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Impact of the WHO Safe Childbirth Checklist on Maternity Outcomes: A Systematic Review with Meta-Analysis

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Abstract

Background: *Maternal and neonatal mortality remain major public health concerns, particularly in low-resource settings where maternity care quality is inconsistent. The World Health Organization Safe Childbirth Checklist (WHO SCC) was developed to improve adherence to essential childbirth practices and reduce preventable maternal and neonatal morbidity and mortality. However, evidence of its effectiveness remains mixed. This systematic review and meta-analysis evaluated the impact of the WHO SCC on the timely management of eclampsia/preeclampsia, maternal mortality, and stillbirth rates.*

Materials and Methods: *A systematic search was conducted in PubMed, EBSCO, and Scopus for English-language studies published between 2004 and 2024. Eligible studies included randomized controlled trials, pre-post studies, and quasi-experimental designs. Data were extracted using a standardized form. Pooled estimates were calculated using a random-effects model and the Mantel-Haenszel method. Only studies reporting appropriate ethical approval or clearance were included.*

Results: *Of 1,147 identified records, 11 studies involving 174,994 births met the inclusion criteria. WHO SCC implementation significantly improved the timely management of eclampsia/preeclampsia (RR: 3.09, 95% CI: 1.23–7.74, p = 0.020). However, no statistically significant effects were observed on maternal mortality (RR: 1.13, 95% CI: 0.83–1.54, p = 0.42) or stillbirth rates (RR: 1.18, 95% CI: 0.77–1.83, p = 0.45).*

Conclusion: *The WHO SCC significantly improves the timely management of eclampsia/preeclampsia but does not significantly reduce maternal mortality or stillbirth rates. Its integration into routine maternity care should therefore be accompanied by complementary interventions addressing broader determinants of maternal and neonatal survival. Further high-quality research is needed to identify strategies that can maximize the checklist's effectiveness and improve overall maternity outcomes.*

Keywords*: Maternal health, Meta-analysis, Neonatal mortality, Quality improvement, Stillbirth, WHO Safe Childbirth Checklist.*

Introduction

Maternity outcomes are a challenge, especially in low- and middle-income countries (He et al., 2024). Maternity outcomes encompass a range of health-related results for mothers and newborns during pregnancy, childbirth, and the postpartum period. Harrington et al (2023) noted that the components include maternal health outcomes, which refer to maternal death, morbidity (preeclampsia and postpartum haemorrhage). Neonatal health outcomes are also critical, covering aspects such as stillbirths, newborn death, birth asphyxia, low birth weight, and preterm births. An estimated 2.6 million stillbirths and 295 thousand maternal deaths occur worldwide (Abate et al., 2024; Baykemagn et al., 2024). According to De-Meneses et al. (2022), these deaths are

largely preventable with the implementation of simple, evidence-based practices during childbirth and the immediate postpartum period. Despite maternity care advancements, some facilities record sub-optimal outcomes due to their struggle with gaps in care provision. The World Health Organization (WHO) developed the Safe Childbirth Checklist (SCC) as a tool to bridge the gap and improve the maternity care quality (Ghosh et al., 2022).

The WHO SCC is a 29-item checklist designed to assist midwives in delivering essential interventions at four critical points in the childbirth process (Kamrani et al., 2024). The critical points are on admission, just before pushing or caesarean section, within one hour after birth, and before discharge. Singh et al. (2023) noted that the checklist covers a range of evidence-based practices that target the leading causes of maternal and neonatal mortality namely maternal haemorrhage, infection, gestational hypertensive, and birth asphyxia. By ensuring that key tasks are completed at each point, the SCC aims to reduce preventable deaths and complications.

Several studies such as Ghosh et al. (2022) and Walker et al. (2020) have evaluated the impact of the WHO SCC on maternity outcomes but a scarcity of the synthesized evidence persists. Although the evidence on the implementation of the WHO SCC is growing, the findings are mixed. Given that variations in implementation strategies, maternity contexts, and provider training may contribute to differences in the effectiveness of the checklist, a systematic review with meta-analysis of the available literature is essential to provide a comprehensive understanding of the impact of the checklist on maternity outcomes.

The importance of improving the quality of maternity care cannot be overemphasised. The Sustainable Development Goal 3 aims to reduce the global maternal mortality ratio to less than 70 per 100,000 live births and end preventable deaths of newborns by 2030 (Bartniczak et al., 2024). Achieving these targets requires the widespread adoption of interventions that can improve care. The WHO SCC offers a practical and scalable solution to the challenge, but its effectiveness in various settings needs to be better understood.

This systematic review and meta-analysis aim to evaluate the impact of the WHO Safe Childbirth Checklist on maternity outcomes (prompt management of eclampsia/pre-eclampsia, maternal mortality, and stillbirth rates) across different contexts. Specifically, this review seeks to address the following research question articulated using the Population, Intervention, Comparison, Outcome (PICO) framework (Hosseini et al., 2024): "Among births, what is the impact of utilising the WHO SCC compared to usual care on prompt management of eclampsia/pre-eclampsia, maternal mortality, and stillbirth rates?" This review will contribute to the literature by identifying gaps in the current body of evidence and suggesting areas for future research.

Methods

Search strategy

The search strategy was systematically designed to capture relevant articles. Search terms related to the title of the key variables of the review were first identified. They were "WHO Safe Childbirth Checklist", "pregnancy", "eclampsia", "postpartum haemorrhage", "bleeding", "mortality", "birth" and "outcomes." Furthermore, “AND” and “OR” Boolean operators were used to link the terms. The resulting search string was: "(WHO Safe Childbirth Checklist) AND (pregnancy OR eclampsia OR postpartum haemorrhage OR bleed OR mortality OR birth OR outcomes)." This approach was taken to ensure that the search captured articles that mentioned both the checklist and its outcomes. The search was conducted across three electronic research databases: PubMed, EBSCO Essentials, and ScienceDirect. Additionally, a hand search was performed to ensure that no relevant articles were overlooked. Additionally, the search was limited to English-language articles published between 2004 and 2024. The 20 years were deliberately chosen, given that the WHO Safe Childbirth Checklist was introduced in the early 2000s. The inclusion criteria were limited to pre-post studies, randomised controlled trials (RCTs), and quasi-experiments, as they provide the most reliable evidence for impact studies. Preprints, systematic reviews, editorials, and descriptive and qualitative analyses were excluded. The authors independently conducted the literature search, and discussions for consensus were held throughout the study identification, screening, eligibility check, and inclusion stages of the study selection process.

Quality Assessment

Quality assessment was done to evaluate the rigour and credibility of the included studies. The Joanna Briggs Institute (JBI) Critical Appraisal Tool for trials and quasi-experiments was applied. The tool assessed allocation concealment, random sequence generation, blinding of

participants, blinding of outcome assessment, completeness of outcome data reporting, and selective reporting. Each study was evaluated for allocation concealment and random sequence generation to determine whether selection bias was present. Additionally, the blinding of participants and outcome assessors was also evaluated. This was done to ensure that any observed differences in outcomes are attributed solely to the intervention and not to cofounders. The review also evaluated the completeness of outcome data to check for attrition bias. Studies with significant losses to follow-up or incomplete outcome data were flagged for potential bias, as this could skew the results. Furthermore, selective reporting was assessed to determine if the studies reported all pre-specified outcomes. This was crucial for ensuring transparency and avoiding reporting bias, where only positive or significant results are published. Only articles with an appraisal score ≥ 50% were included in the review and meta-analysis. This was done to ensure that the conclusions of the systematic review were based on medium to high-quality evidence. The authors independently conducted a quality assessment of the studies, and discrepancies were resolved by discussion and consensus.

Risk of Publication Bias Assessment

A funnel plot was used in meta-analyses to detect bias by plotting study effect sizes against a measure of the standard error or sample size. To generate the funnel plot, the effect sizes (odds ratios) from each of the included studies were plotted on the horizontal axis, while the corresponding standard errors were plotted on the vertical axis. Studies with smaller standard errors, often reflecting larger sample sizes or more precise estimates, appeared at the top of the plot, while studies with larger standard errors (smaller studies) were scattered toward the bottom. The funnel plot was supported by Egger's statistical test at a 5% threshold.

Data Extraction

A data extraction form was created before the review process began. The form included fields for capturing study characteristics, such as author, year, country, and study design, as well as sample size details and outcomes (management of preeclampsia, maternal death, and stillbirth rates). To minimise bias and ensure reliability, the authors independently extracted data from each study. The extracted data was compared, and discrepancies were resolved through discussion and consensus.

Data Analysis

Descriptive statistics were employed to summarise the characteristics of the included studies. Meta-analyses were performed using the random effects model and the Mantel-Haenszel method to compare risk ratios (RR) from individual studies, accounting for variations in study populations and interventions. The *METAANALYSIS Statistical software* (Developed and supported by Elixir Hungary) was employed to perform the analysis, and heterogeneity among studies was assessed using the I^2 statistic. An I^2 value of 25%, 50%, and 75% was interpreted as low, moderate, and high heterogeneity, respectively.

Ethical Approval

Ethical approval for this review was waived because it utilised secondary data from prior published studies. Additionally, this review was conducted as part of an academic exercise; therefore, it was not registered in the PROSPERO database. PROSPERO is the International Prospective Register of Systematic Reviews, where researchers can register their systematic reviews. It aims to reduce duplication and promote transparency in review processes. However, academic exercises and reviews not intended for clinical or policy guidelines are often exempt from mandatory registration.

Results

Study selection process

The search was conducted across three electronic research databases: PubMed, EBSCO Essentials, and ScienceDirect. Additionally, a hand search was performed to ensure that no relevant articles were overlooked. The search identified a total of 1,147 articles, with 73 from PubMed, 108 from EBSCO Essentials, 957 from ScienceDirect, and 9 from the hand search. After the initial search, one duplicate study was identified and removed, leaving 1,146 unique articles for further evaluation. The next stage involved a rigorous title screening process to eliminate articles that were clearly irrelevant. During this stage, 1,125 titles were deemed unrelated to the topic and were removed, leaving 21 articles for abstract screening. The abstracts of these remaining articles were then reviewed to ensure that the research addressed both the WHO SCC and relevant maternity outcomes. Following the abstract screening, 3 articles were excluded, resulting in 18 articles progressing to the full-text review phase. During the full-text review, the remaining 18 studies were carefully assessed for eligibility. The articles were assessed against the inclusion and exclusion criteria to ensure that only studies that answered the research question and reported the outcomes of interest progressed to the next stage of inclusion. During eligibility checks, 7 articles were excluded. The remaining 11 eligible studies were included in the review and meta-analysis. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram in Figure 1 illustrates the study selection process.

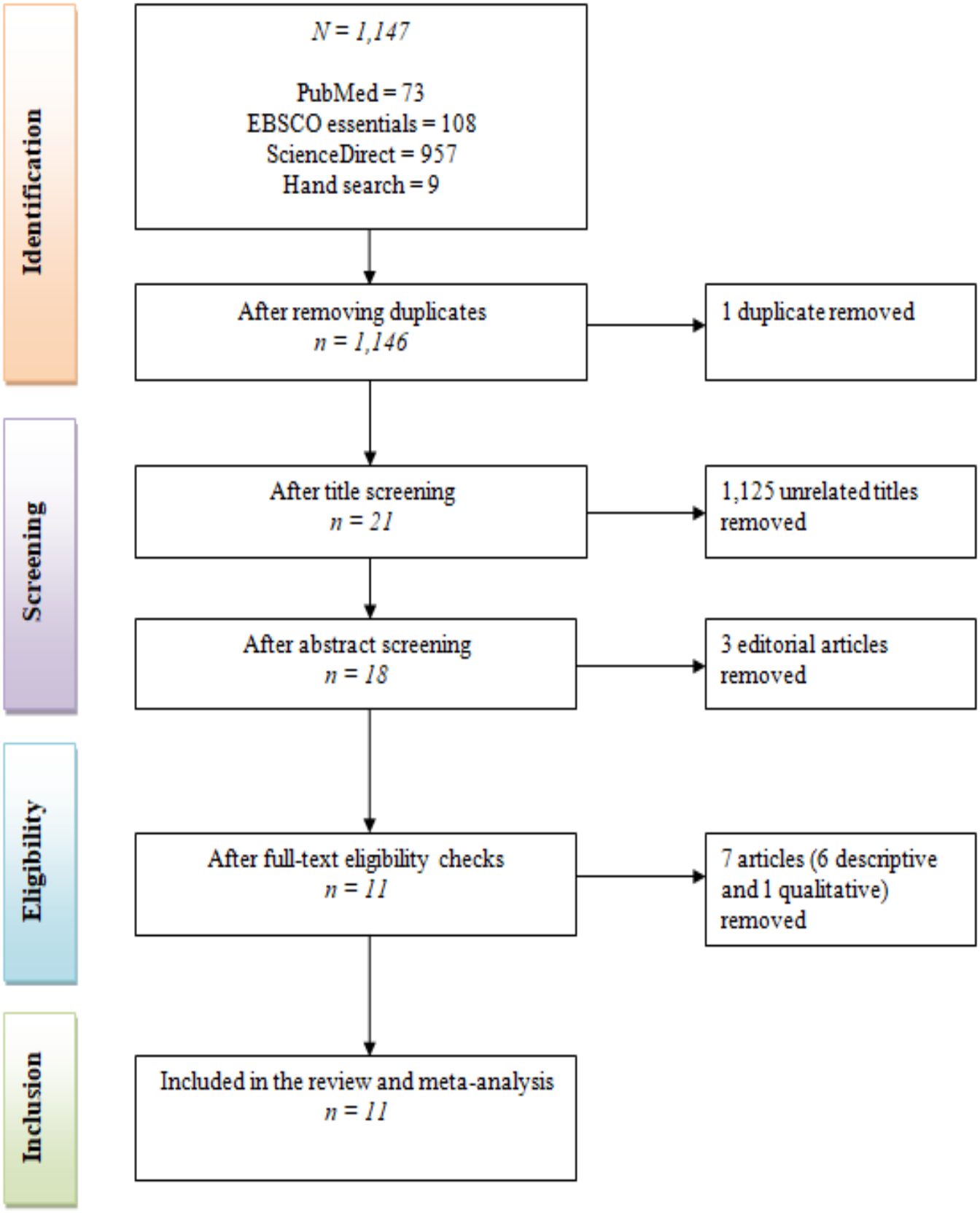

***Figure 1**: PRISMA flow diagram of the study selection process*

Characteristics of the included studies

The included studies were conducted between 2012 and 2022, involving 174,994 births (95,989 in the WHO SCC and 79,005 in the control groups). The studies took place in India (n = 5), Bangladesh (n = 1), Italy (n = 1), Rwanda (n = 1), Namibia (n = 1), and Kenya and Uganda (n = 2). They consisted of cluster randomised trials (n = 5) and pre-post studies (n = 6). Table 1 details the characteristics of the included studies.

***Table 1**: Characteristics of the included studies*

Author (Year)	Country	Design	Total sample size	Sample Size in the intervention group	Sample Size in the control group
Ghosh et al. (2022)	Kenya and Uganda	Cluster-randomised controlled trial (Cluster RCT)	29442	14509	14933
Walker et al. (2020)	Kenya and Uganda	Cluster RCT	2938	1447	1491
Varghese et al. (2019)	India	Cluster RCT	134020	75610	58410
Albolino et al. (2018)	Italy	Pre-post	239	98	141
Varaganti et al. (2018)	India	Pre-post	1255	620	635
Tuyishime et al. (2018)	Rwanda	Pre-post	201	95	106
Kabongo et al. (2017)	Namibia	Pre-post	2927	1526	1401
Semrau et al. (2017)	India	Cluster RCT	2138	1048	1090
Nababan et al. (2017)	Bangladesh	Pre-post	310	157	153
Kumar et al. (2016)	India	Cluster RCT	480	240	240
Spector et al. (2012)	India	Pre-post	1044	639	405
Total			174994	95989	79005

Quality Assessment Results

All the included studies demonstrated sufficient methodological rigour and credibility by achieving an appraisal score of at least 50%. Eight of the studies (72.7%) provided medium-quality evidence, while three (27.3%) offered high-quality evidence. Figure 2 shows the results of the quality assessment.

Assessment criteria	Ghosh et al. (2022)	Walker et al. (2020)	Varghese et al. (2019)	Varaganti et al. (2018)	Tuyishime et al. (2018)	Albolino et al. (2018)	Kabongo et al. (2017)	Nababan et al. (2017)	Semrau et al. (2017)	Kumar et al. (2016)	Spector et al. (2012)
Allocation concealment											
Random sequence generation											
Blinding of participants											
Blinding of outcome assessment											
Completeness of outcome reporting											
Selective reporting											
Score in percent (%)	83.3	66.7	66.7	50.0	50.0	66.7	66.7	50.0	83.3	100	50.0

Study score ≥ 50% adequate quality; green = present attribute, red = absent attribute.

Figure 2: Quality assessment results

Risk of publication bias results

The funnel plot used to assess publication bias did not suggest any potential bias. The Egger's test also did not support the presence of funnel plot asymmetry (intercept: 4.07, 95% CI: -3.5 to 11.65, t: 1.053, p-value: 0.32). Figure 3 shows the funnel plot.

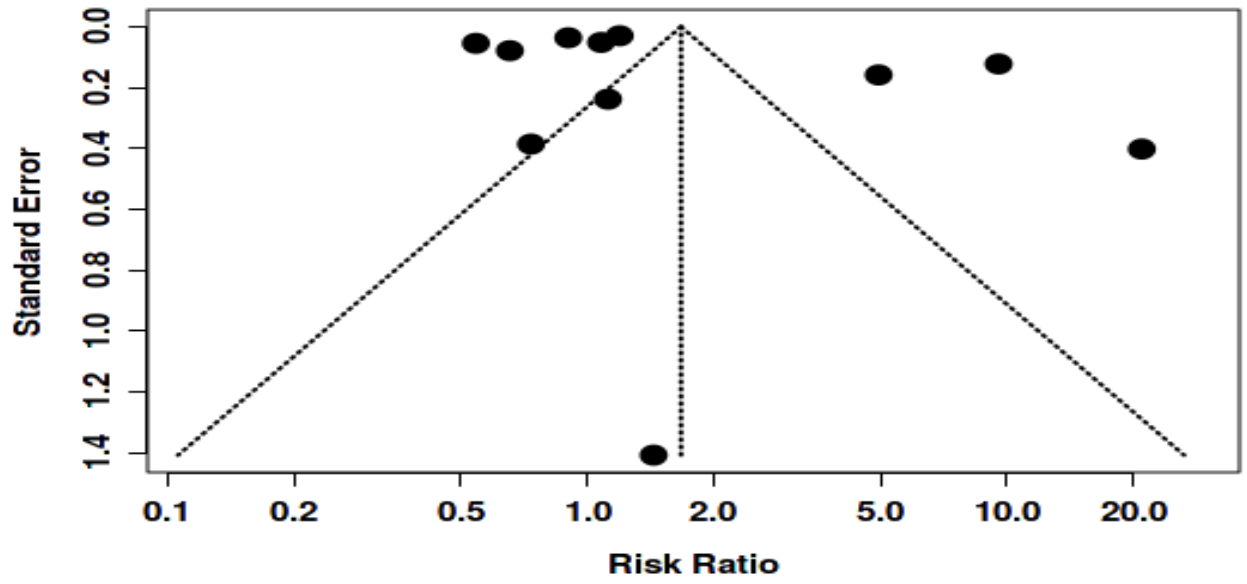

***Figure 3**: Funnel plot for assessment of publication bias*

Synthesis of evidence for eclampsia/preeclampsia

For eclampsia/preeclampsia, evidence from seven studies involving 2,897 births in the WHO SCC group and 2,770 in the control was synthesised. The likelihood of providing prompt care for eclampsia/preeclampsia was noted to be 3.09 times higher in the WHO SCC group compared to the control (RR: 3.09, 95% CI: 1.23-7.74, p = 0.020), despite significant heterogeneity (99%). Figure 4 shows a forest plot illustrating the impact of the WHO SCC implementation on prompt management of eclampsia/preeclampsia.

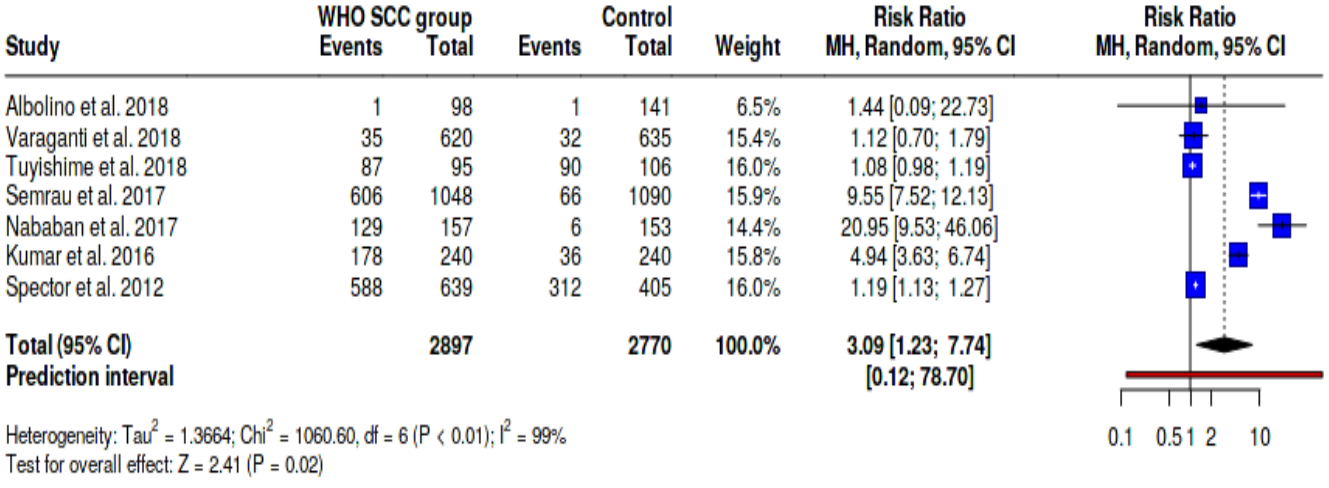

***Figure 4**: Forest plot showing the impact of WHO SCC implementation on prompt management of preeclampsia/eclampsia.*

Synthesis of evidence for maternal death

For maternal death, evidence from three studies involving 2,307 births in the WHO Safe Childbirth Checklist group and 2,130 in the control was combined. The meta-analysis showed no significant difference between the groups (RR: 1.13, 95% CI: 0.83-1.54, p = 0.42). Figure 5 displays a forest plot illustrating the impact of WHO SCC implementation on maternal death.

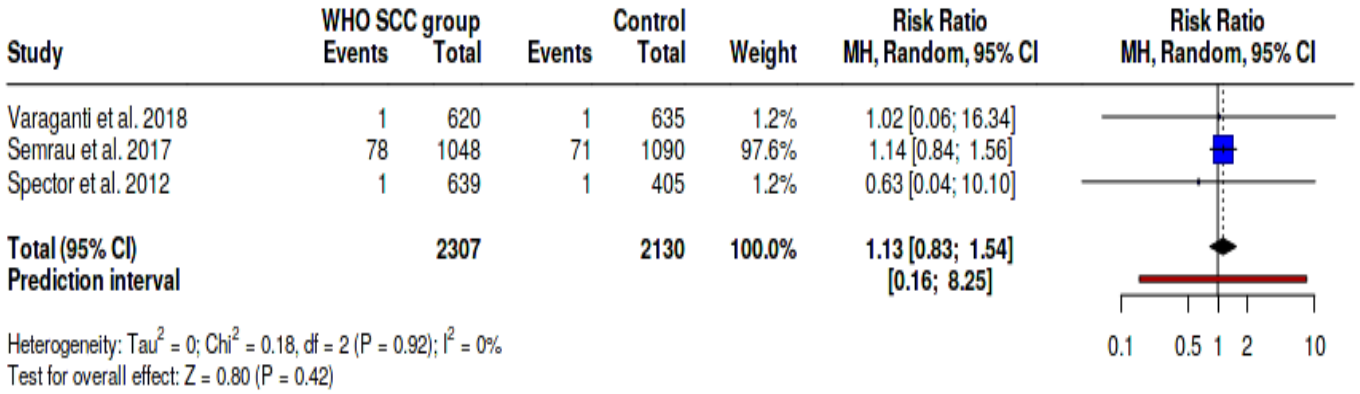

***Figure 5**: Forest plot showing the impact of WHO SCC implementation on maternal death*

Synthesis of evidence for stillbirth

For stillbirth, evidence from seven studies was synthesised, encompassing a total of 95,399 births in the WHO Safe Childbirth Checklist group and 78,365 in the control. The analysis showed no significant difference between the groups (RR: 1.18, 95% CI: 0.77-1.83, p = 0.45). Figure 6 displays a forest plot illustrating the impact of WHO SCC implementation on stillbirth.

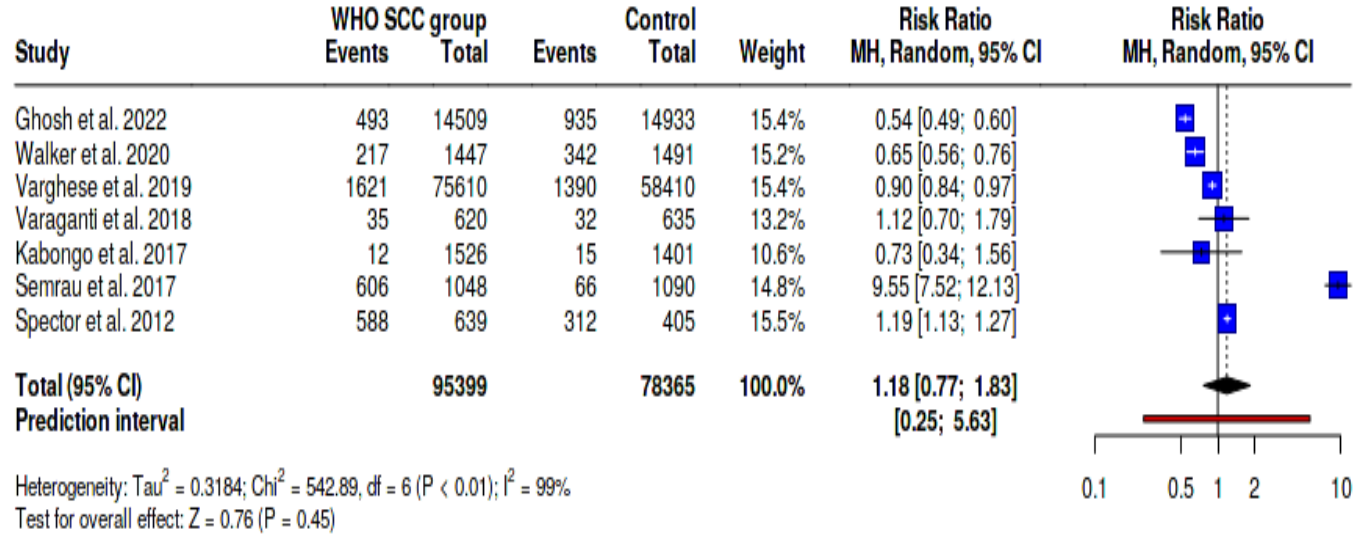

***Figure 6**: Forest plot showing the impact of WHO SCC implementation on stillbirth.*

Discussion

This meta-analysis review found that the likelihood of providing prompt care for eclampsia and preeclampsia to pregnant women increased threefold when the WHO SCC was implemented. Eclampsia and preeclampsia are serious pregnancy-related conditions that can lead to severe complications for both mothers and their infants if not addressed quickly. This finding indicates a clear improvement in the timeliness of managing eclampsia and preeclampsia, which may result in fewer complications following the adoption of the WHO SCC. The threefold increase in the chances of offering prompt care suggests that the checklist acts as an effective tool in improving the quality of maternal healthcare services. This may be because the checklist guides midwives through standardised protocols for assessing and treating preeclampsia and eclampsia effectively, thereby reducing variability in midwifery practice. This aligns with Dohbit et al. (2021), who reported that the utilisation of the WHO SCC was linked to a significant enhancement in management and a decrease in the onset of eclampsia. It also contrasts with Molina et al. (2021), who observed that the use of the WHO SCC helps prevent the maternal transition from preeclampsia to eclampsia by promoting timely management of the condition.

This meta-analysis showed that the implementation of the WHO SCC did not lead to any significant change in maternal death rates. This suggests that although the SCC was designed to improve the quality of care during childbirth through standardised practices, its influence on maternal mortality might be affected by various factors beyond checklist adherence. One possible explanation is that maternal death rates are determined by a complex interplay of factors, including the underlying health status

of pregnant women, the availability of emergency obstetric care, and healthcare infrastructure. In areas with high maternal mortality, systemic issues such as limited access to comprehensive healthcare services, shortages of skilled health professionals, and delays in receiving emergency care can overshadow the benefits of implementing specific interventions like the WHO SCC. As a result, even with better adherence to essential maternity practices, other barriers may still prevent significant reductions in maternal mortality. This finding aligns with De-Meneses et al. (2022), who reported no notable change in maternal deaths following the implementation of the WHO SCC in two hospitals in Brazil. It also concurs with Kaplan et al. (2021), who found that the implementation of the WHO SCC did not produce a significant change in maternal mortality across 32 hospitals in Indonesia.

This study showed that there was no significant change in the rate of stillbirth after the implementation of the WHO SCC. This suggests that the checklist might not address all factors affecting stillbirths. The reason could be that stillbirth rates are influenced by various underlying conditions, such as maternal health, foetal development, and the quality of prenatal care. If the healthcare system fails to properly manage pre-existing maternal conditions or if there are gaps in antenatal care, simply implementing the SCC may not be enough to prevent stillbirths. This finding contrasts with Kaplan et al. (2021), who reported a significant reduction in stillbirths in a multi-facility study in Indonesia following the implementation of the WHO SCC. The difference may be due to the level of training that care providers have in using the checklist. Nonetheless, this result supports Kuhnt et al. (2023), who found no significant difference in the occurrence of stillbirths after implementing the WHO SCC.

Limitation

This review has two significant limitations that should be considered when interpreting the findings. First, the heterogeneity of evidence across the included studies presents a challenge. The studies varied considerably in their research methods, which makes direct comparisons difficult and limits the wider applicability of the findings. The high level of variability may have influenced the strength of the pooled results, decreasing the confidence in the conclusions drawn from the meta-analysis. Second, the study protocol was not registered in PROSPERO to avoid duplicate of research.

Conclusion

The implication for practice is that the WHO SCC was effective in managing eclampsia/preeclampsia but had no impact on maternal death or stillbirth rates, respectively. In conclusion, the evidence regarding the impact of implementing the WHO SCC on managing eclampsia/preeclampsia demonstrates some benefit, albeit limited, heterogeneous, and of medium quality. Midwives should consider the benefits and risks of incorporating the WHO SCC into their routine practice.

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