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Maternal Interventions to Reduce Preterm Birth: A Systematic Review

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Abstract

The issue of preterm birth is a significant public health concern as it elevates mortality and morbidity risks and is a crucial focus of the Millennium Development Goals (MDGs) for child survival. This systematic review presents an analysis of the various interventions aimed at reducing preterm birth in diverse country settings. The review was conducted of randomized control studies of interventions designed to decrease preterm birth (PTB). Secondary analysis of randomized control studies of interventions was also eligible. The review finds that low-dose aspirin, 17-alpha hydroxyprogesterone, and transvaginal ultrasound are effective interventions in preventing preterm birth. These interventions are deemed optimal for mitigating preterm births among a considerable portion of the population, offering valuable guidance to healthcare providers, policymakers, and health systems in determining suitable interventions for preventing the adverse effects of preterm birth.

Keywords: Preterm; Birth; Maternal intervention; Prevention; Maternal and child health; Public health; Epidemiology; Risk factors; Systematic review

Introduction

The financial burden associated with preterm births significantly impacts public health since it carries increased mortality and morbidity risks in neonates. Therefore, defeating preterm birth is essential as part of the Millennium Development Goal 4 (MDG) for child survival. Since preterm birth often has an unknown etiology [1], it is crucial to identify interventions that may reduce its incidence. Furthermore, a review of maternal interventions across all countries, including low, middle, and high-income settings are necessary since maternal interventions are rapidly evolving, as well as the difficulty of extrapolating data from high-income settings to low- and middle-income settings. Preterm births (commonly called PTB) continue to be prioritized on a global scale within the public health sectors. The high priority stems from the fact that out of every five preterm births experienced within middle-income and low-income countries, four end up being neonatal deaths [2]. A preterm birth usually occurs when a baby is born before the 37th week of its gestation period [3]. The classification of preterm births consider the gestational age per the guidelines of the World health organization (WHO). Those that are born before they achieve the gestation period of 28 weeks are considered to be extremely preterm, those born within a gestation period of 28 to 32 weeks are considered to be very preterm, and those that are born before 37 weeks and after 32 of the gestation periods are considered to be late preterm. The other form of classification that can be adopted for preterm infants is based on their weight at the time of delivery. Birth weights below 1500 grams are classified as very low birth weights; birth weights below 1000 grams are considered extremely low, while those below 2500

grams are classified as low birth weights [4]. PTB also manifests in two different clinical presentations within the healthcare sector. The first form of PTB is spontaneous, which occurs in cervical dilation, preterm labor, and the premature rupture of the preterm membrane, whereas indicated PTB occurs due to complications caused by an obstetrician in the absence of labor or PROM [5]. The number of preterm births experienced worldwide every year is close to 15 million, which accounts for about 11% of the total number of births. Preterm births also lead to about one million deaths for children under the age of five each year, accounting for about 35% of infant deaths within the same estimated period [6]. There has been a continued increase in the rates of preterm births within many countries in recent years, which has been occurring based on a significant variation between mortality and preterm birth rates. The issue of preterm birth continues to be burdensome to middle and low-income countries worldwide, particularly those in Africa and Asia [6]. For instance, a country like Ethiopia has a high prevalence of preterm births compared to the other nations within its vicinity [7].

Studies investigating the long-term effects of preterm birth have found that PTB has adverse health outcomes that persist into adulthood (Vogel et al., 2018). A further literature review has also revealed that during the last 50 years, preterm birth PTB has significantly impacted mortality rates during early and middle adulthood [8]. As well as contributing to lifelong disability, preterm birth imposes significant economic burdens on society [9]. Babies with low birth weights due to premature births have been at the forefront of the healthcare sector. As part of Sustainable Development Goal (SDG) 3.2, premature births and low birth weight babies must be addressed to prevent preventable deaths among all children under five [10]. This review considers low, middle, and high-income countries rather than focusing only on preterm birth interventions in a single population. We aim to Assess the evidence regarding prevention practices used in the last five years to reduce preterm births and compare and evaluate them. And Provide recommendations and suggestions to be employed in future research and develop methods to prevent preterm births.

Methodology

A systematic literature review was conducted. The review was conducted of randomized control studies of interventions designed to decrease preterm birth (PTB). Secondary analysis of randomized control studies of interventions was also eligible. Only articles published in English literature between November 2016 and 2022 were selected. The evidence was classified into maternal intervention classification groups, and a narrative synthesis was conducted. The CASP tool checklist for assessing evidence was adopted as part of this systematic review. This review was conducted on Rev Man five Web, the online platform for Cochrane intervention and flexible reviews. The Grade Pro software is an additional tool for certainty assessment, developing, and evaluating recommendations. According to the GRADE approach, evidence for a given outcome was rated according to four levels of certainty: high, moderate, low, and very low. The review included randomized control studies of interventions designed to decrease PTB. secondary analysis of randomized control studies of interventions was also eligible. Only articles published in English literature between November 2016 and 2022 were selected. The last review of systematic reviews and randomized controlled trials of preterm birth prevention was conducted between January 2005 and October 2016 [11]. Articles published from November 2016 onwards were included in this systematic literature review. Consideration was also given to the multi-component interventions used to prevent the occurrence of delivered preterm neonates and underweight babies while using neonatal and maternal health interventions for pregnant women. The reports of the same study were also included [12]. This review did not include all medical interventions not favored by healthcare settings or failed to follow the medical order. The 37th week of gestational age is considered a cut-off point to exclude women who will give birth after that. The exclusion criteria also focused on articles with no full text, accessible commentaries, duplicate studies, abstracts, and even editorials. The same was applied to those that had anonymous reports. All non-English articles or those with systematic reviews focusing on indirect data were excluded from this review.

Result

Fifteen studies were identified, all of which focused on maternal interventions aimed at preventing preterm birth. the following maternal interventions were found to be effective in a significant reduction of preterm birth rate:

a) low-dose aspirin 81 mg (OR, 0.87 95% Confidence interval CI 0.78 to 0.97),

b) 17-alpha hydroxyprogesterone (OR, 0.28, confidence interval 95% CI 0.14 to 0.58),

c) cervical ultrasound (TVU CL) (OR, 0.11; 95% confidence interval (CI) 0.04 to 0.30).

d) 4 mg of FA was found to be superior to 0.4 mg of FA in reducing the preterm birth rate (OR,0.43 95% confidence interval CI 0.19 to 0.97).

However, we downgrade the evidence of this trial from high to moderate certainty because of its high risk of bias; therefore, the result of this study should be treated with more caution.

Low and very low degrees of evidence indicates that the following maternal interventions are not associated with reducing preterm birth risk:

1. The use of R4U scorecards,
2. exercise-based interventions,
3. aerobic exercise,
4. 200 mg progesterone,
5. Arabian pessary
6. 17-OHPC (250 mg IM)

The findings of these trials should be interpreted with caution due to suboptimal methodological approaches and a low level of

evidence quality. Consequently, it is challenging to draw definitive conclusions based on these studies alone.

A randomized controlled trial utilizing Bayesian adaptive randomization found that the mean incidence of preterm birth was significantly reduced with the use of 1000 mg of DHA, as compared to 200 mg of DHA. However, the validity of these results is limited due to bias, indirectness, and imprecision, as evidenced by a wide confidence interval that extends beyond the threshold of no effect. As such, these findings should be viewed with caution and require further verification through future research.

Conclusion

The present review indicates that low-dose aspirin therapy (81 mg), 17-alpha hydroxyprogesterone, and transvaginal ultrasound of cervical length (TVU CL) are effective measures in preventing preterm birth (PTB). These interventions represent the most effective methods currently available for reducing preterm births across a significant proportion of the population. This finding holds crucial implications for clinical practice, as healthcare providers, policymakers, and health systems can utilize this evidence to guide the selection of interventions aimed at mitigating the adverse health consequences of preterm birth. Despite these promising results, there remains a need for further adequately powered randomized trials to establish effective and safe methods for reducing the incidence of preterm births. Such studies could help expand the range of available interventions and ensure that clinicians can make informed decisions based on the latest evidence.

Acknowledgment

None.

Conflict of Interest

No conflict of interest.

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