

Pre-diabetes: Risk factor management

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Key Points:

People with pre-diabetes are at increased risk of developing diabetes.

Given the disproportionately high prevalence of diabetes and pre-diabetes in Māori, Pacific and Indo-Asian people, these groups are especially at risk of developing type 2 diabetes and associated comorbidities.

Pre-diabetes should be managed along with associated cardiovascular risk factors eg, tobacco smoking, high blood pressure, high cholesterol.

Lifestyle interventions can delay or reduce progression to type 2 diabetes, and possibly reduce long-term morbidity and mortality.

A range of interventions are effective; the choice will depend on individual/whānau/family preferences and community resources.

Many interventions can provide better results than usual care, but ongoing support and follow up are required to enable behaviour change.

Efficacy increases with multiple behaviour changes, with weight loss being dominant.

For overweight or obese people, aim for a long-term loss of at least five percent of initial weight.

Introduction

Diabetes is associated with significant morbidity and mortality from both micro- and macrovascular disease, and increased health and societal costs. The prevalence of diabetes is higher in Māori, Pacific and Indo-Asian populations and amongst those living in lower socio-economic areas. Prevention, early identification and effective management of diabetes and associated cardiovascular and metabolic risk factors are key to reducing the population morbidity and mortality burden.

According to the virtual diabetes register (VDR¹, Ministry of Health), an estimated 260,000 New Zealanders had diabetes at end 2015. In the 2008/09 New Zealand Adult Nutrition Survey, an estimated seven percent of New Zealand adults had diabetes and nearly 26 percent had pre-diabetes (Coppell et al 2013). Māori, Pacific and Indo-Asian people have a disproportionately high prevalence of pre-diabetes; over 40 percent of Auckland residents of these ethnicities aged around 40 years have been identified with pre-diabetes or diabetes (Chan 2015).

Pre-diabetes

In New Zealand, HbA1c is the recommended diagnostic screening test for diabetes and pre-diabetes. Individuals with an HbA1c of 41-49 mmol/mol are considered to have pre-diabetes. A fasting glucose concentration of 6.1-6.9 mmol/L is also categorised as pre-diabetes. An oral glucose tolerance test (OGTT) is recommended only when there is uncertainty about the validity of HbA1c measures in

¹ Virtual Diabetes Register, Ministry of Health <http://www.health.govt.nz/our-work/diseases-and-conditions/diabetes/about-diabetes/virtual-diabetes-register-vdr>

specific patients (eg, in the presence of haemoglobinopathy, abnormal red cell turnover or other special clinical reasons) (NZSSD 2011).

People with pre-diabetes are at increased risk of developing both diabetes and cardiovascular disease (Ackermann et al 2011, Huang et al 2016). Lifestyle interventions can delay or prevent the development of type 2 diabetes. This is particularly important for populations who have a high risk of developing type 2 diabetes.

What are the risks of developing diabetes?

Extrapolation from earlier studies with the older definitions of impaired glucose tolerance (IGT) and impaired fasting glucose (IFG) is difficult when applied to people detected using HbA1c. For those people with IGT or IFG, approximately 5-10 percent of people with pre-diabetes progress to type 2 diabetes each year. However, based on the HbA1c defined pre-diabetes, the proportions of people who develop diabetes may be closer to 2% per year (Yudkin 2016). This risk is higher in people who are overweight or obese, and the risk increases as HbA1c levels rise.

Given the disproportionately high prevalence of diabetes, pre-diabetes and other cardiovascular risk factors in Māori and Pacific people, these groups are likely to be at greater risk of progression to type 2 diabetes and cardiovascular morbidity.

Screening

The New Zealand Guidelines Group (2012) recommended that HbA1c screening for type 2 diabetes be completed as part of a full cardiovascular risk assessment. The New Zealand Society for the Study of Diabetes (2011) advised that the following groups be given priority for diabetes and pre-diabetes screening:

- Those adults over 25 years of age who:
 - have known ischaemic heart, cerebrovascular or peripheral vascular disease
 - are on long-term steroid or antipsychotic treatment
 - are obese (BMI ≥ 30 kg/m²; or ≥ 27 kg/m² in Indo-Asian)
 - have a family history of early age onset of type 2 diabetes in more than one first degree relative
 - are women with a past history of gestational diabetes mellitus.
- Obese children and young adults (BMI ≥ 30 kg/m²; or ≥ 27 kg/m² in Indo-Asian) if:
 - there is a family history of early onset type 2 diabetes
 - they are of Māori, Pacific or Indo-Asian ethnicity.

Managing the risks of pre-diabetes

Progression from pre-diabetes to diabetes can be significantly delayed or reduced through lifestyle modification (Tuomilehto et al 2001, Pan et al 1997, Lindström et al 2006, Li et al 2008, Schellenberg et al 2013) and, to a lesser extent, with drug treatment using metformin (Diabetes Prevention Program Research Group 2002).

Randomised controlled trials of subjects with IGT have confirmed the potential for lifestyle interventions (such as dietary counselling, increased physical activity, weight loss and behaviour modification). These interventions could lead to a 27% reduction to the incidence of diabetes over 15 years. (Lindström et al 2006, Li et al 2008, Diabetes Prevention Program Research Group 2002, Diabetes Prevention Program Research Group 2015). Lifestyle interventions could delay the development of diabetes by 3 to 4 years. (Yudkin 2016). For every one kilogram of weight loss, the risk of diabetes could reduce by 16 percent (Hamman et al 2006). Therefore weight loss is an essential component of diabetes risk management.

Lifestyle interventions are more effective for people with an HbA1c in the higher range (Sakane et al 2014), and more intensive programmes are likely to be more effective (Balk et al 2015). Interventions can provide better risk factor control than usual care (Xiao 2013), but long-term support is often required. Such interventions may potentially yield long-term societal benefits (Dall et al, 2016), but hard evidence is lacking.

While lifestyle advice is being given it is essential that cardiovascular risk is assessed and actively managed if indicated by current national guidelines; this will have a greater early benefit on morbidity and mortality than lifestyle measures alone.

Practice Points

The key principles and actions recommended to help manage the risks of pre-diabetes are outlined below. These are essentially the same as healthy lifestyle advice for all adults.

Initiate change

- Make sure programmes are individually tailored, culturally appropriate and consider non-health social issues. These may be individual or group-based, and use appropriate technological support.
- Ensure the risks associated with pre-diabetes are understood.
- Assess the individual's willingness to change.
- Encourage participant engagement and develop an agreed plan that can be revised and includes follow up.
- Goal setting and self management are important components. Start with small achievable goals, especially for those which might be expected to give the greatest benefit.
- Encourage people to prioritise and make one change at a time.
- Integrate practice-based or referral behavioural support.
- Encourage and congratulate even small successes.

Engage front line healthcare workers

- Ensure all staff are adequately trained, competent and cognisant of referral options.
- Early inclusion of multi-disciplinary support as appropriate may be helpful.
- Use system prompts and tools to help identify, remind and refer people – preferably electronic and linked to patient management systems.
- Provide feedback to staff on referral outcomes and promote effective communication channels.
- Encourage clinical leadership.

Support people to follow healthy eating guidelines

- Encourage people to enjoy a variety of nutritious foods including:
 - vegetables and fruit - at least three servings of vegetables and at least two servings of fruit every day
 - grain foods – at least 6 servings every day; choose mostly whole grain and those naturally high in fibre.
 - milk and milk products - at least two servings every day; select low-fat and reduced-fat varieties
 - legumes, nuts, seeds, fish and other seafood, eggs or poultry, or red meat with the fat removed – at least two servings every day of legumes, nuts or seeds OR at least one serving of seafood, eggs, poultry or red meat every day.

- Encourage people to choose and prepare foods and drinks:
 - with unsaturated fats instead of saturated fats
 - with little or no added sugar
 - that are mostly 'whole' and less processed.
- Recommend drinking plain water instead of sugary drinks and/or alcohol.
- Recommend that people enjoy three meals per day.
- Recommend that some grain foods (but not too much), plus fruit and/or vegetables are included at each meal.
- Recommend control of overall intake eg, smaller portion sizes, less snacking.

Support people to increase physical activity

- Help the individual to identify an activity that fits with their lifestyle and is sustainable – often exercise with others is more enjoyable.
- Recommend aiming for 30 minutes of moderate intensity exercise, such as brisk walking, on most days. Where possible, this should be increased to 60 minutes per day.
- Remind people that any increase in activity, however small, is a positive step; even 'snacks' of exercise of three to ten minutes per day may have some benefit.
- Encourage people to reduce inactivity. Recommend avoiding sitting for extended periods and encourage taking time to stand, stretch, and walk around.
- Recommend including some muscle strengthening activities on at least two days per week.
- Consider a Green Prescription (GRx).

Offer support for weight reduction

- This is one of the most important targets for people with pre-diabetes; weight loss has a wider range of benefits in many long-term conditions beyond diabetes and cardiovascular risk
- For overweight or obese people, aim for a long term loss of at least five percent of initial weight.
- Support people to make good choices about what they eat - follow healthy eating guidelines.
- Encourage people to be as active as possible.
- Note that staying the same weight (not increasing) may be a meaningful achievement for some individuals.

Drug treatment

- Metformin is the only drug currently recommended for the routine management of pre-diabetes. The use of metformin should be considered this in the context of other cardiovascular risk factors and overall cardiovascular risk
- Metformin is an adjunct, not an alternative, and is less effective alone than lifestyle change.
- Treatment with metformin should be considered after six to twelve months for those whose HbA1c levels continue to rise despite lifestyle changes, or when HbA1c levels are close to the cut-off point for diabetes and are not falling (i.e. 46-49mmol/mol).
- It is usually recommended to start with a low dose (500 mg daily or twice daily with food). Increase gradually as tolerated, if required, to 1500-2000 mg per day in divided doses.
- If the patient is intolerant, the dosage can be initiated at 250 mg per day.
- Pioglitazone, while effective, is not recommended because of its side-effect profile.

Offer follow up and support

- Advise smokers to quit and offer support/treatment for this.
- Follow up must reflect the individual's goals and plans, and be agreed with them in the context of whānau/family.
- Initial HbA1c should be repeated after three months of lifestyle change and thereafter at six to twelve month intervals.
- Self-monitored blood glucose measurement and retinal screening are not required or recommended for those with pre-diabetes.

References

- Ackermann RT, Cheng YJ, Williamson DF, Gregg EW. 2011. Identifying adults at high risk for diabetes and cardiovascular disease using haemoglobin A1c National Health and Nutrition Examination Survey 2005-2006. *American Journal of Preventative Medicine* 40(1):11-17.
- Balk EM, Earley A, Raman G, et al. 2015. Combined Diet and Physical Activity Promotion Programs to Prevent Type 2 Diabetes among Persons at Increased Risk: A Systematic Review for the Community Preventive Services Task Force. *Annals of Internal Medicine* 163(6):437-451.
- Chan WC. 2015. Linking Ministry of Health and TestSafe data to support population health improvement. Presentation to Ministry of Health, Counties Manukau District Health Board.
- Coppell KJ, Mann JI, Williams SM, et al. 2013. Prevalence of diagnosed and undiagnosed diabetes and pre-diabetes in New Zealand: findings from the 2008/09 Adult Nutrition Survey. *New Zealand Medical Journal* 126(1370):23-42.
- Dall TM, Storm MV, Semilla AP, Wintfeld N, O'Grady M, Narayan V. 2015. Value of lifestyle intervention to prevent diabetes and sequelae. *American Journal of Preventive Medicine* 48(3):271-280.
- Diabetes Prevention Program Research Group. 2002. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine* 346(6): 393-403.
- Diabetes Prevention Program Research Group. 2015. Long-term effects of lifestyle intervention or metformin on diabetes development and microvascular complications over 15-year follow-up: the Diabetes Prevention Program Outcomes Study. *The Lancet Diabetes & Endocrinology* 3:866-875.
- Hamman RF, Wing RR, Edelstein SL. 2006. Effects of weight loss with lifestyle intervention on risk of diabetes. *Diabetes Care* 29(9):2012-2017.
- Huang Y, Cai X, Mai W, et al. 2016. Association between prediabetes and risk of cardiovascular disease and all cause mortality: systematic review and meta-analysis. *BMJ* 355:i5953.
- Li G, Zhang P, Wang J, et al. 2008. The long-term effect of lifestyle interventions to prevent diabetes in the China Da Qing Diabetes Prevention Study: a 20-year follow-up study. *Lancet* 371:1783-89.
- Lindström J, Ilanne-Parikka P, Peltonen M. 2006. Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: follow-up of the Finnish Diabetes Prevention Study. *Lancet*. 368:1673-79.
- Ministry of Health. 2016. Virtual Diabetes Register (VDR). Internet. Available from: <http://www.health.govt.nz/our-work/diseases-and-conditions/diabetes/about-diabetes/virtual-diabetes-register-vdr> (accessed 6 September 2016).
- New Zealand Guidelines Group. 2012. New Zealand Primary Care Handbook 2012. 3rd ed. Wellington: New Zealand Guidelines Group.
- New Zealand Society for the Study of Diabetes. NZSSD Position Statement on the diagnosis of, and screening for, Type 2 diabetes. September 2011.
- Pan XR, Li GW, Hu YH, et al. 1997. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. *Diabetes Care* 20:537-44.
- Sakane N, Sato J, Tsushita K, et al. 2014. Effect of baseline HbA1c level on the development of diabetes by lifestyle intervention in primary healthcare settings: insights from subanalysis of the Japan Diabetes Prevention Program. *BMJ Open Diabetes Research and Care* 2:1-6.
- Schellenberg, ES, et al. 2013. Lifestyle interventions for patients with and at risk for type 2 diabetes: a systematic review and meta-analysis. *Annals of Internal Medicine* 159(8):543-551.
- Tabák AG, Herder C, Rathmann W, et al. 2012. Pre-diabetes: a high-risk state for developing diabetes. *Lancet* 379(9833):2279-90.
- Tuomilehto J, Lindström J, Eriksson JG, et al. 2001. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine*. 344:1343-1350.

Xiao L, Yank V, Wilson SR, Lavori PW, Ma J. 2013. Two-year weight-loss maintenance in primary care-based Diabetes Prevention Program lifestyle interventions. *Nutrition & Diabetes* 3:e76.

Yudkin JS. 2016. "Prediabetes": Are There Problems With This Label? Yes, the Label Creates Further Problems! *Diabetes Care* 39:1468-71.