

The Role of Complementary Medicine in Type 2 Diabetes: An Evidence-based Study on the Clinical Efficacy of Chromium Picolinate



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Background

- Prevalence of diabetes worldwide has increased by 150% (2010-2019)
 - 9th Leading cause of death
 - Type 2 diabetes accounts for 90% of all diabetic cases
 - Management of diabetes
 - Lifestyle modifications : healthy diet & increase physical activity
 - Prescription drugs : antidiabetic mediations (e.g., metformin)
 - Alternatives : Complementary and Alternative Medicines**
- Diabetic patients may look for alternative medicines that may supplement their existing treatment regimen and many complementary medicines or dietary supplements have been **sold without substantial or high-quality evidence** on their efficacy.
- Complementary Medicine is a huge business in Australia, with annual revenue of **\$4.9 billion in 2017**
- One of the active ingredients in marketed complementary medicines that claims to be able to control blood glucose levels is **Chromium Picolinate**.

Aim & Hypothesis

- Aim**
To evaluate the evidence on the clinical efficacy of chromium picolinate supplementation for controlling blood glucose levels in adults with type 2 DM.
- Hypothesis**
It is hypothesised that daily supplementation of chromium picolinate is effective in controlling blood glucose levels of adults with type 2 DM.

Methods

- Systematic review of randomized controlled trials (RCTs) was done according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline.
- Online search from 3 database (PUBMED/MEDLINE, Cochrane Central, SCOPUS) was conducted based on the following criteria:

Inclusion Criteria	Exclusion Criteria
Randomized Control Trial (RCT) study design, including parallel and crossover studies	Animal or plant studies, including studies using either live animal/plant or animal/plant tissue
Adults diagnosed with existing type 2 DM or NIDDM as subjects of the study (both intervention and control groups)	Subjects with type 1 DM/IDDM, pre-diabetes, or no diabetes at all
Chromium supplementation as the intervention	Intervention using chromium compounds other than chromium picolinate or chromium picolinate combined with any other metallic ions
Subjects' fasting blood glucose and/or postprandial blood glucose levels are available	Studies that do not have blood glucose and/or postprandial blood glucose levels as an outcome or incomplete data.
	Comparator or placebo contains other active ingredient(s).

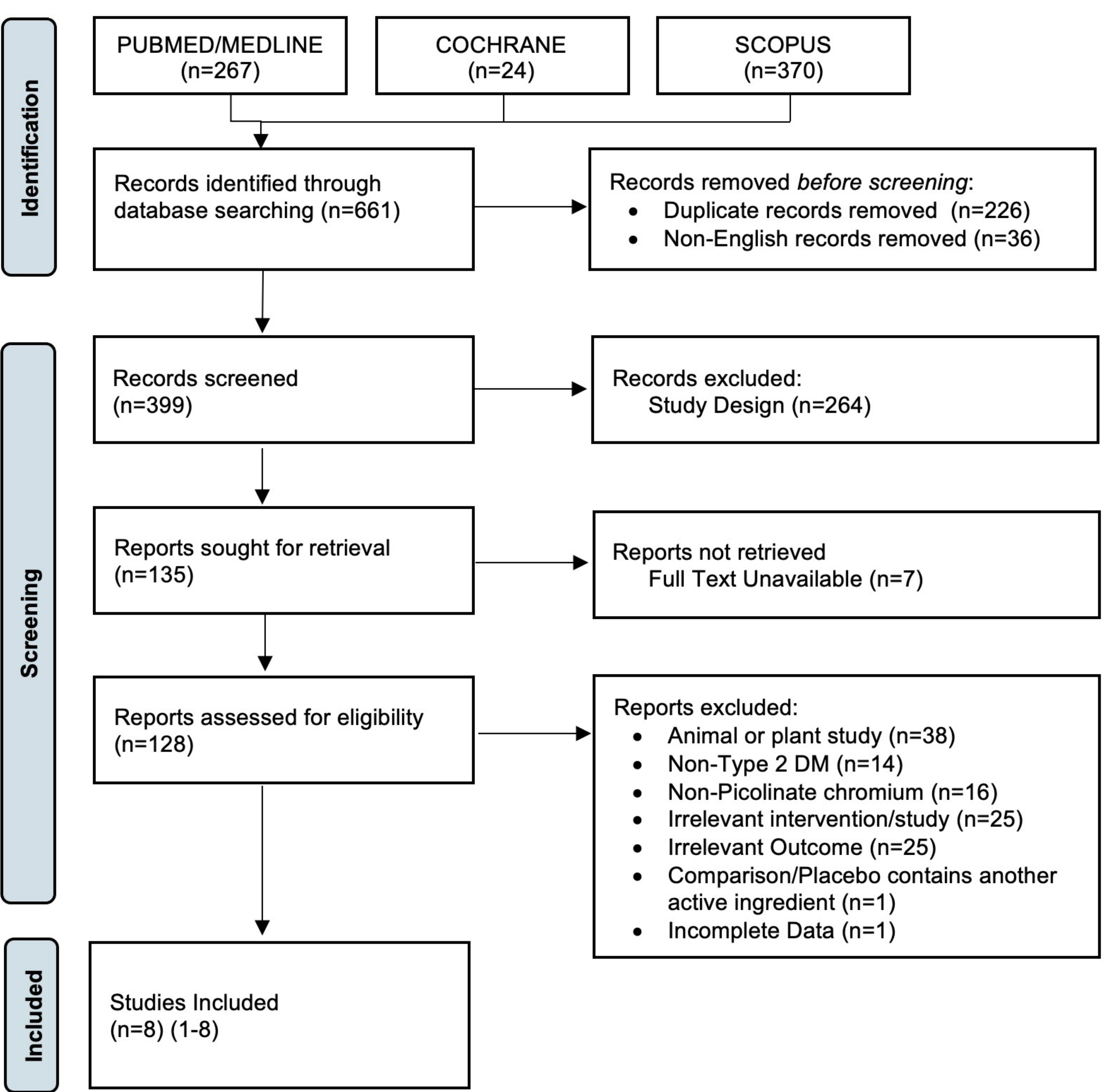
All included studies were assessed for bias based on the Cochrane Collaboration's tool for assessing risk of bias in randomised trials.

Risk of Bias Assessment

#	Study (Year)	Selection Bias	Performance Bias	Detection Bias	Measurement Bias	Recall/Responder Bias	Attrition Bias
1	Ghosh, et al. (2002)	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
2	Singer, et al. (2006)	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
3	Cefalu, et al. (2010)	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
4	Farrokhan, et al. (2020)	Low risk	Medium risk	Low risk	Low risk	Low risk	Low risk
5	Rabinovitz, et al. (2004)	Low risk	High risk	Low risk	Low risk	Low risk	Low risk
6	Albaracin, et al. (2008)	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
7	Albaracin, et al. (2007)	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
8	Anderson, et al. (1997)	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk

Overall, the included studies have low risk of bias. However, One study (Farrokhan, et al.) did not mention whether they applied double-blinding, therefore having a medium risk for performance bias. Another study (Rabinovitz, et al.) only applied single blinding and no placebo for the control group, both of which have high risk for performance bias.

Results



- 8 randomized controlled trials (RCT) were included after satisfying the eligibility criteria.
- 3 studies reported both fasting and postprandial blood glucose levels while the remaining 5 only reported fasting blood glucose levels.
 - 7 studies reported significant reduction in fasting blood glucose levels and 3 studies reported significant reduction in postprandial blood glucose levels after the intervention.**
 - 1 study did not report any significant impact of the chromium picolinate supplementation towards the fasting blood glucose levels.

The exact physiological mechanisms and pathways on how chromium may influence the sensitivity of insulin and glucose uptake is still an active area in research. Some studies have shown that chromium influences the sensitivity of insulin receptors and cellular pathways.

The risk and safety of chromium picolinate supplementation has not been shown or thoroughly studied from the included studies.

Conclusion

- Based on the synthesized evidence, it can be concluded that **chromium picolinate supplementation is effective** in controlling the blood glucose levels of adults with type 2 DM.
- Safety of chromium picolinate not addressed
 - Optimal dose not studied

Future Directions

As chromium is a heavy metal, the risk and safety assessment of chromium supplementation, especially in the long term, should be studied to prevent harm for the patients or consumers. Future studies may also look into the Ideal dose (minimal dose with maximum efficacy) for chromium picolinate and reduce the possibility of side-effects from consuming the complementary medicines.