Effectiveness of mhealth applications for maternal healthcare delivery: a systematic review of systematic reviews

Edward Kwabena Ameyaw, Padmore Adusei Amoah, Obidimma Ezezika

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Table of Contents

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Abstract

Background: Globally, the use of mobile health (mhealth) applications/interventions has ascended. Robust synthesis of existing systematic reviews on mhealth applications may offer useful insights to guide maternal health clinicians and policy makers.

Objective: This systematic review assessed the effectiveness /impact of mhealth applications on maternal healthcare delivery globally.

Methods: We systematically searched Scopus, Web of Science (Core Collection), Medline/PubMed, Cinahl and Cochrane Database of Systematic Reviews, using a pre-developed search strategy. Three reviewers independently assessed the quality of the reviews. We presented a narrative synthesis of the findings, highlighting the specific mhealth applications, where they are implemented and their effectiveness/outcomes towards various maternal conditions.

Results: A total of 2,527 documents were retrieved, out of which 16 were included in the review. Most mhealth applications were implemented by sending Short Message Service (SMS) with mobile phones. Mhealth interventions were most effective in five areas; maternal anxiety and depression, diabetes in pregnancy, gestational weight management, maternal healthcare utilization, and behavioural modification towards smoking cessation, and controlling substance use in pregnancy. We noted that mhealth interventions for maternal healthcare are skewed toward high-income countries (n=13, 81.3%).

Conclusions: The effectiveness of mhealth applications for maternity healthcare is drawing attention in research and practice recently. Considering that worse maternal conditions typically occur in low and middle-income countries (LMICs) whilst most mhealth interventions abound in high-income countries, more mhealth interventions and research efforts in LMICs will be beneficial for positive maternal health outcomes.

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Background: Globally, the use of mobile health (mhealth) applications/interventions has ascended. Robust synthesis of existing systematic reviews on mhealth applications may offer useful insights to guide maternal health clinicians and policy makers.

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Conclusions: The effectiveness of mhealth applications for maternity healthcare has drawn attention in research and practice recently. The study showed that research on mhealth applications and their usage dominate in High Income Countries (HICs). As a result, it is imperative that Low and Middle-Income Countries (LMICs) intensify their commitment towards these applications for maternal healthcare, in terms of usage and research.

Key words: mhealth, maternal health, telemedicine, technology, healthcare, newborn

[PROSPERO Registration**:** CRD42022365179]

Introduction

The use of mobile health (mhealth) applications has ascended following the proliferation of wearable devices, live audio-visual communication systems, short message services, and mobile phone app inter alia [1]. mHealth is defined by the World Health Organization (WHO) as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices,” [2]. Mhealth has been identified as an essential public health tool for efficient healthcare delivery, especially in situations where face to face model of care cannot be readily provided [3, 4, 5]. The grievous repercussions of the COVID-19 outbreak on the ailing health systems of low-and-middle countries (LMICs) [6,7], and some high-income countries [6-8], partly suffice the need to optimise the use of mhealth applications/interventions. A critical aspect of healthcare greatly impacted by COVID-19 was maternal healthcare delivery [9-11].

Nonetheless, mhealth could help subside some of the challenges confronting maternal healthcare delivery. Recent evidences have reverberated that the continuum of maternity healthcare

has received its fair share of mhealth interventions globally, with increasing use and resultant positive outcomes [12-16]. So far, existing mhealth applications for maternal and newborn healthcare include the Mobile Technology for Community Health (MOTECH), behavioural change tools and momConnect [17,18]. There are also mhealth applications for general healthcare delivery such as the Hospital Authority (HA) mobile application in Hong Kong [19]. Mhealth aids to offset the human resource gap through diverse technologies designed to support treatment adherence, clinical diagnosis and enhancement [2]. In this study, the terms “mhealth applications” and “mhealth interventions” are alternated. Also, “newborn healthcare or care” is subsumed under “maternal healthcare or care.”

It is anticipated that there will be about 5.6 billion mobile connections by 2025, with most of these being smartphones [20]. A considerable proportion of these mobile connections are earmarked to occur in LMICs, where worse maternal health conditions occur, as mobile connections are more readily accessible in some instances than clean water and electricity [21, 22]. This could be suggestive that LMICs have an increased propensity of maximizing the benefits of mhealth to truncate the alarming maternal and newborn morbidity and mortality, which at present is almost 95% of all global maternal deaths [23]. The utility of mhealth interventions can, therefore, be maximized to curtail the gloomy maternal health situation in some parts of the world.

There is a plethora of systematic reviews that have synthesized the relevance of mhealth interventions used in maternal healthcare [24-29]. For instance, Ambia & Mandela [26] realized that mobile phone-based interventions lead to a statistically significant rise in the uptake of early infant diagnosis of HIV whilst Bossman et al [29] highlighted the importance of Short Message Service (SMS) and voice message reminders towards behavior change among pregnant women by enhancing ANC and PNC attendance, skill birth attendance and vaccination uptake [29].

Meanwhile, these reviews have not been synthesized on a global scale to draw consistencies and inconsistencies in the evidence to guide maternal healthcare models and interventions, to maximise gains. A recent systematic review of systematic reviews rather focused on the effectiveness of mhealth on health issues such as diabetes, heart failure symptoms, hypertension and other health conditions [30]. The prevailing evidence seem to converge that mhealth interventions are impactful and beneficial for maternal healthcare in both HICs and LMICs [31-34].

So far, no review has synthesized the existing systematic literature reviews to provide aggregate evidence to guide maternal healthcare practitioners, clinicians and policymakers. Robust synthesis of existing systematic reviews on mhealth interventions may be useful in guiding clinicians and policymakers with relevant evidence and further pinpointing aspects requiring further evidence to minimize potential risks associated with the existing maternal healthcare models. Hence, this systematic review of systematic reviews explores the effectiveness or impact of mhealth applications/interventions on maternal health globally.

Methods

This paper is a systematic review of systematic reviews. The review addressed the following research questions:

i. What mobile health (mhealth) applications are used for maternal healthcare delivery globally?
ii. What is the effectiveness of mhealth applications for maternal healthcare?
iii. What are the barriers and facilitators in the use of mhealth applications for maternal healthcare delivery?

We conducted this study in line with the updated guidelines for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement and the methodological considerations when including existing systematic reviews [35].

Protocol and registration

We developed a protocol to guide the conduct of the study. The protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO).

Search strategy and information sources

Our search focused on published systematic reviews that focused on specific mobile health (mhealth) application(s) used in delivering any maternity healthcare (i. e. prenatal, birth or postnatal) and/or newborn care, subsumed under maternal care. A newborn refers to a neonate, thus a child within 28 days of birth, as conceptualised by the World Health Organisation [36]. A systematic search for systematic reviews was executed in five databases: Scopus, Web of Science (Core Collection), Medline/PubMed, Cinahl and Cochrane Database of Systematic Reviews, using a pre-developed search strategy (see supplementary file 1 [S1]). The aforementioned databases were used due to their dominance in biomedical reviews. Searches were done on 20th October 2022. Besides, relevant references of retrieved articles were searched manually to retrieve other relevant articles.

Eligibility criteria

This study included systematic reviews involving primary studies of all study designs (e.g. randomised controlled trials, pre and post-test designs, non-randomised trials, and observational studies). We included reviews focusing on the effectiveness of all available mhealth applications used for maternal and newborn healthcare delivery globally; e.g. Service Delivery Application [SDA]. An article was considered a systematic review if it had these five characteristics: (i) clearly defined aim/research question, (ii) eligibility criteria for included studies, (iii) appropriate search strategy, (iv) appraisal/quality assessment and (v) analysis/synthesis [37]. Besides, PICO was applied in determining the eligibility. Thus, the population of interest (P) were pregnant women, women in labour/at birth, postnatal women and neonates. Intervention of interest was mhealth as defined in the introduction section (I). Where reported, the comparison (C) were the women or neonates who were not treated with the assistance of any mhealth application and the outcomes (O) were the reported results that emerged after using mhealth application for any maternity/neonatal condition. Only studies in the English Language were considered without year limits. Due to the language competency of authors, only papers published in the English Language were considered as English is the working language of the authors. We also excluded papers focusing on non-maternal health issues or reviews on interventions other than mhealth.

Study selection

Reviews were imported to EndNote, and duplicates were removed, after which title and abstract screening were performed by two authors (EKA and PAA) using the inclusion and exclusion criteria. This was done whilst blinding each other's decision and all discrepancies were discussed for resolution.Initial screening was on the titles and abstracts retrieved from the search. All suitable papers were retrieved for full-text evaluation. Afterward, we conducted a full-text assessment to determine eligibility for inclusion. The journal, authorship or years were not blinded in the process. Reference lists of included papers were searched for additional suitable papers, and we had no reason to contact authors as our results were exhaustive.

Quality assessment, data extraction and synthesis

We extracted data following a standardized extraction form (EKA), after which data was reviewed by a senior researcher (PAA). Specifically, we extracted the following data: author information and year of publication, setting/context, objective, time range of included articles, databases searched, number of included articles, design of included articles, and whether the meta-analysis was conducted or not (see Table 1). In addition, we extracted data on the description of included mhealth applications, target population, effectiveness of the mhealth applications and other relevant outcomes of interest as

shown in Table 2. All discrepancies were discussed for resolution. By way of definition: (i) mhealth applications referred to the specific mhealth technique and/or tool(s) that were used; (ii) target population could either be pregnant women, women in labour/childbirth, postnatal women and neonates; (iii) effectiveness refers to the outcomes reported after using the reported mhealth technique or intervention. We presented a narrative synthesis of the findings by highlighting the specific mhealth applications, where they are implemented and their effectiveness/outcomes towards various maternal conditions, such as the impact on maternal healthcare utilisation. Each of the authors (EKA, PAA, OE) independently assessed the quality of the reviews using the critical appraisal instrument for systematic reviews and research synthesis by the Joanna Briggs Institute (JBI) [38], see S2. This is a 12-point critical appraisal tool for assessing the quality of a systematic review to determine if specific papers could be included or otherwise. Reporting was guided by the Preferred Reporting Items for Overviews of Reviews (PRIOR).

INSERT FIGURE 1 HERE

Results

Characteristics of reviews

Our rigorous systematic search retrieved 2,516 articles, with 168 duplicates thereby leaving 2,348 (see Figure 1). Additional eleven (11) articles were identified through cross-referencing and free-hand search. As a result, we screened the titles and abstracts of 2,359 articles and 58 were eligible for full-text screening. Of these, 19 were deemed eligible for inclusion. However, three (3) were excluded due to limited data, hence 16 reviews (of 198 studies) were included in the final review (see Figure 1), as no study was excluded based on quality assessment outcome. Of the 198 studies, twenty-nine (29) were included in more than one review (14.6%) and they were counted once. These reviews were published between 1996 and 2020 (see Table 1) and eleven meta-analysed [27, 34, 39-47]. Eight (8) included articles on Randomised Controlled Trial (RCT) designs only [27, 39, 41, 42, 45-48], seven (7) had studies of RCTs and other designs such as Controlled Clinical Trials (CCTs), Cohort Studies, Non-randomised Controlled Trials, Quasi RCTs and pilot RCTs [34, 40, 43, 44, 49-51] whilst one review had no RCT design (51).

INSERT TABLE 1 HERE

Most of the reviews were conducted in high-income countries (n=13, 81.3%), predominantly from the United States (n=11) [27, 34, 40- 43, 45-51], United Kingdom (n=7) [39, 40, 42, 43, 45, 49, 50], Australia (n=6) [27, 39, 43, 45, 48, 50], the Netherlands (n=4) [27, 42, 43, 46] and Norway (n=2) [45, 49]. Only three of the reviews were conducted in Low- and Middle-Income Countries (such as Tanzania, Thailand, Kenya, South Africa, Ethiopia, Nigeria, India) [44, 47, 52]. Eleven of the reviews (68.8%) focused on pregnant women alone [27, 34, 40, 41, 44-46, 48-51], two focused on both pregnant and postpartum women [39, 52], one was on both pregnant women and women intending to be pregnant [42] with another focusing on pregnant women and their partners [43] (see Table 2).

Characterising mhealth interventions and conditions supported

Different forms of mhealth interventions are implemented to augment the delivery of maternity healthcare globally. As illustrated in Table 2, the dominant channels or platforms by which mhealth interventions operate are mobile phones [40, 50, 52] usually in the form of Short Message Service (SMS) [41-43, 45,46,52]. Quite a significant proportion of the mhealth interventions are delivered through websites, thus 19% [27, 39, 41]. With respect to the specific maternal conditions, a significant proportion of the mhealth interventions were used to assist pregnant or postnatal women to overcome anxiety and depression [27, 39, 46, 51], assist with diabetes in pregnancy [41, 49] and

gestational weight [50].

Some were also used to help mitigate smoking cessation [40,43] and alcohol prevention/substance use in pregnancy [42, 45, 51] or to support ANC attendance and facility delivery [44, 47, 52]. One review focused on asthma in pregnancy [48]. For instance, in the review by Ming et al [41], they assessed modem transmission of blood glucose readings to a centralized health facility's, telephone system that interpreted blood glucose readings into audio tones by transmitting them to a database. In the case of Farzandipour et al [50], a greater proportion of their studies utilised telephone for prenatal weight monitoring, and provision of educational information. The review by Griffiths et al. [40] involved interventions delivered by video or DVD, computer (either PC or laptop), mobile phone or any portable handheld device [40].

Effectiveness of mhealth interventions

Considering that different mhealth interventions targeted different conditions in pregnancy and postnatal phases, varied effectiveness outcomes emerged. Meanwhile, all the studies revealed that indeed mhealth interventions are effective for maternal healthcare, though at varying magnitudes or levels of effectiveness. On depression, there was a uniform agreement among all studies on this condition, demonstrating the extent to which mhealth interventions help mitigate the condition (see Table 2). All the reviews on depression highlighted that mhealth interventions were helpful in subsiding depression in pregnancy and childbirth. In the review by Bayrampour et al [39], four studies (4/5) revealed positive impacts with one reporting that only 18% of the pregnant and postpartum women met the clinical criteria for depression relative to 79% in the control group, after a 12-week assessment. Similar findings emerged from the review by Lee and Cho [51]. Meanwhile, two reviews concluded that mhealth intervention had minimal effect on depression among pregnant women [27, 46].

INSERT TABLE 2 HERE

Mhealth interventions were reported to be effective in enhancing maternal healthcare utilization, as concluded by all the three studies focusing on maternal health utilisation. These manifested in antenatal care enhancement (ANC) [47], skilled birth attendance at birth leading to a decline in perinatal mortality [52] or both ANC and utilization of health facilities for childbirth [44]. Relatedly, the mhealth interventions focusing on alcohol/drinking and smoking showed effectiveness in diverse ways as indicated by all the four reviews focusing on these [40, 42, 45, 51]. Another area where significant impacts were recorded was obesity/overweight management, especially during pregnancy [43, 50] and diabetes managements in pregnancy and newborn outcomes [41, 49]. For instance, 66% of studies included in the review by Farzandipour et al. [50] revealed positive impacts on gestational weight gain. Some studies in the review by Eberle et al. [49] also reported marginally higher neonatal birth weight in the intervention group relative to the non-intervention group.

Three reviews reported that women were satisfied with the mhealth interventions, partly due to the positive user experience and the benefits [39,41,43]. One review highlighted dissatisfaction arising from text-messaging-based mhealth interventions due to fatigue caused by multiple messages [52]. The same review indicated that the use of mhealth interventions is compromised by privacy issues in instances where the mobile device (e. g. mobile phone) is co-shared among family members, when women do not own mobile phone or when there is illiteracy. Two reviews indicated that acceptability and use of mhealth is enhanced by providing information in varied local languages, using locally-based software and when the target is broadened to include women's significant others [51,52]. Meanwhile, low literacy rate, low accessibility to mobile phone among women in rural locations in LMICs and uncertainty regarding whether a text is received by the women, were some of the

identified barriers [52].

Discussion

Principal Findings and comparison with other studies

There is sufficient evidence that mhealth applications effectively mitigate diverse conditions that pregnant and postpartum women encounter. All the sixteen reviews converged that mhealth applications are useful for maternity health conditions. The specific areas where positive impacts manifested include increased utilization of maternal healthcare services (antenatal care, skilled birth and postnatal care), reduction in perinatal deaths, weight management in pregnancy, alcohol/drinking and smoking mitigation, as well as diabetes management. These conditions represent some of the leading causes of maternal and newborn morbidity and mortality [53].

The positive impact of mhealth interventions on maternity health resonates with prevailing evidence on the implications of mhealth on overall healthcare such as the review by Marcolino et al [30], which also revealed positive impacts after synthesising evidence from available systematic reviews. Additionally, consistent evidence has emerged from different parts of the world [54-56]. Continuous and effective utilisation of mhealth interventions in maternal healthcare can, therefore, constitute a cornerstone strategy for achieving the first and second targets of the third SDG, which enjoins all countries to attain less than 70 maternal deaths per 100,000 live births, and reduce neonatal mortality to not more than 12 deaths per 1,000 live births by 2030.

Most of the reviews reported evidence from high-income countries (HICs), which is suggestive of limited use of mhealth interventions for maternal healthcare services in LMICs. As we did not restrict our search to high-income countries, it is unlikely that evidence from LMICs are missed due to eligibility issues. Hence, we can infer that there is limited use and evidence about mhealth and maternal health services across LMICs. The United States, United Kingdom and Australia were the dominant locations where mhealth interventions are implemented and assessed. This situation is quite worrying as little evidence exists on the use and effectiveness of mhealth interventions in LMICs, where worse maternal and neonatal morbidities and mortalities occur. Estimates from the World Bank indicate that United States has a 19 maternal mortality ratio (MMR), whilst the United Kingdom and Australia have 6 MMR each, as of 2017 [57]. In that same year, African-based LMICs such as South Sudan, Chad, and Sierra Leone recorded 1,150, 1,140 and 1,120 MMR, correspondingly [57]. Hence, LMICs with alarming MMR need to create a more conducive environment for mhealth to thrive. These may include conscious and continuous strengthening of internet connection and electrification, especially in deprived settings.

Several factors could account for the divide in mhealth use for maternal healthcare between HICs and LMICs. Mobile devices and the internet are essential prerequisites for mhealth activities to thrive. Meanwhile, mobile phone ownership and internet access are quite difficult in most LMICs. For instance, one of the three reviews that focused on LMICs reported that some women share mobile phone with other family members and this was a setback towards maximization of the benefits of mhealth interventions [52]. A recent report on mobile phone survey in nine LMICs (Colombia, Ghana, India, Indonesia, Kenya, Mozambique, Nigeria, Rwanda, and South Africa) showed that 90 percent of people in LMICs do not have a decent internet connection [58]. The report also revealed that less than half of people in LMICs have access to basic internet. The extent to which limited internet access compromise the operation of mhealth in LMICs has been echoed [59-61]. Undeniably, mobile phone access and use in HICs far exceed LMICs [62] and seem to have no relevance without the internet. All these factors might have culminated in the preponderance of

mhealth interventions in HICs relative to LMICs.

Implications for Policy and Future Research Directions

Mhealth applications are yielding enormous positive outcomes for maternal wellbeing. However, the use of mhealth is skewed towards HICs, relative to LMICs where worse maternal conditions emerge from. This is, however, not surprising given the disparity in internet access between LMICs and HICs [63]. Another contributory factor may be the relatively low government expenditure on healthcare in LMICs, manifesting in limited resource allocation to healthcare. As of 2019, LMICs averagely spent 5.32% of GDP on healthcare as compared to 12.49% average healthcare expenditure in HICs [64-66]. Hence, an increment in the overall allocation to healthcare could make it feasible to invest in the most cost-effective mhealth facilities that can offer women the opportunity to benefit from some mhealth interventions, that are implementable given the context and acceptability. For instance, simple text message-based mhealth interventions are implementable with relatively minimal resources relative to more advanced options like audio and video conference interventions [67,68].

The use of mhealth interventions typically requires some basic literacy skills [33].

The overall literacy rate of females may therefore have to be enhanced for them to benefit from mhealth interventions. Countries intending to enhance the benefits of mhealth, especially those in LMICs that do not currently have universal compulsory education ought to give fair consideration to compulsory education/literacy skills training to ensure that all persons attain at least second-cycle education. This could better place females and their partners to utilize current and future technological innovations not only in healthcare, but also in all spheres of life. We are not oblivious to the reality that some LMICs already have universal compulsory education systems [69,70]; for those countries, fortification of such educational arrangements can enhance gains in the long run. More importantly, backing this with a formidable policy framework can guarantee sustainability and effective implementation of mhealth.

For instance, considering internet connectivity challenges in LMICs compared with HICs, text-messaging mhealth interventions may be suitable and relatively easily implementable with political commitment backed by a rigorous policy framework. Secondly, as mhealth interventions require some level of literacy, there is a need for a conscious effort to reduce illiteracy rates. By this, all persons especially women will be well positioned to use mhealth interventions and ascertain the associated benefits. Globally, governments might have to build partnerships/intensify partnerships with the private sector, particularly the telecommunication companies to widen access, as this can offer some leverage for maximising the utilisation and impact of mhealth interventions for the wellbeing of women and newborns.

All countries intending to implement mhealth or maximise the benefits of mhealth could implement national mhealth policies that prioritize maternal issues and also invest in internet connectivity, and electrification. These are the critical factors that can bridge the gap between HICs and LMICs as well as the rural and urban residents [71,72]. When women and their partners have uninterrupted internet and electricity and a generally suitable environment for mhealth utilisation, minimal advocacy from ANC providers, non-governmental agencies and central government can translate into high usage and acceptability. By so doing, the alarming MMR battling LMICs could be reduced, with the bridged disparity between HICs and LMICs, leading to a global decline in MMR.

Future research on this subject could focus on how mhealth interventions work out for special populations such as the physically challenged, persons living with HIV in stereotyped settings, teenagers/adolescents and persons identified with lesbian, gay, bisexual, transgender and intersex (LGBTI) sexual orientations. These populations are sometimes either not comfortable or have truncated access to services meant for the general population [73-76]. Identification of workable mhealth interventions for special populations will augment efforts to attain the global commitment encapsulated in the third Sustainable Development Goal (SDG) *"ensure healthy lives and promote*

wellbeing for all at all ages" [77].

Strengths and limitations

To our knowledge, this is the first systematic review of systematic reviews that has exclusively investigated the effectiveness of mhealth applications/interventions on maternal health globally. Besides, we included all available reviews irrespective of study design and year of publications. This aided to identify a wide array of mhealth interventions and the myriad maternity conditions they are applied to. Notwithstanding the strengths, the study is not devoid of limitations. First, despite the comprehensive search, we only included reviews written in the English Language, which happens to be the working language of the authors. Secondly, the search in PubMed did not include Medical Subject Heading (MeSH) terms. However, in addition to the database searches, we performed citation searches, specifically forward and backward citation searches, to identify additional reviews that might have been missed in the database search. This was done to identify additional reviews that might have been missed in the database search.

Conclusion

The effectiveness of mhealth applications in maternal healthcare is well established in the literature. This manifests in the positive impact towards management and reduction in anxiety and depression, diabetes in pregnancy, and gestational weight. Other aspects include smoking reduction or cessation during pregnancy, and enhancement in maternal healthcare utilisation. Meanwhile, mhealth applications are skewed towards HICs, likely due to the advancement in technology and other resources required to optimise the inherent utility of mhealth applications. Considering that mhealth applications dominate in HICs, LMICs must consider pragmatic approaches to improve their availability and usage. Such approaches may include the adoption of workable mhealth policies, political commitment through increment in budget allocation for healthcare to offer cost-effective mhealth interventions for maternal healthcare delivery (e.g., like non-android text messages).

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Data Availability

All systematic reviews included in this study are already available to the public.

Conflict of Interest

None to declare

Authors' Contributions

EKA conceived the study, developed the protocol and contributed to the development of all sections of the manuscript. PAA contributed to screening, quality assessment and review of drafts of the manuscript for important intellectual content. OE independently assessed the quality of all included reviews and reviewed drafts of the manuscript to ensure important intellectual content. All authors reviewed the final draft and approved it for submission. No generative AI was used in any part of the manuscript.

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Abbreviations

ANC	Antenatal Care
CCT	Controlled Clinical Trial
COVID-19	Coronavirus 2019
DVD	Digital Video Disc
JBI	Joanna Briggs Institute
GDP	Gross Domestic Product
HA	Hospital Authority
HICs	High Income Countries
HIV	Human Immunodeficiency Virus
LMICs	Low and Middle-Income Countries
LGBTI	Lesbian, Gay, Bisexual, Transgender and Intersex
Mhealth	Mobile Health
MMR	Maternal Mortality Ratio
MOTECH	Mobile Technology for Community Health
PC	Personal Computer
PNC	Postnatal Care
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT	Randomised Controlled Trial
SDA	Service Delivery Application
SDG	Sustainable Development Goal
SMS	Short Message Service
WHO	World Health Organisation

Supplementary Files

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