Effects of preconception care and periconceptional nutrition interventions on maternal nutritional status and birth outcomes: a systematic review

Zohra Lassi, Sophie Kedzior, Jai Das, Zulfiqar A. Bhutta

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Background

Preconception care is important for healthy maternal, birth, and neonatal outcomes (Dean, 2013). Appropriate interventions relating to nutrition and other lifestyle factors, such as behavioural modifications to promote weight loss, are important for ensuring good pregnancy preparedness. Weight loss during the preconception period has shown to increase rates of natural conception, prevent excessive gestational weight gain, and possibly lower the risk of fetal macrosomia (Lan, 2017; Schummers, 2015).

Previous evidence has shown the benefits of delayed childbearing, specifically in adolescence, as adolescent pregnancy is associated with an increased risk of preterm birth, stillbirth, small-for-gestational age, neonatal mortality, and complications during labour and delivery (Bhutta, 2013; Haldre, 2007; Paranjothy, 2009; WHO, 2007). However, variable evidence exists related to prolonging interpregnancy intervals. In a systematic review, Conde-Agudelo et al identified maternal nutritional depletion, folate depletion, infection transmission, and reduced lactation due to breastfeeding and pregnancy overlap as hypothetical nutrition-related causal mechanisms between short intervals and adverse maternal, perinatal, infant and child outcomes in closely-spaced pregnancies (Conde-Agudelo, 2012).

The benefits of micronutrient supplementation during pregnancy are well-established, particularly for iron and folic acid. However, there is limited evidence for micronutrient supplementation during pre- and periconception apart from the use of folic acid for prevention of neural tube defects (De-Regil, 2015). Intermittent utilization of iron and folic acid prior to conception has shown to reduce the risk of anemia in women of reproductive age, though additional evidence is needed for effects on other maternal and newborn outcomes (Fernández-Gaxiola, 2011).

Despite existing evidence to support the provision of preconception care, the effectiveness of intervention approaches requires further investigation. Determining the most effective delivery mechanisms across different settings is vital to successfully implementing pre- and periconceptional interventions in low- and middle-income (LMIC) settings. Strategies may require adaptation to contextual needs and barriers unique to different populations. Implementation challenges in LMICs include high rates of unplanned pregnancy, lack of awareness, and barriers to accessing health services (Poels, 2016).
This review aims to synthesize the existing evidence on preconception care interventions for delayed childbearing, prolonged interpregnancy intervals, periconceptional folic acid, and periconceptional iron folic acid on maternal nutritional status and birth outcomes and will also include findings from rigorous evaluations of existing programmes. This approach will enable a comprehensive assessment of the effectiveness of preconception care for improving maternal, birth, and neonatal health and nutrition outcomes. This evidence will be critical to inform policy and programmatic decision-making in LMICs.

**Objectives**

1. What is the effectiveness of interventions to delay age at first pregnancy on maternal nutrition and birth outcomes?
2. What is the effectiveness of interventions to prolong interpregnancy intervals on maternal nutrition and birth outcomes?
3. What is the effectiveness of periconceptional folic acid use on maternal nutrition and birth outcomes?
4. What is the effectiveness of periconceptional iron folic acid use on maternal nutrition and birth outcomes?

**Existing reviews**

**Objective 1: Delayed age at first pregnancy**


- While there are existing reviews examining the effects of various interventions on preventing unintended pregnancies, they have mainly included RCTs. In this review, we will also include evidence from large-scale program evaluations in addition to relevant experimental and observational studies.

**Objective 2: Prolonged interpregnancy intervals**


• While there are existing reviews examining the effects of birth spacing, there are no reviews of interventions to prolong pregnancy intervals. This will be the first review to examine interventions to prolong interpregnancy intervals and their impact on maternal nutrition and birth outcomes.

**Objective 3: Periconceptional folic acid use**


• While there are existing reviews examining the effects of periconceptional folic acid use, the reviews are outdated and, therefore, there is a need to update this evidence.

**Objective 4: Periconceptional iron folic acid use**


• While there are existing reviews examining the effects of iron folic acid use prior to pregnancy, the reviews are outdated and focus on menstruating women. In this review, we will update this evidence and also include the effects of iron folic acid use in the periconceptional period.

**Intervention**

The following interventions targeting adult women and adolescent girls (10-19 years) during the pre- and periconceptional period in low- and middle-income countries will be included:

• Interventions to delay age at first pregnancy
  o Educational interventions and contraceptive promotion provided at the community, school or household level by parents, colleagues, teachers, health workers or social workers to adolescents and young women.

• Interventions to prolong interpregnancy intervals
  o Educational interventions and contraceptive promotion provided at the community, school or household level by parents, colleagues, teachers, health workers or social workers to mothers of reproductive age.

• Periconceptional folic acid
Pubescent or menstruating women who received any folic acid supplementation.

- Periconceptional iron folic acid
  - Pubescent or menstruating women who received any iron folic acid supplementation.

These interventions will be compared against no intervention, standard of care (whatever is applicable in the setting the study was conducted), or placebo. Folic acid and iron folic acid use during pregnancy will not be included.

### Population

The target population is non-pregnant adult women and adolescent girls (10-19 years), regardless of health status, living in low- and middle-income countries as defined by the World Bank.

### Outcomes

List the primary and secondary outcomes for the review, including all outcomes important to those who will be affected by and those who will make decisions about the intervention(s). Give thought to the inclusion of adverse and unintended effects, resource use and outcomes along the causal chain.

#### Primary outcomes:

**Maternal**

- Unintended pregnancy
- Anemia
- Iron deficiency anemia

**Neonatal**

- Neural tube defects
- Stillbirth
- Perinatal mortality
- Neonatal mortality

#### Secondary outcomes:

**Maternal**

- Reported changes in knowledge and attitudes about the risk of unintended pregnancies
- Initiation of sexual intercourse
- Use of birth control methods
- Red blood cell folate
- Serum folate
- Adverse effects
- Adherence to folic acid or iron folic acid supplementation
- Abortion
- Miscarriage
- Sexually transmitted infections (including HIV)
- Maternal mortality

**Neonatal**
- Preterm birth
- Low birth weight
- Small-for-gestational age
- Other congenital anomalies
- Admission to special care for any cause

**Study designs**

We will include primary studies, including large-scale programme evaluations, that assess the efficacy and/or effectiveness of interventions using experimental and quasi-experimental study designs that allow for causal inference:

1. Studies where participants were randomly assigned, individually or in clusters, to intervention and comparison groups.

2. Studies where non-random assignment to intervention and comparison groups is based on other known allocation rules, including a threshold on a continuous variable (regression discontinuity designs) or exogenous geographical variation in the treatment allocation (natural experiments).

3. Controlled before-after studies in which allocation to intervention and control groups was not made by study investigators, and outcomes were measured in both intervention and control groups at baseline, and appropriate methods were used to control for selection bias and confounding, such as statistical matching (e.g., propensity score matching, or covariate matching) or regression adjustment (e.g., difference-in-differences, instrumental variables).

4. Interrupted time series studies in which outcomes were measured in the intervention group at least three time points before the intervention was implemented and at least three time points after.

**References**


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**Review authors**

**Lead review author:**

Name: Zohra Lassi  
Title: University Beacon Fellow  
Affiliation: University of Adelaide  
Address: Level 8, Hughes Building, University of Adelaide, North Terrace  
City, State, Province or County: Adelaide, South Australia  
Post code: 5006  
Country: Australia  
Phone: +61.883.139.266
Co-authors:

Name: Sophie Kedzior
Title: Research Officer
Affiliation: University of Adelaide
Address: Level 8, Hughes Building, University of Adelaide, North Terrace
City, State, Province or County: Adelaide, South Australia
Post code: 5006
Country: Australia
Phone: +61.883.139.266
Email: sophie.kedzior@adelaide.edu.au

Name: Jai Das
Title: Assistant Professor
Affiliation: Aga Khan University
Address: Stadium Road
City, State, Province or County: Karachi, Sindh
Post code: 74800
Country: Pakistan
Phone: +92.21.3486.4717
Email: jai.das@aku.edu

Name: Zulfiqar A. Bhutta
Title: Co-Director, Director of Research
Affiliation: Centre for Global Child Health, The Hospital for Sick Children
Address: 686 Bay Street, 11th Floor
City, State, Province or County: Toronto, Ontario
Post code: M5G 0A4
Country: Canada
Phone: +1.416.813.7654
Email: zulfiqar.bhutta@sickkids.ca
Roles and responsibilities

- Content: Zulfiqar Bhutta and Zohra Lassi have content expertise.
- Systematic review methods: All authors have systematic review methods expertise.
- Statistical analysis: Zohra Lassi and Jai Das have statistical analysis expertise.
- Information retrieval: Zohra Lassi, Jai Das, and Sophie Kedzior have expertise in retrieving information.

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Potential conflicts of interest

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Preliminary timeframe

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