Lifestyle modification for the primary prevention of type 2 diabetes mellitus in the Canadian Aboriginal population

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ABSTRACT

Canada's Aboriginal populations have significantly higher rates of type 2 diabetes compared to non-Aboriginal Canadians. In First Nations populations living on reserve, the rates are more than double. Large randomized controlled trials (RCTs) have shown that intensive lifestyle modification in individuals with impaired glucose tolerance can decrease the overall incidence of diabetes by up to 22%.

Implementing lifestyle interventions into clinical practice remains a significant challenge because of both limited resources and uncertainty about optimal program design. Most studies have focused on translation into the primary care setting, and have shown moderate benefits. However, there have been no trials examining the feasibility and effectiveness of RCT-based lifestyle modification in Canadian Aboriginal communities. Canadian initiatives have so far focused on school-based healthy lifestyle curriculum and community awareness, but have had little success in reducing weight.

Factors such as community remoteness, cultural diversity, poor retention of health care workers, and lack of access to healthy food are significant barriers to implementing lifestyle modification programs in Canadian Aboriginal communities. More importantly, these communities face systemic inequalities that must be addressed in order to achieve meaningful and sustained lifestyle changes.

DIABETES IN CANADIAN ABORIGINAL POPULATIONS

Canada's Aboriginal people include First Nations, Inuit, and Métis and constitute 3.8% of the population. Although a rare disease in Aboriginal populations prior to the 1940s, the prevalence of type 2 diabetes mellitus (T2DM) in this population has increased by up to 36% from 2001 to 2006. In 2010 15.3% of First Nations living on reserve, and 8.7% living off reserve reported they had T2DM, compared to 6% of non-Aboriginal Canadians. Diabetes complications and comorbidities also disproportionately affect Aboriginal people.¹

Being overweight and obese are chief risk factors for T2DM. In 2010, 74% percent of First Nations adults living on reserve, and 62% living off reserve reported they were overweight or obese, compared to 52% of non-Aboriginal Canadians.¹ The disparity between Aboriginal people and the rest of Canada is also evident with respect to other T2DM risk factors and health determinants, highlighting the systemic inequalities facing these populations (Table).¹⁻²

GOVERNMENT INTERVENTION

The Canadian government has recognized the diabetes epidemic spreading through First Nations populations. In 1999, Health Canada began the Aboriginal Diabetes Initiative (ADI) as part of the Canadian Diabetes Strategy.³ The ADI began Phase 3 in 2012 with \$275 million of funding over 5 years focusing on initiatives for youth, families, pregnancy and prepregnancy, improved access to healthy food options, and enhanced training for health care providers.

LIFESTYLE MODIFICATION PREVENTS DEVELOPMENT OF T2DM

Seven large randomized controlled clinical trials (RCTs) have been conducted internationally to examine the effect of lifestyle modification on preventing the development of T2DM in patients with impaired glucose tolerance (IGT).⁴ These interventions were found to reduce the overall incidence of diabetes between 4 to 21.7% at a follow-up time of 3 to 6 years.⁴

The Diabetes Prevention Program (DPP) in the United States was the largest RCT, and relied on a lifestyle coach and frequent contact to encourage participants to attain a 7% weight reduction and increase moderate-intensity activity to 150 minutes per week.⁵ The intervention was delivered on an individual basis at a cost of \$1399 per participant and included 16 sessions and follow-ups. At 3 years, those with intensive lifestyle counseling reduced their relative risk of diabetes by 58%.⁶ Weight loss was the single most important factor in reducing diabetes incidence.⁷

Unfortunately, several studies reported that the effects of lifestyle interventions decreased in the long term, and the only study that monitored mortality showed no effect on this outcome.⁴ Although lifestyle modification shows promising results, these studies highlight the difficulty of implementing lasting lifestyle changes in high risk populations, even in highly controlled settings.

TRANSLATING PRIMARY PREVENTION STRATEGIES

The Canadian Diabetes Association Clinical Practice Guidelines (CDA-CPGs) recognize that Aboriginal peoples are at high risk for diabetes and recommend the use of structured lifestyle modification or pharmacological therapy to reduce this risk.⁸ Aboriginal children should be evaluated for modifiable risk factors, prediabetes, and metabolic syndrome.⁹ Screening for diabetes should be started early (age 10 or established puberty) and be more frequent (every 1-2 years) when one or more additional risk factor(s), such as excess weight, abdominal obesity, hypertension, or exposure to diabetes in utero, are present.¹⁰

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Table: Determinants of Health in Aboriginal and Non-Aboriginal Canadians^a

HEALTH DETERMINANTS	FIRST NATIONS (ON-RESERVE)	ABORIGINAL (ON-RESERVE)	TOTAL ABORIGINAL	NON- ABORIGINAL
Daily smoking (%)	46	41		22
Smoked during pregnancy (%)	37			19
Dwellings requiring major repairs (%)	34			8
Living in crowded dwellings (%)			15 ^b (31 ^c)	3
Food insecurity or compromised diet (%)		51		18
Unemployment Rate (%)			22	7
Employment Rate (%)			49	62
Did not graduate high school (%)			48	30
College certificate / university certificate / bachelor's degree (%)			16	28
Incidence of low income in year 2000				
Living in families (%)			22	12
Unattached individuals (%)			57	38
Unmet health care needs in last 12 months				
Northern Territories (%)			18	14
Canada (%)			20	13
Contact with general practitioner in the last 12 months				
Northern Territories (%)			59	76
Canada (%)			77	79
Contact with nurse in the last 12 months				
Northern Territories (%)			49	22
Canada (%)			17	10

^a Adapted from Reading & Wein, 2009.

^b First Nations living on reserve and off reserve.

^c Inuit.

The implementation of RCT-based interventions into clinical practice or community settings poses many challenges and is in the early stages in Canada. However, studies have shown that intensive lifestyle interventions are cost-effective in patients with IGT, leading to a cost saving of \$84,700 per quality-adjusted life-year (QALY) for a median cost of \$1,500 per QALY.¹¹ Below we will summarize implementation attempts in different settings and highlight some lessons learned. Finally, we will identify some important factors to consider for implementation in Aboriginal communities.

TRANSLATION TO PRIMARY CARE

The clinical setting is the most common site for implementing the lifestyle modifications described in RCTs. Adaptation of these interventions into routine clinical practice has required shorter program duration, delivery through group sessions, and intermittent support during the maintenance phase.¹² Challenges to program implementation include recruiting patients, preventing dropout, determining the optimal mode of intervention delivery, and achieving a

sustained lifestyle change.¹³⁻¹⁴ Interestingly, motivational interviewing, a key component of the DPP important in providing resolve to change, is not included in most translational programs.

Several reviews have concluded that implementing lifestyle modifications was feasible and achieved some benefits (eg mean loss at 1 year of 1.8 kg¹², 4%¹³ weight loss).¹²⁻¹⁵ Unfortunately, the impact from translational studies was less pronounced compared to that seen in RCTs like the DPP, which achieved a 5 to 7%¹⁶ weight loss, and there were small or no improvements in fasting plasma glucose or glucose tolerance.¹² Diabetes incidence was usually not measured; however, we know from the DPP that a 5 kg weight loss is estimated to cut the incidence of diabetes in half at 3 years of follow-up.⁷ Therefore, the weight loss achieved in translational studies can also be expected to elicit some reduction in diabetes incidence.

A meta-analysis found the number of sessions attended correlated with increased weight loss and longer programs were likely more effective. Delivery of intervention by lay community staff, use of electronic media, and the absence of a maintenance phase did not have

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a significantly negative impact on weight loss—important findings, given limited resources in rural and Aboriginal communities.¹³

THE CANADIAN PRIMARY CARE EXPERIENCE— "AN OUNCE OF PREVENTION"

"An Ounce of Prevention" was the first study to implement the DPP into primary care in Canada.¹⁷ The 4-week program consisted of a weekly 2-hour session, and was led by a registered nurse or dietitian who delivered 90 minutes of education followed by 30 minutes of guided exercise. The cost of the program was \$470 per participant. Challenges identified included the need for strong endorsement from clinical and administrative leadership to attain optimal space, staffing and recruitment, and the need for ongoing program evaluation.

TRANSLATION TO ALTERNATIVE SETTINGS

Translation studies have also examined the implementation of lifestyle interventions in community centers (eg YMCA), workplaces, and churches. These settings exhibit greater demographic diversity compared to primary care and may be a better model of how to deliver interventions to Aboriginal communities. Unfortunately, settings with the greatest diversity demonstrated lower, though still statistically significant, weight loss, and less session attendance compared to primary care.¹⁵

Whereas primary care may utilize existing relationships with health care providers to enhance efficacy and decrease attrition, they are limited by staff and space availability.¹⁵ These problems are magnified in rural communities because primary care may be unavailable or unable to meet existing health care demands. Community settings use existing structures for program implementation, increase reach in rural communities, and can make use of volunteers.

TRANSLATION TO ABORIGINAL COMMUNITIES

Few studies have implemented lifestyle interventions into Canadian Aboriginal communities.¹⁸⁻²⁰ Challenges to implementation include rural and remote community isolation and unique geography, cultural diversity, low retention of health care professionals, poor continuity of care, lack of appropriate settings for physical activity, unsustainable funding, and lack of access to healthy food.²¹

The CDA-CPGs recommend collaborative strategies to engage entire communities and build trusting relationships, incorporation of traditions and local culture, and use of existing community infrastructure when implementing lifestyle programs.⁹ However, some argue that the CDA-CPGs fall short on how these goals should be achieved, and instead recommend that communities be engaged to develop their own unique practice guidelines.²¹ This requires learning about the community and engaging with the chief and council, local health care professionals, and the wider community for support, design, and implementation of programs.

Despite the largely inclusive nature of Canadian interventions, results have been disappointing. One explanation might be the overemphasis on changing interpersonal determinants of health, rather than systemic and environmental factors hindering change in these communities.²²

In the United States, government funding for the Special Diabetes Program for Indians Diabetes Prevention supported the im-

plementation of a 16-session program delivered to 80 tribes in rural, reservation, and urban settings.²³ Program materials were translated to tribal languages and adapted to local culture. The study reported the average weight loss over 3 annual visits to be 2.5, 1.4, and 1.1 kg, respectively. Since the use of controls was considered unethical, it is uncertain whether the 4% incidence of diabetes among study participants represents a true decrease in incidence.²⁴

THE CANADIAN ABORIGINAL EXPERIENCE

No RCT-based interventions have been implemented in Canadian Aboriginal communities. Lifestyle programs involving inclusive community consultation have been implemented on the Sandy Lake reserve,²⁵ in seven northwestern Ontario First Nations communities,²⁶ in the Kahnawake school district,²⁷ and in the rural Okanagan region.²⁸ These programs have focused on school children and the community at large, and have aimed to increase healthy living skills through a school-based curriculum, promotion of healthy food choices in stores, mass media campaigns, and community events. Unfortunately, despite some studies showing an increase in knowledge, none reported a change in weight or BMI.

Although community-based interventions have a broader reach, the lack of a targeted, intensive approach may have been a factor in the programs' limited success. Participants and staff identified earlier and sustained school intervention, one-on-one communication, increased community awareness, and lower prices for healthy food as ways of improving the program.²⁹

CONCLUSIONS

Despite the largely disappointing outcomes of lifestyle interventions for the prevention of T2DM in Aboriginal communities, a few things are certain. First, Aboriginal communities face many systemic challenges that complicate the already lofty task of achieving sustained individual lifestyle changes through counseling. Second, community ownership and consultation is necessary but not sufficient for programs to deliver measurable risk reductions. Lastly, to achieve a sustained reduction in T2DM incidence, complementary strategies addressing systemic inequalities must be developed, implemented, and evaluated.

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