



THE EFFECTIVENESS OF INDIGENOUS KNOWLEDGE-BASED LIFESTYLE INTERVENTIONS IN PREVENTING OBESITY AND TYPE 2 DIABETES MELLITUS IN INDIGENOUS CHILDREN IN CANADA: A SYSTEMATIC REVIEW

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INTRODUCTION

The rates of obesity and type 2 diabetes mellitus (T2DM) are rising in Indigenous communities in North America (1, 2). Indigenous children in Canada have one of the highest incidence rates of pediatric T2DM in the world, at 12.45/100,000 persons/year (3, 4). The increase in T2DM is mainly driven by obesity, which manifests early in life and rises with age (3). As such, there is a critical need for prevention and treatment strategies that address T2DM and related comorbidities in Indigenous children. It is recommended that sustainable interventions for Indigenous populations are controlled and owned by local communities to maximize their success (5). The Indigenous peoples of Canada can be categorized into three main groups: First Nations, Métis and Inuit, each with unique beliefs and cultures. Interventions that incorporate Indigenous Knowledge and practices, and encompass the holistic vision of physical, mental, emotional, and spiritual health, will increase buy-in by communities (6).

AIM

This systematic review aimed to answer the following research question: *In Indigenous children in Canada, are traditional knowledge-based lifestyle interventions effective in preventing obesity and T2DM?*

METHOD

Literature Search: A literature search was conducted in May 2020 across multiple databases. The primary outcomes for this systematic review were changes in Body Mass Index (BMI) z-score with the implementation of the intervention, and the diagnosis of T2DM. The secondary outcomes included changes in total adiposity (fat mass) and central adiposity (waist circumference (WC), waist-to-hip ratio, waist-to-height ratio and skinfold thickness), and lifestyle factors (nutrition and physical activity). **Eligibility Criteria:** The study designs we aimed to include in this review were randomized control trials (RCTs), non-RCTs and uncontrolled pre-/post-test studies. Studies that recruited Indigenous boys and girls <18 years of age were included. Studies were included regardless of the publication language, date or setting. **Meta-Analysis:** An exploratory meta-analysis was conducted for two studies. The chi-square test of homogeneity and inconsistency index (I^2) were used to evaluate the heterogeneity of the meta-analysis results. **Risk of Bias & GRADE:** Risk of bias was assessed using the Risk Of Bias In Non-randomised Studies - of Interventions (ROBINS-I) tool for non-RCTs and University of Alberta Evidence-based Practice Center (UAEPC) tool for uncontrolled studies. The GRADE guideline was used to assess the overall confidence in the reported evidence.

RESULTS

Ten studies were included in this systematic review, with four non-RCTs and six uncontrolled pre-/post-test studies. Nine studies were conducted in First Nations communities and one study was conducted in a Métis community. Across all studies, there were a total of 1328 children receiving a school and/or community-based intervention, and 382 children in control groups. Four studies aimed to evaluate diabetes prevention program, notably the Sandy Lake Health and Diabetes Project and the Kahnawake School Diabetes Prevention Project. An exploratory meta-analysis was conducted for BMI z-score and WC (7, 8). The pooled mean difference was -0.10 (95% CI -0.16,-0.04) for BMI z-score and -2.10 (95% CI -3.69,-0.50) for WC, favouring the intervention group. Both studies involved school-based programs with peer-led components that promoted healthy living behaviours and self-efficacy (7, 8). However, one uncontrolled study reported no change in BMI z-score and an increase in WC with the intervention (9). Notably, this study aimed to evaluate a school-based program that did not have peer-led components. Another uncontrolled study reported an increase in both BMI z-score and WC with the intervention (10). A peer-led component was only one aspect of the intervention delivered. There were no significant changes with the intervention to lifestyle factors across the included studies. Nine of the included studies reported changes in diet with the intervention, with two uncontrolled studies (11, 12) reporting some improvements in diet and the

Study ID Author Last Name (Year)	Study Design	Number of Participants (Intervention:Control)	Intervention Description	Key Outcome Results	Risk of Bias Assessment
Paradis et al. (2005)	Cross-sectional, longitudinal study with control arm	458:199	Kahnawake Schools Diabetes Prevention Project (KSDPP)	Skinfold thickness increased less rapidly in intervention vs. control group. Increase in BMI and no improvements in physical activity or diet.	Moderate/ Serious
Oosman (2012)	Non-randomized clinical trial with control arm	16:22	Métis culture-based comprehensive school health program	No significant changes in dietary intake between intervention and control groups with the intervention. No changes in physical activity.	Moderate
Ronsley et al. (2013)	Non-randomized clinical trial with control arm	118:61	Healthy Buddies™ (HB) school-based program (Peer-led component)	Reduced BMI z-score and WC with intervention.	Serious
Eskicioglu et al. (2014)	Quasi-experimental clinical trial with control arm	51:100	School-based healthy eating and physical activity program (Peer-led component)	Reduced BMI z-score and WC with intervention.	Serious
Saksvig et al. (2005)	Pre-/post-test (uncontrolled)	122:0	The Sandy Lake Health and Diabetes Project (SLHDP)	Mean BMI and body fat % increased with intervention.	Unclear
Adams et al. (2005)	Pre-/post-test (uncontrolled)	140:0	Kahnawake Schools Diabetes Prevention Project (KSDPP)	No changes in BMI or diet with the intervention.	Low
Tomlin et al. (2012)	Pre-/post-test (uncontrolled)	133:0	Action Schools! BC: school-based physical activity and healthy eating intervention	Increased WC z-score and aerobic fitness with the intervention. No changes in BMI z-score, physical activity and diet.	Low
Kakekagumick et al. (2013)	Pre-/post-test (uncontrolled)	43:0	The Sandy Lake Health and Diabetes Project (SLHDP)	Increase in BMI z-score, WC and body fat % with the intervention.	Unclear
Triador et al. (2015)	Pre-/post-test (uncontrolled)	76:0	EarthBox Kids: an obesity prevention garden education project.	No improvement in self-reported food consumption with the intervention. Improvements were observed in preferences for fruits and vegetables. Improvements in dietary intake with the intervention, however most children did not meet intake recommendations. Moderate improvements observed in physical activity with intervention.	Unclear
Gates et al. (2016)	Pre-/post-test (uncontrolled)	49:0	Healthy school snack program		Unclear

Figure 1. Study Characteristics

remaining reporting no significant changes (7, 9, 10, 13-16). The ROBINS-I tool was used to evaluate the risk of bias in the four studies with a control group, revealing a low risk of bias in participant selection and data reporting. The UAEPC tool was used to assess risk of bias in the six uncontrolled studies, with four studies ranked at an unclear risk of bias, and two studies ranked at a low risk of bias. An unclear risk of bias assessment was a result of the absence of an independent outcome assessor and/or a standardized measurement method (Figure 1). The overall quality of evidence using GRADE was low or very low due to the lack of randomization and small sample sizes.

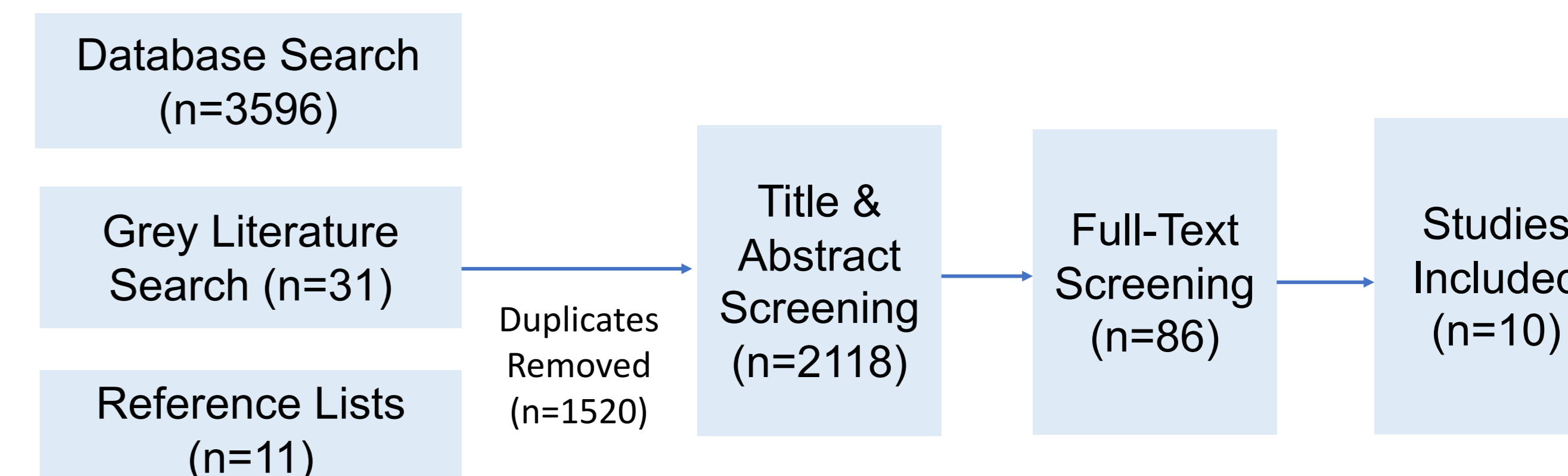


Figure 2. PRISMA Diagram

CONCLUSIONS

This systematic review suggests that the implementation of Indigenous Knowledge-based lifestyle interventions with a peer-led component may improve BMI z-score and WC among Indigenous children in Canada. However, the lack of randomization lowered confidence in the evidence, and suggest the need for Indigenous-led RCTs to establish culturally appropriate interventions to ensure the success of interventions in preventing obesity and T2DM.

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