

# The beneficial effects of RAS Blockades on insulin sensitivity, metabolic cytokines and glycemic control in non-diabetic patients: a meta-analysis

Sai Tian<sup>1</sup>, Rong Huang<sup>2</sup>, Ke An<sup>2</sup>, and Shaohua Wang<sup>3</sup>

<sup>1</sup>Affiliated Zhongda Hospital of Southeast University

<sup>2</sup>Southeast University

<sup>3</sup>ZhongDa Hospital of Southeast University

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## Abstract

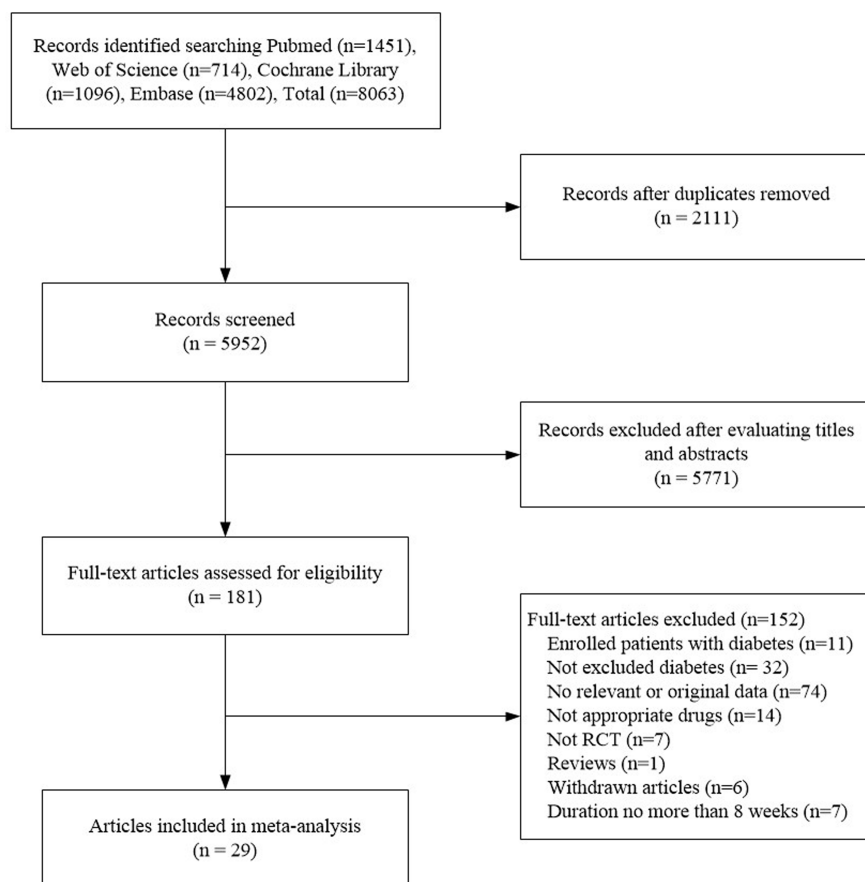
Background: To investigate the comparative effects of Renin-Angiotensin System (RAS) Blockades and other antihypertensive agents on insulin sensitivity, metabolic cytokines and glycemic control in non-diabetic patients. Methods: We searched for the relevant articles published on MEDLINE, EMBASE, Cochrane Library and Web of Science. 29 randomized control trials that investigated the use of Angiotensin-converting enzyme inhibitors (ACEI) or Angiotensin receptor blockers (ARB) versus active comparator or placebo to determine the effects on insulin sensitivity and glycemic index in non-diabetics were included. Subgroup and meta-regression analyses were performed to explore potential sources of heterogeneity. Results: RAS Blockades significantly decreased the homeostasis model assessment of insulin resistance and fasting plasma glucose (WMD -0.69, 95% CI -1.01 to -0.38,  $p < 0.001$ ; WMD -0.09 mmol/L, 95% CI -0.15 to -0.03,  $p = 0.003$ , respectively), while increased the quantitative insulin sensitivity check index (WMD 0.02, 95% CI 0.01 to 0.03,  $p < 0.001$ ) among non-diabetic patients. Besides, RAS Blockades significantly decreased hsCRP and TNF- $\alpha$  (WMD -0.41 mg/L, 95% CI -0.70 to -0.11,  $p = 0.007$ ; WMD -0.21 ng/mL, 95% CI -0.30 to -0.13,  $p < 0.001$ , respectively), while increased adiponectin and potassium (WMD 0.46  $\mu$ g/mL, 95% CI 0.14 to 0.78,  $p = 0.005$ ; WMD 0.24 mmol/L, 95% CI 0.10 to 0.39,  $p = 0.001$ , respectively). Conclusions: RAS Blockades are superior to other antihypertensive agents in improving insulin sensitivity, glycemic control and some metabolic cytokines in non-diabetic patients, indicating a better antihypertensive choice, which probably delays the onsets of diabetes.

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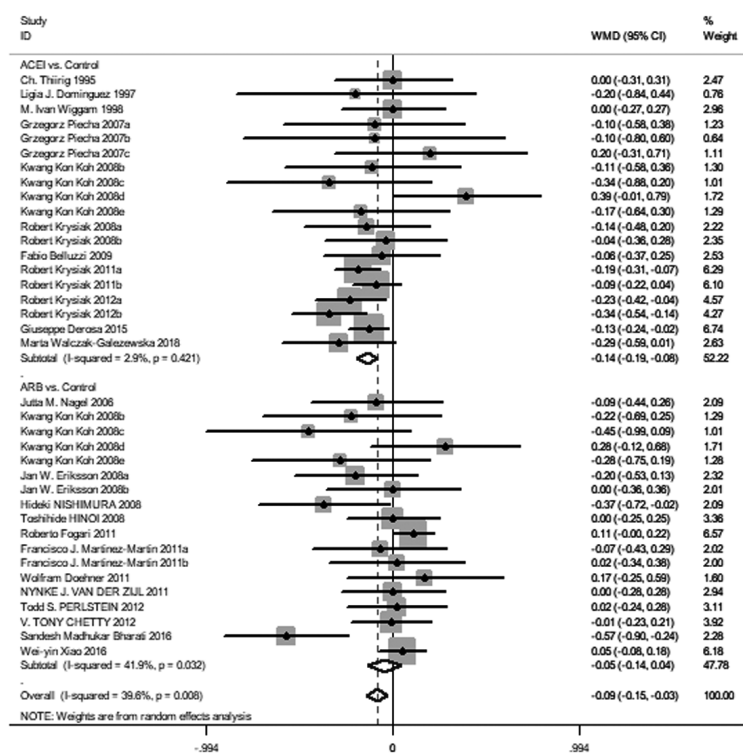
manuscript.docx available at <https://authorea.com/users/318792/articles/448806-the-beneficial-effects-of-ras-blockades-on-insulin-sensitivity-metabolic-cytokines-and-glycemic-control-in-non-diabetic-patients-a-meta-analysis>

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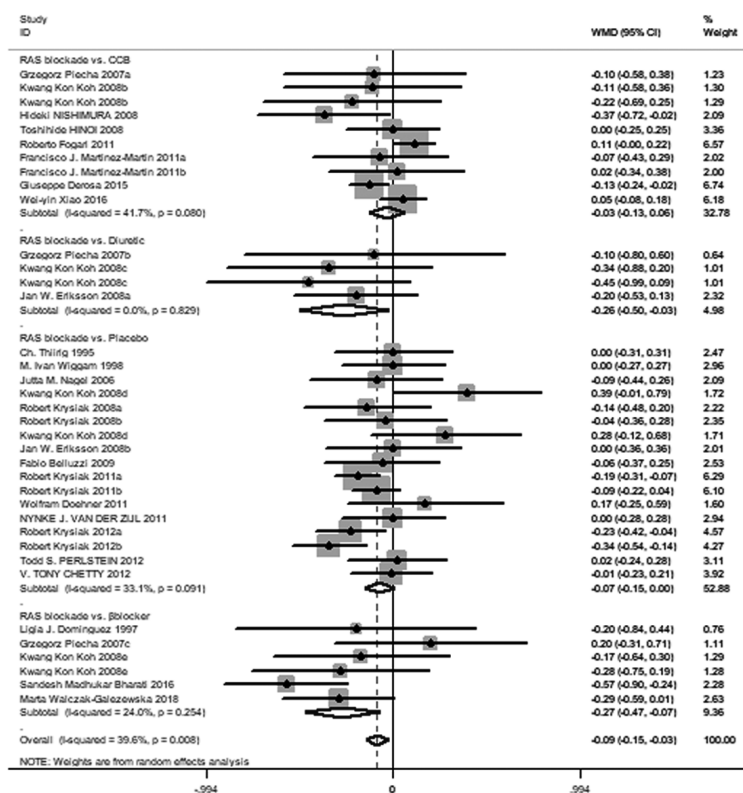
Table 1.docx available at <https://authorea.com/users/318792/articles/448806-the-beneficial-effects-of-ras-blockades-on-insulin-sensitivity-metabolic-cytokines-and-glycemic-control-in-non-diabetic-patients-a-meta-analysis>



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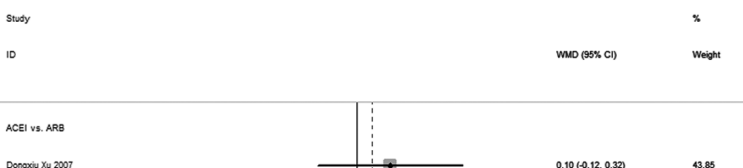


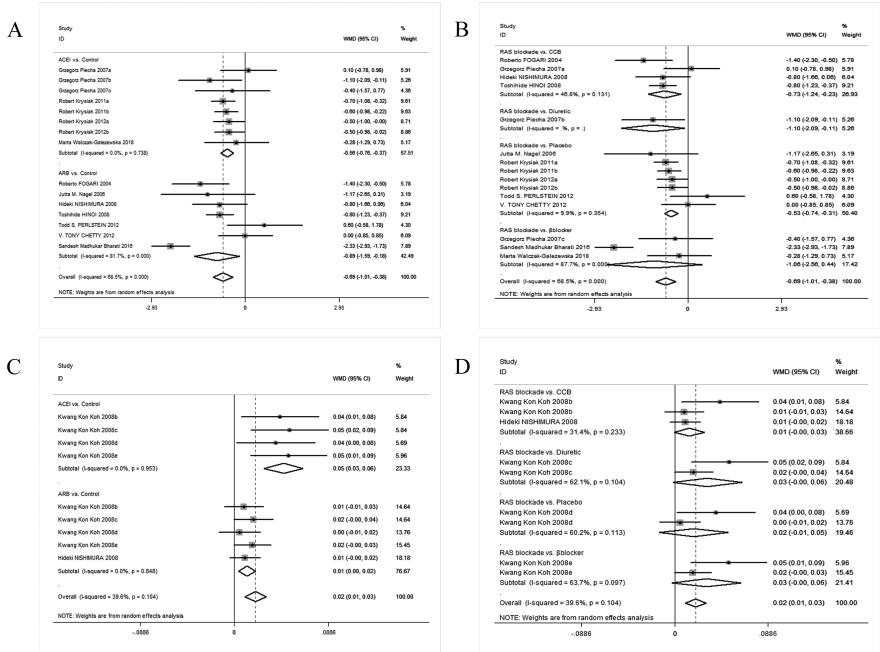
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C





|                                   | Random sequence generation (selection bias) | Allocation concealment (selection bias) | Blinding of participants and personnel (performance bias) | Blinding of outcome assessment (detection bias) | Incomplete outcome data (attrition bias) | Selective reporting (reporting bias) | Other bias |
|-----------------------------------|---------------------------------------------|-----------------------------------------|-----------------------------------------------------------|-------------------------------------------------|------------------------------------------|--------------------------------------|------------|
| AA Lteif 2012                     | +                                           | +                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Ch. Thiirig • L 1995              | +                                           | -                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Dilek Yavuz 2003                  | +                                           | +                                       | -                                                         | ?                                               | +                                        | +                                    | +          |
| Dongxiu Xu 2007                   | +                                           | ?                                       | ?                                                         | ?                                               | +                                        | +                                    | +          |
| Fabio Belluzzi 2009               | +                                           | ?                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Francisco J. Martinez-Martin 2011 | +                                           | ?                                       | -                                                         | +                                               | +                                        | +                                    | +          |
| Giuseppe Derosa 2015              | +                                           | ?                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Grzegorz Piecha 2007              | +                                           | ?                                       | ?                                                         | ?                                               | +                                        | +                                    | +          |
| Hideki NISHIMURA 2008             | +                                           | ?                                       | ?                                                         | ?                                               | +                                        | +                                    | +          |
| Jan W. Eriksson 2008              | +                                           | +                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Jutta M. Nagel 2006               | +                                           | -                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Kwang Kon Koh 2007                | +                                           | -                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Kwang Kon Koh 2008                | +                                           | ?                                       | -                                                         | -                                               | +                                        | +                                    | +          |
| Ligia J. Dominguez 1997           | +                                           | -                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| M. Ivan Wiggam 1998               | +                                           | -                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Marta Walczak-Gałe, zewska 2018   | +                                           | ?                                       | -                                                         | -                                               | +                                        | +                                    | +          |
| NYNKE J. VAN DER ZIJL 2011        | 5+                                          | ?                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Robert Krysiak 2008               | +                                           | +                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Robert Krysiak 2011               | +                                           | +                                       | +                                                         | +                                               | +                                        | +                                    | +          |
| Robert Krysiak 2012               | +                                           | ?                                       | ?                                                         | ?                                               | +                                        | +                                    | +          |

