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Corresponding author:
Thomas Hawke

hawke@mcmaster.ca

Author Affiliation:
McMaster University.

Whole body resistance training on functional outcomes of patients with stage 4 or 5 chronic kidney disease: A protocol for a systematic review

Abrahim, S; Steele, AP; Voth, J; Krepinsky, JC; Lanktree, MB; Hawke, TJ.

ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 16 May 2024 and was last updated on 16 May 2024.

INTRODUCTION

Review question / Objective The purpose of this systematic review is to critically appraise the scientific literature with respect to the effects of resistance training on clinically-relevant metrics of functional capacity in Stage 4 and 5 CKD patients. This will help to better inform the association between resistance exercise training and outcomes related to quality of life for CKD patients and assist in improving exercise prescription recommendations accordingly.

Rationale Currently, there's a noticeable gap in the literature regarding the impact of exclusive resistance exercise on populations prone to developing sarcopenia, of which chronic kidney disease patients are included. There is a need for more information on the prescription of resistance exercise to those with late stage chronic kidney disease to improve muscle outcomes and ultimately quality and quantity of life.

Condition being studied The condition being studied is chronic kidney disease (CKD), specifically in stage 4 and 5 as indicated by their estimated glomerular filtration rate (eGFR). Stage 4 and 5 CKD is when symptoms related to muscle weakness and quality of life typically occur.

METHODS

Search strategy The following 8 databases were searched for eligible studies: Pubmed, Embase, Cochrane, CINAHL, Scopus, Web of Science, MEDLINE and AGELINE. The database search included articles published on or before December 31, 2023. The following MeSH terms and keyword combinations were used for screening articles:

Adults 40 years and above- Senior OR elderly OR retiree OR geriatrics OR older people OR older persons OR aging OR older adult OR middle aged OR adults OR middle adulthood OR patients OR patient
AND
Intervention- Resistance exercise training OR RT OR resistance exercise OR weight training OR bodyweight OR BW OR plyometrics OR free weights OR strength training OR physical functioning OR isokinetic OR exercise training
AND
Outcome- 6MWT OR 6 minute walk test OR grip strength OR Timed up and go OR TUG or sit to stand OR STS OR functional measures OR functional ability OR strength measures OR mobility OR functional capacity OR functional measure OR muscle strength OR physical capacity OR quality of life OR QOL
AND
Disease- CKD OR Chronic kidney disease OR end-stage renal disease OR ESRD OR chronic kidney failure OR polycystic kidney disease OR diabetic nephropathy OR nephritic OR nephrotic OR nephropathy OR kidney failure OR chronic renal insufficiency OR hemodialysis OR HD.

Participant or population The study population included adults 40 years of age and older with stage 4 or 5 CKD (with and without dialysis). No exclusions were made based on ethnicity.

Intervention The intervention investigated was resistance training following the Canadian Society for Exercise Physiology (CSEP) guidelines of 2 days/week of structured resistance exercises that use major muscle groups. Moreover, the minimum intervention period was 7 weeks, as a previous meta-analysis has shown optimal improvements in health outcomes from resistance training at this intervention duration.

Comparator The comparison group was participants who maintained their usual physical activity habits and did not complete the prescribed resistance exercise training.

Study designs to be included The studies included were randomized control trials or nonequivalent comparison group studies.

Eligibility criteria Articles were included only if both upper and lower body exercises are involved in the resistance training protocol. Articles were excluded if they are opinion-based or if they are published in a language other than English. They were also excluded if the mean age of the study population was less than 40, the intervention period was for less than 7 weeks, or the resistance training was less than two days/week. Additional exclusion criteria included a lack of control group, no confirmation that resistance training was included in the methodology, or that the studies were conducted in a non-human model.

Information sources The following 8 databases were searched for eligible studies: Pubmed, Embase, Cochrane, CINAHL, Scopus, Web of Science, MEDLINE and AGELINE.. For missing and unclear information, study authors were contacted for additional details.

Main outcome(s) The main outcome was functional metrics, assessed by four measurements including handgrip strength, six-minute walk test, timed up-and-go test, and the sit-to-stand test.

Data management Rayyan, a reference management website, was used to collect and screen articles.

Quality assessment / Risk of bias analysis Risk of bias was assessed using the Cochrane risk-of-bias tool for randomized trials (RoB 2). The RoB 2 is the recommended and standard tool to asses bias in randomized control trials, and it includes the following domains: bias arising from the randomization process, bias due to deviations from intended interventions, bias due to missing outcome data, bias in measurement of the outcome and bias in selection of the reported result.

Strategy of data synthesis Data extraction was performed to identify characteristics of each study, including first author, country, publication year, sample size, stage of CKD, outcomes measured, description of exercise intervention, age range, and main results for each outcome. Effect sizes for each of the four functional outcomes were calculated. Effect sizes (dppc) of mean differences for outcomes with groups of unequal sizes within pre-post-control research designs were computed based on Carlson & Schmidt (1999) and as recommended by Morris (2008).

Subgroup analysis None.

Sensitivity analysis None.

Language restriction Only studies published in english were included.

Country(ies) involved This systematic review was carried out in Canada.

Keywords Kidney disease, chronic; resistance exercise; weight-lifting exercise; exercise training; physical fitness; systematic review.

Contributions of each author

Author 1 - Salma Abrahim - Planned the systematic review framework, conducted the database search and collection of the articles, was the first article screener, conducted data extraction, and conducted majority of the writing of the manuscript.
Email: salma.abrahim@sickkids.ca
Author 2 - Alexandra P. Steele - Assisted in collection of the articles, was the second article screener, conducted data extraction, registered the systematic review protocol, and assisted in editing the manuscript.
Email: steela2@mcmaster.ca
Author 3 - Jennifer Voth - Performed statistical analyses and assisted in editing of the manuscript.
Author 4 - Joan C. Krepinsky - Assisted in conceiving and designing the study and editing of the manuscript.
Author 5 - Matthew B. Lanktree - Assisted in conceiving and designing the study and editing of the manuscript.
Author 6 - Thomas J. Hawke - Conceived and designed the study, assisted in writing and editing the manuscript.