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Preventing the progression of Type 2 diabetes in adults at high risk: a systematic review and network meta-analysis of lifestyle and pharmacological interventions

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Background

Type 2 diabetes mellitus is associated with significant clinical and social consequences, including a reduced quality of life and reduction in life expectancy of up to 10 years, and can account for up to 10% of healthcare budgets. This review updates an earlier systematic review and pairwise meta-analysis performed by Gillies *et al.*[1] by including additional randomised controlled trials and longer follow-up data that was not available to that systematic review, as well as additional interventions compared using a network meta-analysis.

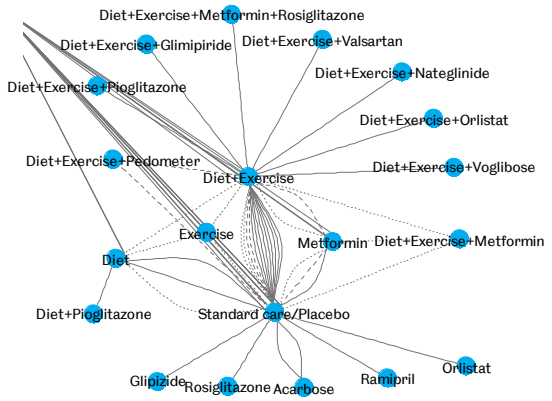
Methods

Log-hazard ratios (LHR) quantifying the effect of interventions on the time to progression to Type 2 diabetes mellitus were synthesised using a Bayesian random effects network meta-analysis[2], which allows the synthesis of direct and indirect evidence about the effects of interventions in studies that share at least one common intervention. The analyses were conducted using WinBUGS[3] with model parameters estimated using Markov chain Monte Carlo simulation (MCMC). Vague prior distributions were defined for all model parameters.

Results

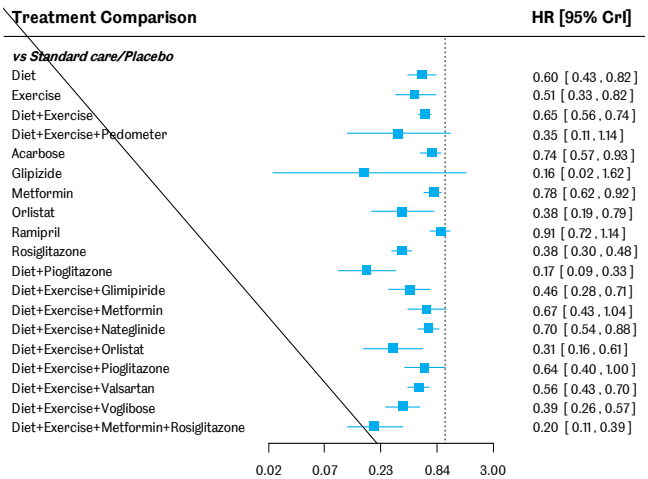
20 interventions were compared across 26 2-arm, two 3-arm and two 4-arm studies (**Figure 1**). Only 5 comparisons were informed by more than 1 trial.

Figure 1: Network of evidence



There was evidence to suggest that all interventions were associated with a reduction in the risk of developing Type 2 diabetes mellitus compared to standard care, although the effects of diet plus exercise plus pedometer, glipizide, ramipril and diet plus metformin plus exercise were statistically inconclusive compared to standard care (**Figure 2**). The most effective interventions relative to standard care were glipizide (HR 0.16, 95% CrI [0.02, 1.62]), diet plus pioglitazone (HR 0.17, 95% CrI [0.09, 0.33]), and diet plus exercise plus metformin plus rosiglitazone (HR 0.20, 95% CrI [0.11, 0.39]).

Figure 2: Forest plot interventions vs. standard care/placebo



The ranking probabilities (not presented) suggested that diet plus exercise plus pedometer, orlistat, glipizide, diet plus pioglitazone and diet plus exercise plus metformin plus rosiglitazone are likely to be among the most effective interventions at preventing progression to Type 2 diabetes mellitus.

Conclusions

Lifestyle and pharmacological interventions are beneficial in reducing the risk of progression to Type 2 diabetes mellitus in adults at high risk. A change in lifestyle has a primary prevention role for a range of chronic condition but there is additional value in adding a drug intervention to prevent Type 2 diabetes mellitus. Adverse events and cost should be taken into account when considering potential risks and benefits and the cost-effectiveness of pharmacological interventions.

References

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