Original Article
The relationship between serum calcium level and women with pregnancy-induced hypertension in China: a meta-analysis

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Abstract: The aim of our study was to determine the relationship between serum calcium levels and PIH. In our study, we searched databases, including Wangfang, Chinese National Knowledge Infrastructure, and PubMed, to find literature regarding the relationship between PIH and calcium levels. The meta-analysis was performed using Review Manager 5.3 software. A total of 8 articles were included in our study. The results of the heterogeneity of PIH (P<0.001; I² = 95%) showed heterogeneity among the included studies, and we used the random effect model for the meta-analysis. In the meta-analysis, significant differences was found between serum Ca and subjects with PIH (MD = -0.27; 95% CI, -0.40 to -0.30). Our research suggests that decreasing of serum calcium maybe a risk of PIH.

Keywords: Calcium, hypertension, case-control study

Introduction

Calcium (Ca) is also involved in many vital processes, such as neuronal excitability, release of neurotransmitters, muscle contraction, membrane integrity, and blood coagulation [1]. A previous study documented that serum Ca has an influence on blood pressure in elderly male subjects [2].

Hypertensive disorders of pregnancy, such as pre-eclampsia (PE) and pregnancy-induced hypertension (PIH), are major causes of maternal morbidity [3, 4]. The results of a previous study revealed that 9.4% of pregnancies are affected by PIH [5]. Some studies suggested that deficiencies of trace elements, such as zinc (Zn), Ca, and Mg, occur in pregnant women [6-8]. However, other study also indicated that no changes in Mg and ionized Ca homeostasis occur in the course of PIH [9]. We design this meta-analysis was to determine whether serum Ca levels are associated with PIH.

Materials and methods

Literature search

Potential studies were identified by a comprehensive literature searching, which covered the following computerized bibliographic databases until 1 January 2016: Wanfang; PubMed; and the Chinese National Knowledge Infrastructure. We searched the retrieved article using the following terms: “calcium”; “pre-eclampsia in pregnant women”; “pre-eclampsia pregnant women”; “hypertensive pregnancy”; “pregnancy-induced hypertension”; and “pregnancy hypertension”. Additionally, we searched related articles by reading the references lists of relevant studies selected. Studies published in Chinese and English were included in the present meta-analysis.

Inclusion and exclusion criteria

The retrieved articles met the following criteria: (1) study involved humans; (2) research focused on the association between PIH and Ca; (3) data needed was extracted from the article; (4) publication language was confined to English and Chinese.

Data extraction

To control the bias and improve the reliability, two reviewers independently extracted data from the relevant article that followed a standardized data-collection form. The following
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Table 1. Characteristics of studies included

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Number</th>
<th>Age (years)</th>
<th>Location</th>
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<tbody>
<tr>
<td>Meiqing T</td>
<td>2010</td>
<td>90</td>
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<td>Shan Xi</td>
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<tr>
<td>Ying L</td>
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<td>28.9, 28.2</td>
<td>Liao Ning</td>
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<tr>
<td>Yanqing Z</td>
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<td>160</td>
<td>25.9, 26.5</td>
<td>Shan Dong</td>
</tr>
<tr>
<td>Siyong Y</td>
<td>2009</td>
<td>142</td>
<td>28.7, 29.0</td>
<td>He Bei</td>
</tr>
<tr>
<td>Yanhua H</td>
<td>2005</td>
<td>89</td>
<td>28.6, 28.2</td>
<td>Guang Dong</td>
</tr>
<tr>
<td>Lili G</td>
<td>2013</td>
<td>118</td>
<td>24.3-33</td>
<td>He Bei</td>
</tr>
<tr>
<td>Yan L</td>
<td>2013</td>
<td>139</td>
<td>22.32-22.32</td>
<td>Guang Dong</td>
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<tr>
<td>Baolan W</td>
<td>2013</td>
<td>435</td>
<td>24.5, 23.9</td>
<td>Shan Xi</td>
</tr>
</tbody>
</table>

Figure 1. Flow diagram of screening article included.

Information was gathered from each study: first author; year of publication; country of residence; age; number of cases and controls; and serum, plasma, or placental levels of Ca in patients with PIH and healthy pregnant women.

Quality assessment

Risk of bias was assessed independently by two authors using the Cochrane Collaboration’s tool for assessing risk of bias, which includes judgments of “low”, “high”, or “unclear” stemming from the following seven domains [10]: (1) random sequence generation; (2) allocation concealment; (3) blinding of participants and personnel; (4) blinding of outcome assessor; (5) incomplete outcome data; (6) selective reporting; and (7) other sources of bias. The risk of bias among randomized trials and the risk can be classified into ‘low’ (high risk of bias), ‘high’ (low risk of bias), or unclear [11].

Statistical analysis

The meta-analysis was performed using Review Manager 5.3 (Cochrane Collaboration). Heterogeneity among effect sizes was tested using a Q statistic and an I² index. The Q statistic tests. The funnel plot was applied to detect potential publication bias [12].

Results

A total of 95 potential articles were identified. Scanning identified 63 unsuitable articles because the articles did not provide sufficient data for this study. Of the remaining 9 articles, one was a systematic review. Finally, there were 8 studies that satisfied our criteria for the meta-analysis (Table 1 and Figure 1).

The results of the heterogeneity of PIH (P<0.001; I² = 95%) showed heterogeneity among the included studies, and we used the random effect model for the meta-analysis. In the meta-analysis, significant differences was found between serum Ca and subjects with PIH (MD = -0.27; 95% CI, -0.40 to -0.30), as shown in Figure 2.

Publication bias and sensitivity analysis

Publication bias was determined by visualization of funnel plots. There was no evidence of publication bias (Figure 3). Low risk of bias was found in present study (Figure 4).

Discussion

In this meta-analysis, significant differences was found between serum Ca and PIH, Which inconsistent with a previous study [1, 8]. Sikorski et al. [21] proposed that Zn is the most important element related to maternal and fetal metabolism during pregnancy [1, 22].

In recent years, studies involving Ca metabolism during pregnancy have been conducted. PIH is a pregnancy-specific condition that augments maternal and infant mortality and morbidity [23]. PIH is caused by many factors, including heredity and immunodeficiency, and
deficiencies in trace elements are thought to play a vital role in the development of PIH. Some limitations also should be addressed in our study. Publication bias may have lower estimated because only article published in English and Chinese were included in present study.

Conclusion

Our findings suggest that the decrease in Ca were associated with PIH. Thus, the serum calcium levels should be measured for PIH patients.

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Disclosure of conflict of interest

None.

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References


