

Effectiveness of Micronutrient Supplementation in Sub-Saharan African Pregnant People Living With HIV



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Please scan the QR code for a full list of references and extracted data from included studies

BACKGROUND

This systematic review is an **update to the 2012 Cochrane Review** on micronutrient supplementation in pregnancy (4). Its objective is to **confirm the importance of micronutrient interventions** during pregnancy and to shed light on the role of specific micronutrients.

- **Micronutrient supplementation** in pregnancy is fundamental for ensuring optimal health outcomes both for mother and infant.
- **Pregnant people living with HIV (PPLWHIV)** are at risk of malabsorption. An adequate intake of micronutrients is important for the effectiveness of antiretroviral therapy (ARV) and to meet the increased nutrient needs.
- **Sub-Saharan African PPLWHIV** face even more challenges due to nutrient insufficiencies and limited access to healthcare.

METHODS

- Eligibility criteria & search terms were developed using the PICO framework (Table 1).
- Searches were conducted in five biomedical databases (Oct 2024).
- Following deduplication, records were screened against the eligibility criteria by two independent reviewers.
- Included studies were evaluated using the Critical Appraisal Skills Programme (CASP) checklist.

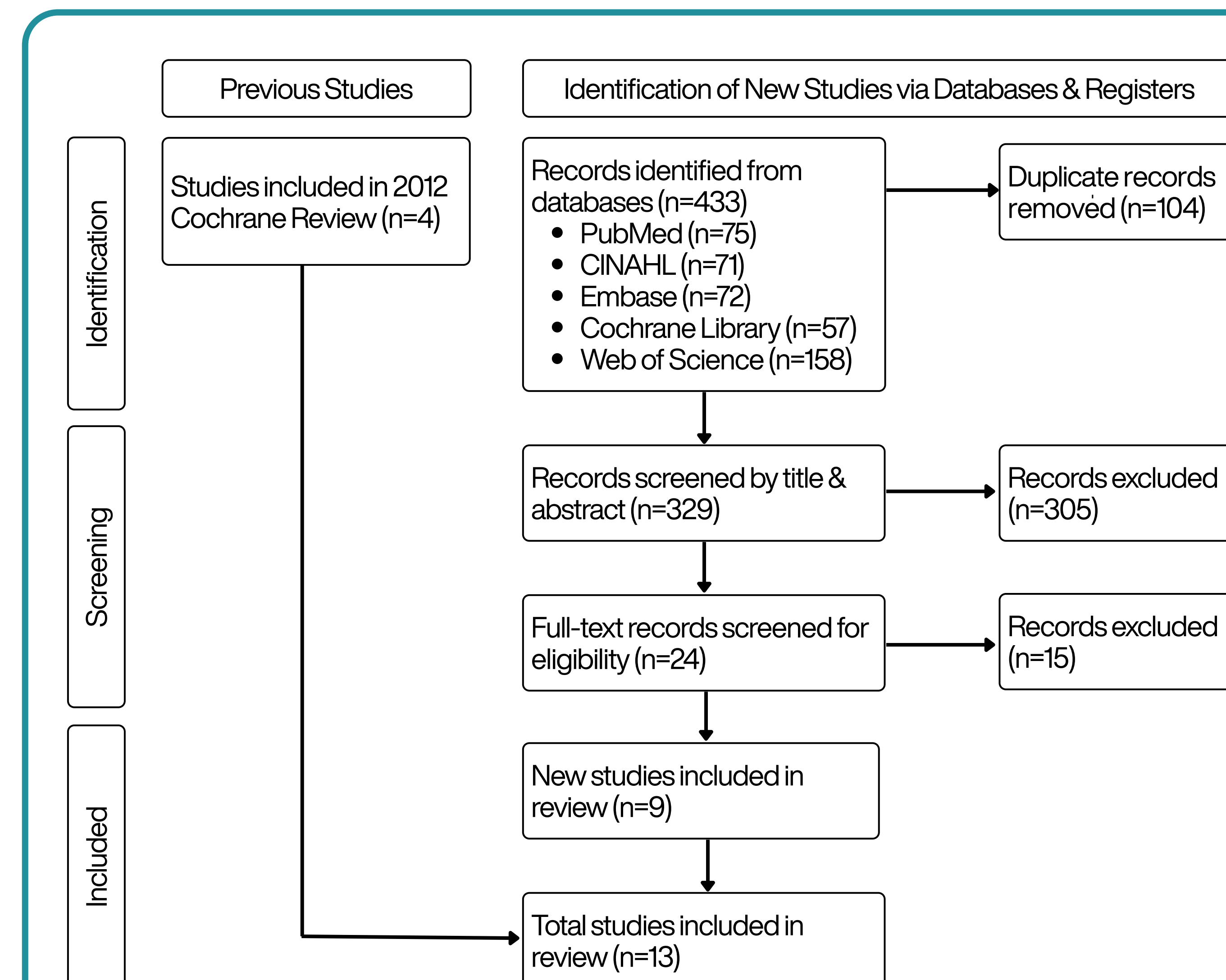
Extracted data items included:

- Study identification information (authors' names, title, publication date, study design, study locale)
- Sample information: sample size, participant demographics, inclusion and exclusion criteria
- Intervention and measurement tools
- Limitations

POPULATION	Sub-Saharan PPLWHIV
INTERVENTION	Micronutrients (vitamins and/or trace elements)
COMPARISON	Between interventions or between an intervention and placebo
OUTCOME	Maternal health (including HIV progression); birth outcomes; infant health
STUDY DESIGN	RCT; cohort studies
DATE OF PUBLICATION	2013 - present

Table 1: eligibility criteria

RESULTS



Maternal Health & HIV Progression

- **CD4 count:** increased with multivitamin supplementation (2); no immune benefit seen with selenium alone.
- **HIV-1 viral load:** unchanged with selenium supplementation alone (3); borderline increase in HIV-1 RNA in breast milk when participants were not on ARV (9).
- **Morbidity:** Vitamin D3 reduced maternal mortality (4); multivitamins lowered the risk of malaria (compared to vitamin A alone) (5); iron therapy improved anaemia recovery and reduced the need for transfusion (6).
- **Breast milk:** LNS increased levels of most vitamins but not thiamine (3); ARVs reduced the levels of nicotinamide, pyridoxal, and B12; selenium in breast milk increased HIV-1 in RNA only in participants not on ARVs (7).

Nine studies met the inclusion criteria and were added to the four included in the 2012 Cochrane Review.

- Studies were conducted in: Tanzania (n=4), Malawi (n=3), Nigeria (n=1), and South Africa (n=1)
- Sample sizes ranged from 180 - 2,300 participants
- Interventions included: multivitamins, selenium, vitamin D₃, iron, lipid-based nutrient supplements (LNS), and combinations of these with ARV.

Birth Outcomes & Infant Health

- **Pre-term birth:** significantly reduced by selenium (3).
- **Low birth weight:** reduced with multivitamins, but no significant reduction with selenium (3).
- **Neonatal mortality:** lower mortality and reduced diarrhoea in children of mothers who took multivitamins (8).
- **Breast milk micronutrients:** iron, copper, and zinc levels remained inadequate despite supplementation; ARVs were linked to higher micronutrient levels in milk but this had limited effect on infant biomarkers (9).

DISCUSSION

Impact of interventions

- New studies support prior evidence: multivitamin supplementation improve maternal immunity and reduce adverse birth outcomes.
- Selenium may reduce pre-term birth but does not benefit immune markers of HIV progression.
- Vitamin D3 reduces mortality but its effects on HIV progression are unclear.

New insights on breast milk

- Postpartum breast milk provides insufficient micronutrient levels (especially iron, zinc, and copper).
- LNS can improve vitamin content, but ARVs may reduce vitamins (B12, pyridoxal), which can negatively impact infant growth.

Interplay of HIV treatment and nutrition

- Interactions are complex and under-researched.
- Earlier studies were conducted before widespread availability of ARVs; newer research benefits from ARV rollout in the region and explore micronutrient-ARV interaction, a novel area of inquiry.

Regional variation

- Newer studies include a broader range of countries, each with distinct nutritional challenges and healthcare access.
- Studies on Malawi focused on breastfeeding due to national health priorities; research in Nigeria focuses on urban-rural disparities; South African studies are ideal for looking at treatment-nutrition interaction as it is the country with the highest ARV coverage.

Research gaps and limitations

- Wide variation in interventions, populations, and settings make comparison difficult.
- Few studies use the same micronutrient formulation or measure identical outcomes.
- Generalisability is limited; more standardised interventions are needed.
- Longer-term follow-up studies on children would help assess sustained effects.
- Research in comparable low-resource setting exists but is not abundant.