

## Dietary and physical activity/exercise behavioural interventions for weight loss in adults with chronic kidney disease: a systematic review

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### Introduction

Overweight/obesity are risk factors for developing chronic kidney disease (CKD), increasing progression to dialysis, and limiting suitability for, and adversely affecting outcomes after, kidney transplant. Little is known about how clinical teams should support adults with CKD to achieve and maintain weight loss using diet and physical activity (PA)/exercise.

We conducted a systematic review of randomised controlled trials (RCTs) to establish the effect of dietary or PA/exercise behavioural interventions on body weight (primary outcome) and other anthropometric outcomes (body mass index, waist circumference, waist-hip ratio, body fat percentage). Safety of interventions was assessed by estimated glomerular filtration rate (eGFR) and serum creatinine.

### Methods

Six bibliographic databases (plus hand and citation searching) were searched to identify RCTs of dietary or PA/exercise behavioural interventions in adults with CKD (pre-dialysis, dialysis and post-transplant). Articles were independently assessed for inclusion by two reviewers. Study characteristics, methodological quality, practical strategies for changing dietary and PA/exercise behaviour (taxonomy of theory-linked behaviour change techniques [BCTs]), and treatment fidelity strategies were captured using a structured data extraction form. Meta-analyses were conducted separately for pre-dialysis, dialysis and renal transplant studies to establish overall effects on outcomes for four types of comparisons (i) diet versus usual care; (ii) PA/exercise versus usual care; (iii) PA/exercise and diet combined versus usual care; and (iv) diet versus diet and PA/exercise combined. Active ingredients (behavioural theories/models, BCTs, intensity, duration and other features such as mode of delivery) of interventions associated with clinically significant improvements in outcomes were identified by calculating a 'promise' ratio.

### Results

Twenty-one RCTs, with a combined sample size of 1,990 patients were identified: n=14 (pre-dialysis); n=2 (dialysis); and n=5 (transplant). PA/exercise interventions (versus usual care) for pre-dialysis patients produced a statistically significant reduction in body weight (standardised mean difference [SMD] - 0.86 Kg, 95% CI [-1.63, -0.08] based on data from two studies. Meta-analyses for dialysis studies showed no statistically significant effects of PA or diet (or combinations) on outcomes of interest. PA/exercise and dietary combined interventions (versus usual care) for kidney transplant patients produced a statistically significant reduction in body mass index (SMD - 0.57 Kg/m<sup>2</sup>, 95% CI [-1.12, -0.03] based on data from two studies. Only one study reported a statistically significant decrease in eGFR. Fifteen BCTs were associated with promising interventions for pre-dialysis studies (e.g. instruction on how to perform a behaviour, and self-monitoring of behaviour). Promising features of pre-dialysis interventions were low-fat diets, aerobic PA/exercise, high intensity ( $\geq 21$  contacts), interventions delivered via one-to-one and group sessions, and those with a supervised component.

### Discussion

Dietary and PA/exercise interventions for pre-dialysis and kidney transplant patients are feasible, safe and can lead to improved anthropometric outcomes in adults with CKD. There is a pressing need for more research on behavioural interventions for dialysis patients. Future studies should aim to identify which

combinations of BCTs and other promising intervention features are most acceptable to patients at pre-dialysis, dialysis and transplant stages of CKD to inform intervention design, alongside implementation of treatment fidelity strategies to maximise outcomes.