

Preventable chronic diseases among Indigenous Australians: the need for a comprehensive national approach

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Indigenous Australians have a life expectancy of approximately 20 years less than non-Indigenous Australians. A major contributor to earlier mortality is premature death from chronic diseases such as heart disease and stroke, diabetes and kidney disease¹. Not only are these conditions much more common among Indigenous people, they occur at much younger ages. In the 25-45 year age group diabetes prevalence and death from heart disease are both 10 times higher than the national rate. Kidney failure is up to 100 times more prevalent in the worst affected communities in remote Australia. These chronic diseases share some common risk factors (poor quality diet, physical inactivity, smoking, central obesity) and frequently occur together in the same individuals. Furthermore they interact to amplify mortality risk. For example, a person with diabetes has 4-6 times higher risk of coronary heart disease (CHD), while end stage renal disease (kidney failure requiring regular dialysis or transplant) increases the risk of CHD 12-20-fold. All available information indicates that this is an escalating epidemic – with increasing prevalence rates and earlier age of onset evident over the past 20-30 years².

Diabetes

The type of diabetes occurring in epidemic proportions among Indigenous people is lifestyle-related – previously known as ‘maturity-onset’, now referred to as ‘type 2 diabetes’. It is a condition of insulin-resistance, rather than insulin deficiency (the body becomes less and less responsive to its own insulin and blood glucose levels rise). The strongest predictor of risk is central obesity: indeed risk increases sharply with even moderate increases in fat on the abdomen. Increasing age is also a risk factor – but much more so when combined with increasing weight. In the wider Australian community, the recent AusDiab Study has found that diabetes prevalence has doubled in the last 20 years in association with increasing body weight and less physical activity of Australians – they have coined the term ‘diabesity’ to highlight the link between weight gain and diabetes risk³. Diabetes is associated with a number of complications affecting small and large blood vessels. If not closely monitored, it can result in blindness and kidney failure, lower limb amputations, heart disease and stroke. These complications are generally related to duration of diabetes: the younger the age of onset, the earlier the development of complications. This means complications are occurring in relatively young Indigenous people – fuelling a very serious public health problem.

In a prospective study in two Central Australian Aboriginal communities, leanness was shown to protect against the development of diabetes across the age range⁴. The obvious conclusion from this and data from other populations is that the risk of diabetes could be greatly reduced if excessive weight gain could be prevented. Diet and physical activity are critical factors – both of which have changed dramatically for Indigenous Australians as they made the transition from traditional hunter-gatherer to western lifestyle.

Kidney failure

In contrast to diabetes, where the relationship between weight gain and risk of diabetes is observed in Indigenous peoples all over Australia, the risk of end stage renal disease (kidney failure) varies widely across regions of Australia. In general the situation is most serious for Aboriginal people in remote areas of northern and western Australia. Researchers from the Menzies School of Health Research compared rates of kidney failure across 36 ATSI regions and found great variation⁵. The differences were largely explained by standard indices for social disadvantage (Socio Economic Indexes For Areas, Australian Bureau of Statistics), with the most disadvantaged communities exhibiting the highest rates of renal failure. The SEIFA indices take into account income, education, occupation/unemployment, and living conditions. There was a 20-fold gradient in kidney failure among Indigenous people between the least and most disadvantaged ATSI regions. This compares to a 3-fold gradient for the non-Indigenous population of Australia.

Social disadvantage and poor health

The pathway by which social disadvantage increases the risk of kidney failure is not yet clearly elucidated. However, it is likely to be related to factors in early life, the burden of infectious disease secondary to poverty and over crowded living conditions, and psychosocial mediators (now also strongly implicated in heart disease and diabetes). The risk factors for kidney failure which have been identified in Aboriginal people include diabetes, high blood pressure, low birth weight, central obesity, and post streptococcal glomerular nephritis (a kidney infection which appears to be secondary to skin infections common among Aboriginal infants and children). Most of these risk factors are also associated with social disadvantage⁶.

Many Aboriginal communities, especially those in remote regions, are very disadvantaged relative to mainstream Australians: poverty secondary to high unemployment and welfare dependency, poor educational outcomes, overcrowded living conditions, poor quality food supply (high cost and limited availability of fresh foods such as fruit and vegetables in particular). Poor health follows. There is a very high burden of infectious diseases, particularly among children, and a very high burden of non-communicable (lifestyle-related) chronic diseases among adults. There is an emerging view that the heavy burden of infectious disease may amplify the risk and/or severity of chronic disease – not just kidney failure as noted above, but vascular disease generally (impacting on both diabetes and heart disease). This effect may be mediated through activation of common inflammatory pathways.

Aborigines as hunter gatherers

It is important to place contemporary Aboriginal health in its historical context. All available evidence indicates that when Aborigines lived as hunter gatherers they were extremely healthy with no evidence of the chronic diseases that plague them now⁷. They had a diet derived from a wide variety of animal and plant sources. It was characterized by many qualities now recognized as desirable: low saturated fat, relatively rich in omega-3 polyunsaturated fat, high fibre, low glycemic index, rich in essential micronutrients (vitamins, minerals, antioxidants and other bioactive chemicals from plants), and low energy density (high bulk). Because they had to hunt and gather daily,

physical activity was built in to daily routines. There was a very high level of social cohesion within clear social structures, and no evidence of substance abuse. From the psychosocial perspective community members were mutually supportive and interdependent. The loss of this lifestyle is a source of great distress to most Indigenous people, whether that loss was in their own lifetimes or earlier in the period of colonization.

Under these very different lifestyle circumstances Aborigines had no evidence of the chronic diseases that now occur so commonly: they were lean, and had low blood pressure, cholesterol and glucose. Furthermore, these risk factors did not increase with age as they do in western societies. Because they lived in relatively small family groups and were primarily nomadic (within well defined 'homelands' recognized by Traditional Law), infectious diseases were likely to have been uncommon.

The therapeutic potential of the hunter gatherer lifestyle

There is no question that the hunter gatherer lifestyle promoted good health and protected against chronic diseases such as diabetes, kidney failure and heart disease. There is also evidence that it could be therapeutic. In 1980 I examined the impact on health of temporary reversion to hunter gatherer lifestyle on a group of middle-aged, diabetic Aborigines from the West Kimberley region of WA⁸. This unique study was possible because the people involved had retained the knowledge and ability to live as hunter gatherers. They were all over weight or obese at the outset. After 7 weeks living off their traditional lands their health profile was transformed. They lost on average 7 kg and the metabolic abnormalities of diabetes were greatly improved (fasting glucose fell from an average of 11.6 to 6.3 mmol/L). Half of them were no longer diabetic. In addition the risk factors for heart disease that we measured (blood pressure, blood cholesterol and triglycerides, bleeding time) all improved markedly. I was struck by the change in people when they were back on their own country: they were confident and assertive, and proud of their local knowledge and skills. At the time we were not able to measure markers of psychosocial state, however observation suggested a very positive change.

This study caught the imagination of Aboriginal people across Australia, and they were not at all surprised by the results. It is an example of a positive model that allows people to feel pride in their traditions, and points the way to interventions which can be based on its principles: physical activity built into daily routines, bush tucker where possible, selection of western foods with the nutritional characteristics of bush foods, and building a greater sense of mastery and control (which will help confront substance abuse and community and family violence).

Other examples of effective interventions

While the model of the hunter gatherer lifestyle is appealing, it is not a practical option for most Indigenous people today. A number of community-based interventions have been conducted in the intervening years which demonstrate that positive change in markers of chronic disease risk can be achieved at the population level. The Minjilang community (on an island off the NT coast) was very distressed when two young footballers in their 20's died from heart attacks in the early 1980's and invited Amanda Lee, then a researcher from the Menzies School of Health Research, to work with them to reduce the risk of heart disease in the community. By working in partnership with the

community council and store she helped them produce significant changes in the food supply which resulted in an improved health profile of the participants⁹. In the course of this and related research on community nutrition and the food supply she identified a number of critical factors in achieving positive change, including the pivotal role of the store manager who has total control over the food supply by controlling what is ordered in. A broader positive outcome from this work was the development of a Nutrition Policy by ALPA (Arnhem Land Progress Association), an Aboriginal community-controlled organization that runs many stores in remote NT Top End communities. Implementation of this policy is variable across remote stores, and is currently under review. Monitoring systems are being developed.

In the early 1990's we were invited to the Looma Community in the West Kimberley region of WA to conduct a community wide screening of diabetes and related conditions among the adult population, and then to work with them to develop interventions to reduce the risk. In this community 25% of people over 15 years had diabetes, and 40% of those over 35. They developed a number of initiatives first targeted at increasing physical activity, then extending to the food supply from the community store, and finally also involving the school. A hallmark of this intervention was the very broad involvement of the community through key local organizations. The focus of the intervention at the store was to increase the consumption of fruit and vegetables and reduce saturated fat and sugar. Over a 4 year period there were significant reductions in plasma cholesterol levels, and other markers of heart disease risk¹⁰. However, diabetes prevalence did not change and the prevalence of obesity rose. This was very disappointing, but reflected the experience of others in interventions in Australia¹¹ and internationally.

The reversal of obesity is extremely difficult to sustain at the population level. However the benefits of increased exercise and improved dietary quality are very important in their own right, particularly in people with diabetes who are at increased risk of heart disease. This is frequently referred to a 'secondary prevention' – the reduction in risk of those who already have a condition. It is never too late to reduce the risk of heart disease. However, in the case of obesity and diabetes, risk reduction must begin in early life. Once established, overweight and obesity are difficult to reverse. The best way to prevent diabetes is to prevent over weight and obesity through a combination of healthy diet and regular exercise.

In recognition of the need for early intervention, the Looma school became involved and introduced a healthy lifestyle approach in their canteen, their physical education and sports program, and in their wider curriculum. Healthy lunches were provided. In place of pies, soft drink and confectionary they offered wholemeal salad rolls with cold meat or cheese, fresh fruit and fruit salad, yoghurt and fruit juice. The community workers then arranged for the school to also provide a low cost breakfast, as many children came to school on empty stomachs. The breakfast was simple – cereal, sultanas, milk, and a piece of fruit and fruit juice. Together these two meals provided the Recommended Daily Intakes for most of the key nutrients for the children.

Schools and Preschool and Childcare centres are ideal settings to implement such programs. Such interventions should be seen as an investment in the health of the next generation – and not dismissed as paternalism ('going back to the days of the former

missions'). Thus, in order to be effective and sustainable they must be strongly supported by the communities, and not imposed from the outside (however well meaning).

Interventions in the primary health care setting

In the early 1990's Dr Wendy Hoy reported that rates of kidney failure on the Tiwi Islands (north of Darwin) were the highest ever reported anywhere in the world, and 100 times higher than in the non-Indigenous population of Australia. She then instituted a trial of ACE Inhibitors (medication for lowering blood pressure) in all people with any signs of renal disease or its risk factors. She demonstrated a reduction in total mortality and mortality from kidney failure over a two year period¹². This was a striking example of the benefits of secondary prevention using pharmacotherapy. The challenge is to sustain these interventions over the long term in the frequently under-resourced primary health care clinics. While appropriate medication is very important (and ensuring compliance is a challenge), diet and other lifestyle modification must continue to be vigorously pursued.

International research of relevance

Diabetes Prevention Program

The largest intervention trial internationally to prevent diabetes in those at risk was completed recently in the US. Over 3000 obese and overweight people at risk of diabetes were randomized to three groups:

- placebo,
- metformin (a drug used to treat diabetes),
- lifestyle modification. The goal of the lifestyle modification program was to achieve and maintain 7% body weight reduction through a combination of a low fat diet and at least 150 minutes per week of exercise.

After a follow up period of just under 3 years the lifestyle modification program reduced the risk of diabetes by 58% relative to placebo, whereas metformin reduced it by 31%¹³. A smaller study in Finland had previously reported an identical reduction in diabetes risk in response to a similar lifestyle intervention¹⁴. These studies are powerful evidence of the value of lifestyle change to prevent diabetes in obese and overweight people at risk – the reduction in incidence was directly related to changes in lifestyle.

The Lyon Diet-Heart Study

There is currently a great deal of interest in the apparent protective effect of the Mediterranean diet against heart disease (and many common cancers). The Lyon Diet Heart Study was a prospective trial in France in which just over 600 patients were randomized to one of two treatments after their first myocardial infarction¹⁵:

- the control diet was based on the American Heart Association Step 1 diet: total fat less than 30% energy, saturated fat less than 10% energy, relatively rich in omega-6 polyunsaturated vegetable oils and spreads;
- the experimental diet focussed on foods: increase intake of fresh fruit and vegetables, use Canola spread and oil (rich in omega-3) and olive oil, cut out dairy fats and other saturated fats, replace red meats with chicken and fish.

All participants continued their usual clinical care under the supervision of their cardiologist. After two years there was a 70% reduction in risk of second heart attack in the experimental group. The results after 4 years confirmed this dramatic result. The benefits were attributed to a marked decrease in the ratio of omega-6/omega-3 polyunsaturated fats (due to a reduction in intake of omega-6 and increases in omega-3), and to a wider variety and amount of fresh vegetables and fruit (rich in antioxidants and other bioactive chemicals).

As a point of clarification the major source of omega-6 polyunsaturated fat in our diet are vegetable seed oils and margarines. Canola oil is one of the few vegetable seed oils to be rich in omega-3 fats, although others have now been developed. The other major source of omega-3 oils are fish and seafood.

GISSI-Prevenzione

This represents a wonderful collaboration of cardiologists in 172 centres across Italy. In this particular study, they enrolled over 11,000 patients who had recently survived a myocardial infarction¹⁶. They were randomized into the following groups:

- 1g omega-3 polyunsaturated oil (fish oil),
- 300 mg vitamin E,
- fish oil plus vitamin E,
- placebo.

There was no effect of vitamin E (confirming a number of other trials). However there was a clear-cut effect of the omega-3 oil in reducing total coronary mortality by 30%, with a particularly striking effect on reducing sudden death by 50%. These effects were evident within 3 months and maintained over 4 years.

In addition all patients were given the following dietary advice at the beginning of the trial: EAT MORE

- fresh fruit,
- fresh and cooked vegetables,
- olive oil,
- fish.

After 6 years those in the top quartile of diet quality had a 50% better survival than those in the bottom quartile, independent of treatment group¹⁷. This remarkably beneficial impact was achieved with a very simple dietary message (eat more fruit, vegetables, fish and olive oil).

The INTERHEART Study

It is estimated that at least 80% of the global burden of cardiovascular disease occurs in low and middle income countries, however most of the knowledge of risk factors comes from studies in high income countries in the developed world. The aim of the INTERHEART Study was to compare the relationships between a range of risk factors and risk of heart attack across the major ethnic groups and countries internationally¹⁸. It was a case-control study conducted at 262 sites in 52 countries, representing every inhabited continent in the world. There were just over 15,000 heart attack cases and just under 15,000 controls. The cases were screened within 24 hours of their first myocardial infarction. The following risk factors were measured:

- smoking
- diabetes
- hypertension
- waist/hip ratio
- dietary patterns (fruit and vegetable consumption daily)
- physical activity
- consumption of alcohol
- blood apolipoproteins (as markers of LDL and HDL cholesterol)
- psychosocial factors

What they found was that these nine modifiable risk factors explained more than 90% of heart disease risk in all populations and across the age range (90% in men, 94% in women). Different combinations of them operated in different populations, but the relationships remained. The most important risk factor worldwide was smoking. The Apo B/ApoA1 ratio (reflecting the ratio of unhealthy/healthy forms of cholesterol) was also very important. Indeed all were important with the exception of alcohol which had only a weak positive effect.

Clearly these risk factors interact with each other: the lifestyle factors (smoking, fruit and vegetable intake, physical activity, alcohol, psychosocial factors) influencing the biological ones (waist/hip ratio, diabetes, hypertension, apolipoproteins). This is why they are all considered to be modifiable.

Subjects with the worst risk profile (negative in all nine areas) had a 330-fold higher risk of heart attack than those with no risk factors (positive in all nine areas). This extraordinary range of risk has profound implications for Aboriginal health, and the potential for reducing the burden of chronic diseases. An adverse risk profile is very common in Aboriginal communities. There are very high smoking rates (up to 70% of adults in some communities), high waist/hip ratio, high rates of diabetes and hypertension, adverse lipid profile, low and irregular consumption of fresh fruit and vegetables, low physical activity, widespread and significant psychosocial distress. These results provide a compelling base from which to develop a model for risk assessment in Indigenous communities. The data also provide a very strong rationale for interventions directed at smoking cessation, improving diet quality (fresh fruit and vegetables in particular), and increasing physical activity. It also highlights the need to address psychosocial distress (enhancing resilience and sense of mastery).

Implications for prevention

These are major challenges that extend well beyond the health sector – education, employment and training, housing are all critical. Disadvantage of Indigenous people must be confronted. A strong argument can be made to focus on children in order to build for the future. An innovative initiative of the Council of Australian Governments (COAG) may provide a model. This is a trial of working together with up to 10 Indigenous communities across Australia using a whole of government approach to provide more flexible programs and services based on priorities agreed with communities through a partnership of shared responsibility. This and other interventions depend fundamentally on genuine community engagement and mutual respect between the collaborating parties.

The importance of early intervention

There is an emerging consensus that the pathways to chronic diseases of adulthood begin in fetal and early postnatal life. Low birth weight is associated with higher risk of central obesity, type 2 diabetes, high blood pressure and heart disease in adult life. Low birth weight is more common in socially disadvantaged communities, and has been linked to maternal smoking, over crowded living conditions, and mother's perceived stress. Low birth weight is more common in remote Aboriginal communities, although its prevalence has fallen in recent years. In a number of high risk areas, the Strong Women Strong Babies Strong Culture program has had a significant impact. In this program older women in communities provide support to young women generally, but particularly during pregnancy.

The first two-three years of life are recognized as being critical in terms of healthy child development. In relation to nutritional status of infants, in many Aboriginal communities where breast feeding is still common the post weaning period is a time of particular vulnerability. The development of a systematic approach to improving nutritional status of infants is well recognized as a priority in the primary health care setting. The provision of subsidized food is likely to be a very cost effective intervention. This could be integrated into education and support sessions delivered by maternal and child health nurses and specialist Aboriginal health Workers.

As noted earlier with the Looma Healthy Lifestyle program, the school is also an excellent setting for nutrition education and provision of healthy meals. If children could receive a healthy breakfast and lunch on five days a week, they would go a long way towards achieving their Recommended Daily Intakes of a number of key nutrients. However, it is important that similar interventions are available for pre-school aged children to maximize the long term benefit.

Other benefits of improved infant and child nutrition

There is little doubt that these interventions would produce very significant additional benefits beyond health. The provision of subsidized breakfast and lunch should encourage improved school attendance which should result in improved education outcomes. In addition, there is evidence from international research that a high quality diet reduces the likelihood of antisocial behaviour in later life.

A well conducted study in the US has demonstrated that support for mothers through pregnancy and for the next two years through regular visits from a maternal and child health nurse results in significantly better long term outcomes for children, particularly for those from socially disadvantaged backgrounds¹⁹. These outcomes included a reduction in criminal and anti social behaviour 15 years later. In a similar vein, a study in Mauritius has shown that malnutrition at age 3 is associated with lower IQ and behavioural problems at age 8, 11 and 17 years²⁰. The authors concluded that reducing early malnutrition may help reduce later antisocial and aggressive behaviour.

Nutritional interventions may also be valuable in reducing violent and antisocial behaviour in later life. Findings from a double-blind, placebo-controlled, randomized trial in young adult prisoners in the UK showed that supplementing the diet with vitamins, minerals and essential fatty acids significantly reduced antisocial and violent behaviour in

prison²¹. This provides a strong rationale for improving diet quality in prisons with a view to improving both health and behaviour!

Conclusion

In summary, chronic diseases represent a serious and escalating health burden for Indigenous populations across Australia. This is not inevitable – local and international experience shows that these conditions are potentially preventable. We have the knowledge base to reduce the devastating impact of early onset chronic diseases in those who already have the conditions, and to prevent or delay their onset in those who have not yet succumbed. It is a challenge that will require strong and long term commitment across government and in Indigenous communities. An excellent starting point would be to work towards improving the health of the next generation through the development of a comprehensive national program to improve maternal and child health. Improved infant and child nutrition through the provision of low cost healthy meals to infants and young children is an achievable and key component of such a strategy. However, it would need to be coupled with education and training of a community-based workforce if the strategy was to be implemented in a sustainable manner. It could be incorporated into the ‘Mutual Obligation’ policy of the Australian Government – recognizing the obligation of Australian society to the healthy development of Aboriginal and Torres Strait Islander infants and children. Alongside the better medical management of chronic diseases must come the broader components of ‘comprehensive primary health care’ which encompass advocacy for a healthier environment (food supply, smoking and other substance abuse, opportunities for regular exercise, appropriate housing, high quality education) as well as education for health promotion, and opportunity for genuine self-determination so as not to continue the current welfare dependency.

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