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The risk of preeclampsia in pregnancy with a deficit of selenium. A systematic review.

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Introduction

Micronutrient deficiency is present in women in the gestational reproductive phase.

Preeclampsia is a multisystem disorder characterized by hypertension and proteinuria in a previously healthy woman on or after the 20th week of gestation. It is defined by systolic blood pressure of (140 mmHg) or more and diastolic blood pressure of 90 mmHg or more on at least two measurements within 6 hours. (1)

The present study analyzed serum selenium concentrations in preeclampsia patients to determine the relationship between selenium and preeclampsia complications (1)

Objectives

This work aims to determine whether selenium deficiency in pregnant women may develop PE.

Methodology

We searched the clinical studies based on literature published from January 2000 to April 2022 in Databank Pubmed/ Medline, Embase, Lilacs, Cochrane Library, Clinical.trials.gov, using Medical Subject Healing (MESH) terms for micronutrients, preeclampsia, eclampsia, selenium, woman and pregnant. The review adhered to PRISMA guidelines and was registered in PROSPERO (CRD42022302298). We employ two independent groups, with three researchers selecting the reports after analyzing the titles and abstracts (PG, AG, FHP) (CHI, KMT). Duplicated reports were excluded, and the two independent groups extracted data.

We assessed the risk of bias using Cochrane's risk of bias tool, considering randomization, treatment allocation, binding, micronutrient analysis, blood arterial pressure measurement. We used Joanna Briggs Critical Appraisal Tools to analyzed report quality, categorizing them as green (good), yellow (fair), or red (poor), and assigning risk of bias as green (no/low), yellow (fair), and red (high). We classified the articles in primary (hypertension) and second outcomes (hypertension without proteinuria), presenting data in a selenium-focused table.

Results and Discussion

Selenium is essential selenoproteins, such as glutathione peroxidase and thioredoxin reductase, which protect against oxidative damage induced by free radicals. (1)

A serum selenium deficiency impacts the cardiac, reproductive, and immune systems. During pregnancy, these elements often drop, so ingesting

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60 ug/day of selenium is recommended to enhance antioxidant activity and reduce the risk of developing PE. (2) (3)

We researched the selenium articles using the keywords selenium and pregnancy in the Cochrane Library database, clinical trial.gov, PUBMED/MEDLINE, and EMBASE and found 131, 369, and 300 articles. In an advanced search (keywords: selenium, pregnancy, preeclampsia, and micronutrient), we used the same Database, respectively, 121, 63, and 15 articles. We selected 78 articles; 20 were excluded and stayed with 58 articles. Of the 30 related articles, were excluded by abstract review and waited with 28 articles. Of these, thirteen were excluded (beclack of data). Finally, we had the fifteen articles eligible to write and produce our article in a table (based on the items illustrated in the table below). The studies show fair (red) or mild (orange) problems with bias and quality of the study, as noted in TABLE 1 (a reduced part of the selenium table) that are presented with six research that showed the best results (classified as orange quality. The other nine reports were classified as red). The meta-analysis is being conducted using the articles with the highest rating.

Table 1. Results of quality and bias of six selected reports

Author	Micronutrient	Study type	Patients (n)	Age group	Outcomes	Study Quality	Risk of Bias
Farzin *et al.* 2012	Selenium	Case-control study	120 patients	Study: ≈ 27.43 ± 3.91 Control: ≈ 26.66 ± 3.72	Serum levels of Selenium were slightly decreased in the SG group compared to the CG. Control: 10.47 ± 2.78 ug/dL Study: 8.82 ± 2.10 ug/dL P<0.001		
Enebe *et al.* 2020	Selenium	Cross-sectional analytical study	162 patients	18 – 40	The study found that the serum levels of selenium were significantly lower in preeclamptic women. Study: 01.758 + 3.35 mg/L Control: 0.842 + 0.71 mg/L P: 0.017		
Negi *et al.* 2012	Selenium	Case-control study	114 patients	Study: ≈ 28 ± 4 Control: ≈ 25 ±4	Selenium levels were slightly lower in the PE and eclampsia groups compared to the control. Control: 22.17 ± 4.19 µg/dL PE: 18.58 ± 5.21 µg/dL Eclampsia: 16.34 ± 5.23 µg/dL P: 0.004		
Haque *et al.* 2015	Selenium	Case-control study	192 patients	Study: ≈ 27 ± 0.98 Control: ≈ 24 ± 0.51	A lower serum selenium concentration was found in women with PE, and even lower levels in severe PE. Study: 23.76 ± 0.64 µg/L (0.30 ± 0.01 µmol/L) Control:32.18 ± 1.22 µg/L (0.41 ± 0.02 µmol/L) P: < 0.05		
Eze *et al.* 2020	Selenium	Comparative case-control study	116 patients	Study: ≈ 31.03 ± 4.73 Control: ≈ 31.45 ± 4.9	The serum levels of selenium were significantly lower in the study group compared to the control. Study: 0.67±0.27 µmol/L Control: 1.20±0.46 µmol/L P: < 0.001		
Rayman *et al.* 2003	Selenium	Case-control study	106 patients	Study: 31±5 Control: 30±5	Serum selenium concentrations were lower in SG compared to CG. Study: 0.56 (0.51-0.64) mg/kg Control: 0.62 (0.57-0.69) mg/kg P: < 0.001		

Conclusions

Given our research regarding micronutrients, we could infer that several articles in our search presented a fair or high level of bias, and many needed more reliable answers regarding trace elements to answer the question on use during pregnancy. Therefore, randomized studies must be conducted to ensure its usefulness and safely confirm its use mechanisms.

Acknowledgments

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