



Increasing prematurity medical prevention in maternal for global health through theory of change: A scoping review

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Abstract

Prematurity is the leading reason of infant mortality in the world. There are 4 important prevention treatment for preterm birth in maternal including Tocolytics (Nifedipine, COX [cyclo-oxygenase-Z inhibitors], Magnesium Sulfate, Atosiban, Beta2-sympathomimetics, Progesterone), Steroids (Betamethasone), or Antibiotics (clindamycin, metronidazole, erythromycin). This scoping review aims to map how prematurity prevention is developed and utilize Theory of Change (ToC) for implementation. ToC is a tool increasingly used by healthcare professionals for designing, implementing, and evaluating delivery processes. Using a search strategy and a selection of electronic databases and grey literature, pertinent publications were identified according to PRISMA guidelines. The inclusion criteria were any global prematurity prevention that described the developmental process. Two independent reviewers applied these standards. Extracted, charted, and discussed were data pertinent to the sub-questions of the research. The analysis incorporated 29 studies during 2013 until 2023. 8 (28%) represented a single component prevention and 21 (72%) represented multi-component prevention. In addition, Antenatal Corticosteroids (ACS) are probably cost-saving or cost-effective when administered to women at imminent risk of preterm birth prior to 34 weeks' gestation. A ToC may be a useful tool for investigating prematurity prevention based on global health recommendations reveals both the potential strengths and current weaknesses of the treatment. ACS and tocolytics are often used in combination in clinical care, and several studies considered the cost effectiveness of this combination. While available studies indicated that women treated with both interventions generally had better health outcomes than no treatment.

Keywords: Theory of change, Prematurity, Medical, Prevention, Global health, Medical

Introduction

Premature birth occurs prior to 37 weeks gestation and are the leading cause of global infant mortality [1],[2]. As many as 15 million preterm births occur annually with more than 80% occurring in low- and middle-income countries (LMICs). There are 4 important prevention treatment strategies commonly used for preterm birth in maternal including Tocolytics (Nifedipine, COX (cyclo-oxygenase inhibitors), Magnesium Sulfate, Atosiban, Beta2-sympathomimetics, Progesterone), Steroids (Betamethasone), or Antibiotics (clindamycin, metronidazole, erythromycin). Steroid are applied as an intervention to accelerate fetal lung maturation in preterm birth [4],[5],[6][33]. A recent Cochrane review summarized if pregnant women who are at risk for preterm delivery receive ACS before the age of 34 weeks their probability of respiratory distress syndrome, as well as risk of necrotising enterocolitis and hemorrhage can be reduced [6]. In addition, tocolytics are used to delay the time of

birth in the hope of improving the outcome of preterm baby. A study revealed that's some tocolytic agents (betamimetic and calcium channel blockers) can reduce preterm birth within 48 hours and 7 days after initiation [6],[7]. Furthermore, magnesium sulfate can be given for neuroprotection and to decrease the risk of gross motor dysfunction and cerebral palsy [8],[9]. Primary interventions of prematurity, such as cessation of smoking programs, and secondary prevention, such as cervical cerclage and pregnancy-inducing agents, can improve the outcome of preterm birth [10],[11]. International EBM guidelines recommend giving ACS between 24 and 34 weeks of gestation [12]. Meanwhile, magnesium sulfate is suggested for women between 24 to 35 weeks of gestation [13][34]. Although the potential benefits of these interventions have been recognized for preterm infants, its worldwide implementation varies widely across contexts and settings [7]. Implementation concepts based on the Theory of Change (ToC) are important for cross-national and cross-cultural achievements in this topic of

universal health coverage.

In this review we target the evaluation of prematurity prevention programs in various countries. We systematically analyzed how ToC-based concepts were applied in the prematurity prevention concepts context.

In addition, the following question were addressed:

- What is the definition of ToC according to this context?
- Why is the ToC being constructed in the specific frameworks?
- What is the procedure for developing ToC?
- Who participated in the ToC?
- In which phase of the prevention were ToC-based approached formulated?
- How are ToCs presented in published papers?
- Which purpose serves the ToC?
- How is the ToC refined?

Methods

For this analysis, the format of a scoping review was chosen for a comprehensive overview of available evidence, identification and synthesis of literature regarding this specific topic. We adopted the JBI methodology and utilized the PRISMA-ScR checklist (Supplemental material) to direct this review process.

Search strategy

From 2013 to the present, Pubmed, MEDLINE, WHO Global Index Medicus, and SCOPUS were queried applying the following keywords: Theory of change, Prematurity, Medical, Prevention, Global Health, Medical. SW conducted a database search in May 2023. The eligibility criteria that were used for the selection of the publications are listed in table 1.

Table 1. Review inclusion and exclusion criteria

Category	Inclusion	Exclusion
Participants	Described prematurity prevention for pregnant women	<ol style="list-style-type: none"> 1. Obstetric health prevention(s) that aim(s) to increase maternal health outcomes as opposed to newborn outcomes. 2. Prevention performed only in non-hospital settings (outpatient environment) 3. Concentrating on non-medical prevention 4. Prevention at the community level
Context	<ol style="list-style-type: none"> 1. Described ToC to defined as a hypothesis prematurity prevention. 2. Development process for a ToC planned about prematurity intervention. 3. Narrative form or illustrated visually 	
Sources	<ol style="list-style-type: none"> 1. Qualitative, quantitative and mixed-methods 2. Medical Guidelines based global health 	All review study
Language	English language.	

Evidence selection

Two independent reviewers (SW and LF) used Rayyan's software (21) to filter abstracts and titles for eligibility criteria. No third reviewer was required to resolve any disagreements between reviewers. All qualified full texts were reviewed by SW. ME and SN resolved any disagreements at any stage through discussion or review.

Data charting

Using a data extraction tool a data charting table

was created (SW) and reviewed by all authors in order to promote consistency. This data extraction from papers that were selected according to the eligibility criteria contained the parameters with special focus on ToC-based implementation:

- Author, reference link, publication year, country, intervention name,
- Type of prematurity intervention,
- Level of ToC, definition of ToC, process development of ToC, stage at which ToC was developed, presentation of ToC in

literature, purpose of ToC (why it is useful), ToC value (what it is supporting), and refinement of ToC over time

- ToC components

Narrative synthesis combining deductive (predetermined research questions) and inductive components was performed.

Results

Database search revealed 10,538 hit and 329 grey literature references. After removal of duplicated 4,162 references were screened regarding titles and abstracts. The eligibility criteria were applied to 298 full texts. Further exclusion was done due to lack of relation to pregnant women (n=136), full text not available (n=39), non-health service-related prevention programs (n=29), ToC not reported (n=48), and unavailability in English language (n=17). Finally, 29 publications fulfilled the eligibility criteria and complete texts were included in the data extraction and analysis. This procedure is depicted in a modified PRISMA-ScR model in Figure 1.

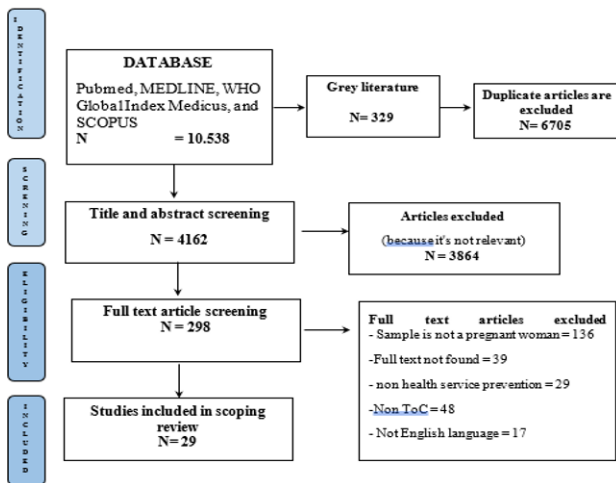


Figure 1 PRISMA-ScR flow diagram of search result

The identified reports were published throughout the 10-year search period without a clear trend (figure 2a). Various regions in the world were covered by these analyses: Europe (n=9), America (n=4), Asia (n=9), Africa (n=4) and Australia (n=1). (Figure 2) The majority of research was conducted in countries with high per capita income. 8 (28%) of the 29 publications presented single component prevention, while 21 (72%) dealt with multi-component prevention. Tocolytics (Nifedipine, COX (cyclooxygenasei-Z inhibitors), Magnesium Sulfate, Atosiban, Beta2-sympathomimetics, Progesterone),

Steroids (Betamethasone), and Antibiotics (clindamycin, metronidazole, erythromycin) were included in the investigated evaluations. All 29 studies were conducted in hospital-based prevention settings.

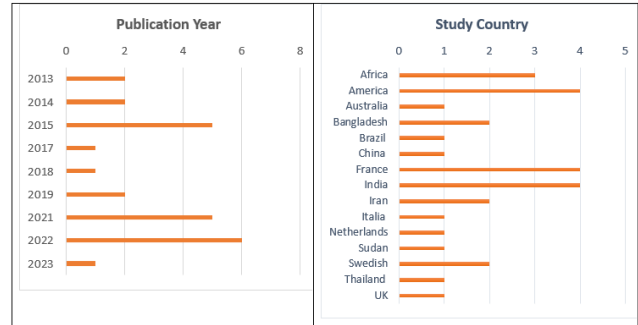


Figure 2: Regional and timely distribution of published reports

Fifteen studies (52%) defined the ToC or a program theory. Five studies (17%) described their model's diagrammatic representation as "logic models," six (20%) as "narrative bullet point form" and seven (24%) as a flow chart diagram. Only 14 studies (48%) provided commentaries on the participants in the ToC development process. In addition, only ten (34% of studies) addressed the evolution of ToCs and their apparent development post-prevention.

Discussion

Theory of change is a method that explains how a set of interventions is expected to lead to specific changes, based on causal analysis and available evidence. A theory of change analysis is carried out by key stakeholders to learn what works in a given context. A theory of change helps identify solutions effectively [16],[17]. Which aims to determine the causes of problems that hinder progress and guide decisions about which approach to take, taking into account superiority, effectiveness, and feasibility of each change process. The theory of change helps identify effective solutions to overcome the causes of problems, in addition to directing decisions that must be taken, taking into account the positive value in change. Meanwhile, the disadvantage of ToC is that it can be too simple or complicated in the analysis process depending on the object being studied [17]. This review provides an analysis of the use of ToC in prematurity prevention. This study involves the use of ACS, Tocolytics and antibiotics. ACS is recommended to be given at 34 weeks of age. It is especially frequently used in LMICs [2,22]. On average, ACS is the first line therapy used in this

review study [2], [3]. However, ACS has a risk of health hazards (neonatal hypoglycemia) that needs to be watched out for [23],[26].[30]. Meanwhile, this study also revealed that tocolysis is only intended for gestational ages of 24 and 30 weeks or more than 30 weeks with a cervical length of 15 or 20 mm [15]. Other therapies were also described in this study but were not dominant. The use of ToC in this analysis is more to answer the "What", "How", and "Why" questions related to prematurity prevention. So that researchers can find out the advantages and disadvantages of therapy. This is the basis for making policies or preparing guidelines related to medical-based management of prematurity prevention. Prematurity can be managed through appropriate prenatal diagnosis by healthcare professionals. Health promotion is needed regarding the importance of screening during pregnancy [31]. Premature birth prevention needs to be implemented through other health promotion efforts, such as showing the effects of smoking through educational videos. Smoking is considered a factor that can increase the risk of premature birth [32].

Toc components

Form of the ToC components are Context, Outcomes, Mechanisms, Measurement Indicators, and Assumptions (COMMA) after modified.

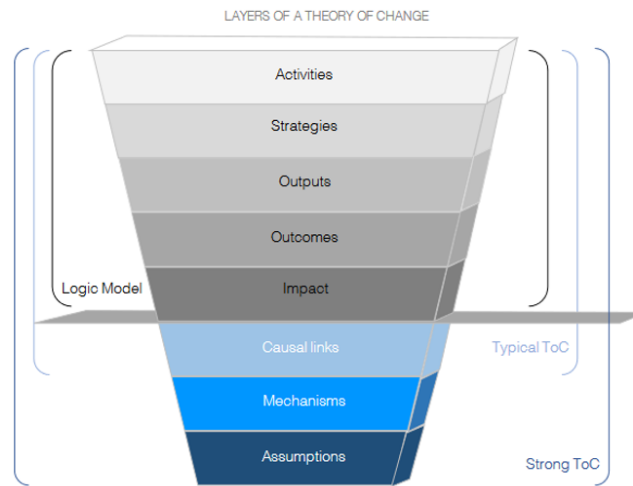


Fig 3. Logic model

Table 2. Toc component assumptions

ToC Component	Context	Outcomes	Mechanisms	Measurement indicators	Assumptions
Definition	therapy programme) and process of ToC	The pathway of changes that the prevention is hoping to achieve.	Impact relationships on outcomes in pathways of change. This is a response/cognitive shift experienced by beneficiaries of such prevention	What can be measured to monitoring progress every therapy step towards change.	Conditions beyond control preventive measures must be taken properly to achieve results.
Number of studies in which ToC component is included (%)	29 (100%)	29 (100%)	14 (48%)	8 (27%)	2 (7%)

Toc use over time

These findings are consistent with the ToC literature in general. Generative causal models explain related mechanisms only in certain contexts to produce results. Although beyond the scope, this special review aims to explore the relationship between ToC and realist evaluation approaches. This is important to increase the depth of understanding of the ToC and theory-based approach to use overall evaluation. This will result in a good evaluation of aspects of medical

prevention in cases of prematurity

Toc mechanisms or “program theory”

Elements of theory-based evaluation needed considerable reflection by program implementers. Therefore, author provides suggestions to consider more about how the mechanism was developed.

Prematurity medical prevention and Toc

ToC can help researcher to developed and evaluate prematurity medical interventions. In addition, ToC

can improve understanding of therapy delivery and enable evaluative. ToC is not simply a diagrammatic summary of what has been done or what is planned. Further study should be carried out on pregnant women who benefit from ToC and the therapeutic process. A consideration that needs to be explored further is how ToC can contribute to organizational and health system learning.

Strengths and limitations

The strength is screening process review. Meanwhile, the limitation is review only includes research published with English language and the subject is specifically for pregnant women or women at risk. Therefore, the findings obtained only limited.

Conclusion

This review examines ToCs using in prevention of prematurity and identifies both strengths and weaknesses of the treatment for maternal. It is important for health care professionals to give treatment regarding premature birth prevention. ACS and tocolytics are frequently used together in clinical settings for maternal. While the studies revealed that health outcomes for women treated with both interventions were generally superior to those of women who did not receive any treatment, this was not always the case.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

Author contributions

SW, LF: are responsible for the study conception and devised the design of this study. SN, DSN, TW: completed the study search. SW, LF, DSN, JH: completed the study selection. JH: completed the data extraction. SW : writing manuscript. SW, TW, JH, DN: completed discussion. TW JH, DSN: additional reviewer. All reviewers contributed to the data analysis. All reviewers are approving this manuscript submission. All authors contributed to the article and approved the submitted version.

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Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author/s.

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