birth practices with peer coaching in Uttar Pradesh, India: a secondary analysis of the BetterBirth trial. *Implement Sci*. 2020;15(1):1.

23. Pinzón-Flórez CE, Fernández-Niño JA, Ruiz-Rodríguez M, Idrovo ÁJ, Arredondo López AA. Determinants of performance of health systems concerning maternal and child health: a global approach. *PloS One*. 2015;10(3):e0120747.
24. Patabendige M, Senanayake H. Implementation of the WHO safe childbirth checklist program at a tertiary care setting in Sri Lanka: a developing country experience. *BMC Pregnancy Childbirth*. 2015;15:12.
25. Tuyishime E, Park PH, Rouleau D, Livingston P, Banguti PR, Wong R. Implementing the World Health Organization safe childbirth checklist in a district Hospital in Rwanda: a pre- and post-intervention study. *Matern Health Neonatol Perinatol*. 2018;4:7.
26. Varghese B, Copas A, Kumari S, Bandyopadhyay S, Sharma J, Saha S, et al. Does the safe childbirth checklist (SCC) program save newborn lives? Evidence from a realistic quasi-experimental study, Rajasthan, India. *Matern Health Neonatol Perinatol*. 2019;5(1):3.
27. Semrau KEA, Hirschhorn LR, Marx Delaney M, Singh VP, Saurastri R, Sharma N, et al. Outcomes of a Coaching-Based WHO Safe Childbirth Checklist Program in India. *N Engl J Med*. 2017;377(24):2313–24.
28. Bayou G, Berhan Y. Perinatal Mortality and Associated Risk Factors: A Case Control Study. *Ethiop J Health Sci*. 2012;22(3):153–62.
29. Ngoc NTN, Merialdi M, Abdel-Aleem H, Carroli G, Purwar M, Zavaleta N, et al. Causes of stillbirths and early neonatal deaths: data from 7993 pregnancies in six developing countries. *Bull World Health Organ*. 2006;84(9):699–705.

## Tables

Table 1: List of 28 Essential Birth Practices from the World Health Organization Safe Childbirth Checklist [19]

---

## List of Essential Birth Practices

---

### *On admission*

1. Assess mother's need for referral
2. Start partograph
3. Assess mother for criteria to start antibiotics
4. Assess mother for signs of pre-eclampsia/eclampsia or the need to administer magnesium sulphate and antihypertensive treatment
5. Ensure availability of supplies to clean hands and wear gloves for each vaginal exam confirmed
6. Encourage birth companion to be present at birth
7. Confirm that mother or companion will call for help during labour if needed

### *Just before pushing (or before Caesarean)*

8. Assess mother for criteria to start antibiotics
9. Assess mother for signs of pre-eclampsia/eclampsia or the need to administer magnesium sulphate and antihypertensive treatment
10. Confirm essential supplies for mother at bedside
11. Confirm essential supplies for baby bedside
12. Identify assistant and confirm readiness to help at birth if needed

### *Soon after birth (within 1 hour)*

13. Assess mother for abnormal bleeding
14. Assess mother for criteria to start antibiotics
15. Assess mother for signs of pre-eclampsia/eclampsia or the need to administer magnesium sulphate and antihypertensive treatment
16. Assess baby's need for referral
17. Assess baby for criteria to start antibiotics
18. Assess baby's needs for special care/monitoring
19. Initiate skin-to-skin contact and breastfeeding (if mother and baby are well)
20. Confirm that mother/companion will call for help if danger signs present

### *Before discharge*

21. Confirm stay at facility for 24 hours after delivery
  22. Assess mother for criteria to start antibiotics
  23. Assess mother's blood pressure
  24. Assess mother for abnormal bleeding
  25. Assess baby for criteria to start antibiotics
  26. Establish good breastfeeding practices before discharge
  27. Discuss and offer family planning options to Mother
  28. Arrange follow-up and confirm Mother/Companion will seek help if danger signs are present after discharge
- 

**Table 2:** Socio-demographic and clinical characteristics of the study population

	Frequency (%)
<b>Age</b>	
15 - 19 years	73(7.5)
20 -24 years	189(19.4)
25 - 29 years	311(31.9)
30 - 34 years	214(21.9)
35 - 39 years	153(15.7)
≥ 40 years	35(3.6)
Missing data	1(0.1)
<b>Total</b>	<b>976(100.0)</b>
<b>Parity</b>	
1-2	520(53.3)
3-4	217(22.2)
≥ 5	81(8.3)
Missing data	158(16.2)
<b>Previous pathology</b>	<b>Frequency (n)</b>
Hypertensive disorders	34(3.5)
Gestational diabetes	2(0.2)
PPH	3(0.3)
Uncomplicated	937(96.0)
<b>Mode of birth</b>	<b>Frequency (n)</b>
Vaginal birth	807(82.7)
Caesarean birth	169(17.3)
<b>Total</b>	<b>976(100.0)</b>

PPH: post-partum haemorrhage

Table 3: Frequency and proportion of checklist use

Month	Groups		Proportion	Total
	checklist use	Non-checklist		
January	110	53	67.5	163
February	162	48	77.1	210
March	122	13	90.4	135
April	113	13	89.7	126
May	130	8	94.2	138
June	191	13	93.6	204
<b>Total</b>	<b>828</b>	<b>148</b>	<b>84.8</b>	<b>976</b>

Table 4: Association between the use of the checklist and obstetric outcomes

Type of birth	Checklist Group (N1=828)	Non-checklist group (N2=148)	Total	P- value
Vaginal birth	699 (84.4%)	108 (73.0%)	807 (82.7%)	0.001
Caesarean birth	129 (15.6%)	40 (27.0%)	169 (17.3%)	
Total	828 (100.0%)	148 (100.0%)	976 (100.0%)	
<b>Maternal complications</b>				
Yes	127 (15.3%)	22 (14.9%)	149 (15.3%)	0.883
No	701 (84.7%)	126 (85.1%)	827 (84.7%)	
Total	828 (100.0%)	148 (100.0%)	976 (100.0%)	
<b>Eclampsia/Severe pre-eclampsia</b>				
Yes	17 (2.1%)	8 (5.4%)	25 (2.6%)	0.017
No	811 (97.9%)	140 (94.6%)	951 (97.4%)	
Total	828 (100.0%)	148 (100.0%)	976 (100.0%)	
<b>Acute foetal Distress</b>				
Yes	38 (4.6%)	4 (2.7%)	42 (4.3%)	0.418
No	804 (95.4%)	130 (97.3%)	934 (95.7%)	
Total	828 (100.0%)	148 (100.0%)	976 (100.0%)	
<b>Perineal Tears</b>				
Yes	59 (7.1%)	6 (4.1%)	65 (6.7%)	0.167
No	769 (92.9%)	142 (95.9%)	911 (93.3%)	
Total	828 (100.0%)	148 (100.0%)	976 (100.0%)	
<b>Post partum Haemorrhage</b>				
Yes	7 (0.8%)	0 (0.0%)	7 (0.7%)	0.262
No	821 (99.2%)	148 (100.0%)	969 (99.3%)	
Total	828 (100.0%)	148 (100.0%)	976 (100.0%)	

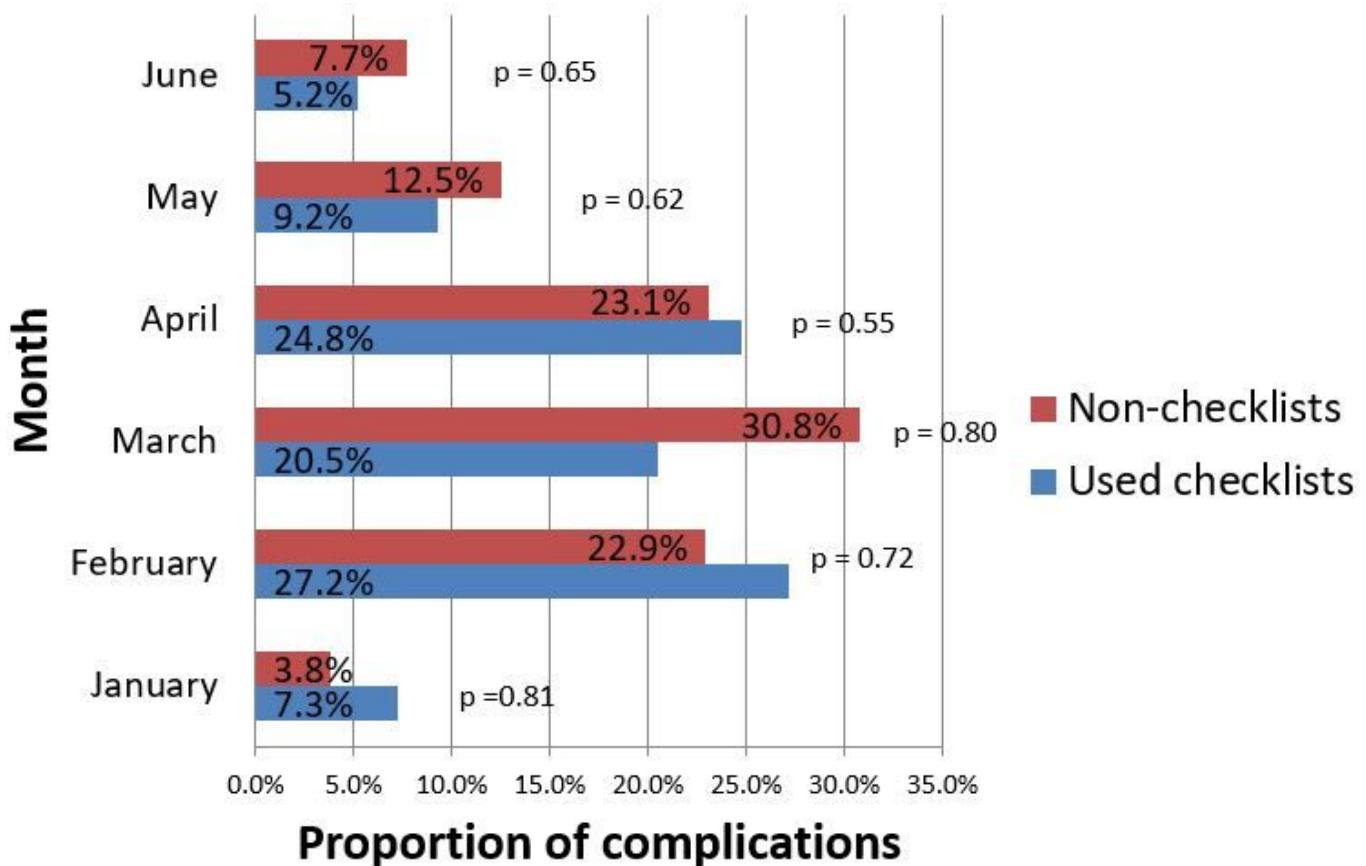
Table 5: Multivariate analysis of variables associated with eclampsia & caesarean delivery

Variable	Severe pre-eclampsia & eclampsia							
	Total n=976	Yes		No		(Adjusted Odds Ratio)	CI 95%	P value
	n	%	n	%				
<b>Age</b>								
≤19 years	73	5	20.8	68	7.2	1.023	0.59 - 1.78	0.930
>19 years	902	19	79.2	883	92.8			
<b>Parity</b>								
primiparous	463	18	72.0	445	46.8	3.01	1.09 - 8.34	0.034
Multiparous	513	7	28.0	506	53.2			
<b>Past history of hypertension in pregnancy</b>						2.70	0.59 - 12.41	0.203
Yes	34	4	16.0	30	3.2			
No	942	21	84.0	921	96.8			
<b>Use of the SCC</b>						0.37	0.15 - 0.90	0.029
Yes	828	17	68.0	811	85.3			
No	148	8	32.0	140	14.7			
<b>Past history of hypertension</b>						9.95	1.40 - 70.90	0.022
Yes	8	2	8.0	6	0.6			
No	965	233	92.0	942	99.4			
<b>Mode of birth (Caesarean)</b>								
<b>Age</b>						0.53	0.84 - 1.42	1.09
≤19 years	73	59	7.3	14	8.3			
>19 years	901	746	92.7	155	91.7			
<b>Parity</b>						0.00	0.23 - 0.58	0.36
primiparous	463	366	45.4	97	57.4			
Multiparous	512	440	54.6	72	42.6			
<b>Past history of Caesarean</b>						0.00	0.02 - 0.05	0.029
Yes	89	20	2.5	69	40.8			
No	886	786	97.5	100	59.2			
<b>Antepartum haemorrhage</b>						0.16	0.14 - 1.37	0.44
Yes	20	16	2.0	4	2.4			
No	955	790	98.0	165	97.6			
<b>Use of the SCC</b>						0.04	1.02 - 2.74	1.67
Yes	827	698	86.6	129	76.3			
No	148	108	13.4	40	23.7			

SCC: WHO Safe Childbirth Checklist

## Figures

## Monthly Distribution of Maternal Complications



Maternal complications: Severe pre-eclampsia/eclampsia, perineal tears, acute foetal distress and post-partum haemorrhage

**Figure 1**

Monthly distribution of maternal complications

## Association between adverse neonatal outcomes and checklist use

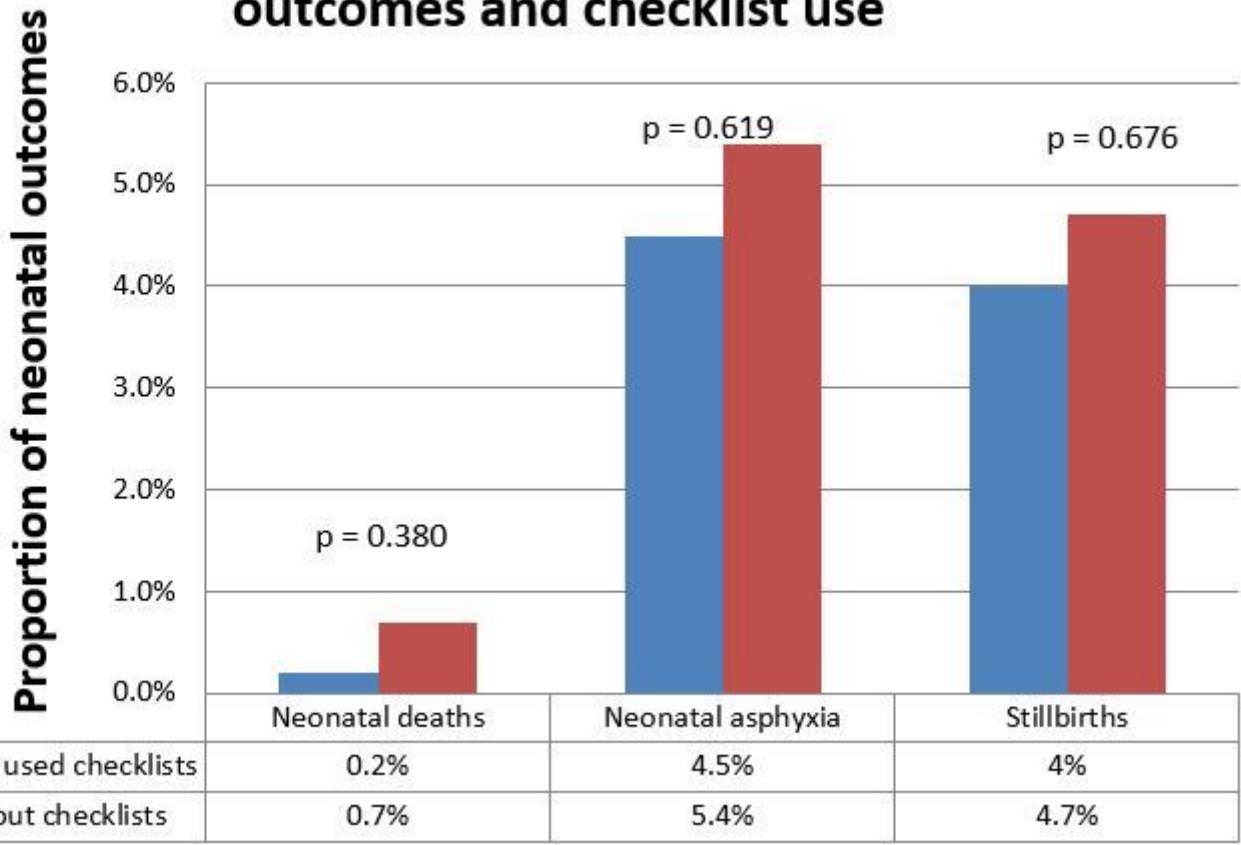


Figure 2

Association between adverse neonatal outcomes and checklist use

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryFig2Evolutionofcompl.pdf](#)
- [SupplementaryFigure1Evolutionofthecompl.pdf](#)
- [formula.docx](#)
- [FlowchartofSCCImplementationinYaounde.docx](#)
- [RECORDChecklistSCCmanuscript.docx](#)