The Association Between Australian's Dietary Pattern and Risk of Cardiovascular Disease

Ziqi Chen[1, †], Minxin Liang[2, †, *]

[1] College of Public Health, Chongqing Medical university, Chongqing, China

[2] Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, Victoria, Australia

* Corresponding Author Email: Hyuu0023@student.monash.edu

†These authors contributed equally to this work.

Abstract. In Australia, one of the top three causes of death is cardiovascular disease (CVD). For those who already have or are at risk for CVD, a healthy dietary pattern is a critical CVD prevention strategy. Following a diet that complies with the healthy eating guidelines of the Australian government can lower the incidence of cardiovascular disease in Australians. Thus, this study will analyze nutrient, food groups, diet pattern, socioeconomic states of Australian and how they relate to CVD risk as well as other CVD risk factors such as high blood pressure, dyslipidemia, type 2 diabetes mellitus, obesity, and overweight. This study found that low socioeconomic Australians are more likely to have low levels of diet and are at higher risk of cardiovascular disease. In addition, the majority of Australians consume nutrients and food groups that do not meet Australia's healthy eating guidelines, and long-term adherence to this unhealthy diet have a greater risk of developing cardiovascular disease.

Keywords: Cardiovascular Disease, Dietary Pattern, Australia.

1. Introduction

Dietary patterns are made up of the composition of foods, the amount of nutrients and the frequency of food intake in people's diets. Different dietary patterns have varying implications on disease risk factors. Healthy food composition, adequate but not excessive nutrient intake, and suitable frequency of consumption all contribute to healthy dietary patterns that lower the risk of diet-related chronic diseases. Unhealthy dietary patterns, on the other hand, increase the risk of disease, the difficulty of managing the disease process and mortality. Existing studies of dietary patterns are generally analysed along three dimensions: nutrients, food and diet. High intakes of risk nutrients can significantly increase the risk of disease, and poor food choices and low food diversity can also affect the risk of disease. However, diet is not solely responsible for adverse effects on disease. The significant increase in cardiovascular disease risk associated with the Western diet and the practical benefits of the Mediterranean diet are evidence that the choice of dietary pattern greatly influences a person's physical condition. Cardiovascular disease is a classic example of a diet-related chronic disease. Poor dietary patterns increase the prevalence of cardiovascular disease and mortality through factors that affect cardiovascular disease. Type 2 diabetes, hypertension, dyslipidemia, and being overweight or obese are all common CVD risk factors. Australia as a developed Western country is very different from other Western countries. Australia is a highly multicultural country with an immigrant population of over 7.6 million in 2020 and nearly 50% of Australians have at least one parent born overseas [1]. In addition to this, there is a significant wealth gap in Australia, with a large number of studies and evidence linking lower income groups to a higher risk of cardiovascular disease. Low socio-economic status influences a person's dietary preferences and affordability, which has a direct impact on the quality of diet and risk of disease in people on low incomes. Australia's unique demographic composition has resulted in a diverse food culture, where dietary patterns vary greatly between people. However, cardiovascular disease is one of the top three leading causes of death in Australia. There are no studies that have looked at the connection between dietary patterns and high cardiovascular disease morbidity and mortality among Australians. In order to comprehend the

connection between dietary patterns and the high incidence of cardiovascular disease in Australians, this study reviewed food patterns in Australia. Understanding the effects of different dietary components on the prevention and management of cardiovascular disease is the goal, as well as informing future research and the establishment of policies pertaining for prevention or management.

2. Relationship between diet and CVD

Diet impacts the risk of cardiovascular disease through influencing risk factors such as blood pressure, serum cholesterol, diabetes, and body weight. Dietary patterns, food, and nutrient levels are used to analyse how diet affects CVD.

2.1. Nutrient and CVD

The impact of dietary fat intake on disease has always been a key area of CVD analysis. Diets containing saturated fats, monounsaturated fats, polyunsaturated fats (PUFA) and trans fatty acids, and other various different fatty acids can have different effects on CVD. The risk of trans fatty acids on blood lipids and cardiovascular disease has long been established. The type of PUFA can also have a differential impact on cardiovascular disease outcomes. Studies have shown that long-chain n-3 fatty acids in fish oil are associated with a lower incidence of coronary heart disease, while short-chain n-3 fatty acids and α-linolenic acid may also have a protective effect [2]. According to a study on saturated fatty acids, short-chain saturated fats from dairy products were not linked to the risk of coronary heart disease but long-chain saturated fats from meat and dairy products were independently linked to a higher risk of coronary heart disease[3]. The available evidence does not demonstrate that a high-fat diet promotes cardiovascular disease [2]. Therefore, food quality and nutrient content are generally considered to have the biggest impact on diet's ability to reduce the risk of cardiovascular disease.

Water-soluble and fat-soluble vitamins are also involved in sustaining cardiovascular function in both healthy and sickness. Patients with various forms of heart disease have been found to be deficient in both fat-soluble and water-soluble vitamins; therefore, ensuring that plasma vitamin concentrations are within the recommended range can assist to lessen the effects of cardiovascular disease [4]. Recent research confirms the link between vitamin D insufficiency and an increased risk of cardiovascular disease [5]. The prevalence of vitamin D insufficiency is particularly high in Australia. Australia's multicultural background has resulted in a large proportion of its population being migrant and Aboriginal, and the lack of sunlight during the Australian winter months has led to high levels of vitamin D deficiency in Australia. Australians are more likely to develop cardiovascular disease if they have a chronic vitamin D deficiency.

2.2. Food and CVD

Creating policies and guidelines for the management and prevention of cardiovascular disease at the nutritional level is challenging. One of the most recent Australian food consumption guidelines for prevention of cardiovascular disease, as well as other current large international dietary recommendations, are based on food intake patterns rather than nutrients. Plant-based foods are the food group highlighted in all dietary guidelines. More than five servings of fruit or vegetables per day have been linked to a 17% lower risk of coronary heart disease events, according to cohort studies [6]. Dietary fibre from plant foods, both soluble and insoluble, has also been linked to a lower risk of death from diabetes and cardiovascular disease [7]. Processed foods are the type of food that the Dietary Guidelines recommend reducing, while ultra-processed foods are the type of food that all Dietary Guidelines recommend avoiding. Ultra-processed foods are factory-made foods that contain little or no natural foods. According to a meta-analysis, eating more ultra-processed food results in a 12% higher risk of cardiovascular disease. This is due to the presence of a variety of nutrients associated with CVD risk, such as trans fats and sodium, in ultra-processed foods [8, 9]. Processing alters the properties of foods and also affects eating behaviour, satiety signals and food reward

systems [10]. The properties of unhealthy processed foods and the compounds contained within them act synergistically to influence a range of cardiovascular disease pathological mechanisms such as metabolism, pro-inflammation, promotion of thrombosis, cellular oxidation and endothelial dysfunction, ultimately leading to the development of cardiovascular disease [10].

2.3. Diet and CVD

In Australia, poor diet is a significant risk factor for poor health. The Australian Dietary Guidelines advise consuming a range of nutritious foods from five different food groups each day. These are vegetables and pulses/beans, fruit, and cereal (grain) foods. Mostly whole grains and/or high grain fibre varieties, lean meats and poultry, fish, eggs, tofu, nuts and seeds and pulses/beans, dairy product mostly low fat. However, according to the Australian Nutrition and Physical Activity Survey in 2010, less than 1% of Australians report eating in line with recommendations, with less than 4% reporting meeting the recommended minimum portion sizes and consuming more than 35% of adult energy intake of discretionary foods [11]. Most Australians did not consume enough of the minimum suggested portion sizes for the five major food groups [11].

Over 60.5% of Australians met the WHO requirement of five servings of fruit and vegetables per day, according to a large cohort study. In Australia, all-cause mortality was found to be negatively correlated with daily consumption of fruit and vegetables, according to the study's findings [12]. The average daily intake of grains in Australia is 4.5 servings, with men consuming approximately 1.3 servings more than women [13]. However, only about a third of Australians' carbohydrate intake comes from whole grains or high fibre sources [14]. Therefore, the risk of cardiovascular disease and its related health care costs and productivity losses could be effectively decreased by increasing the intake of whole grains in the Australian diet [14]. Consumption of red meat and processed meat is significantly connected with an increase in coronary heart disease and other cardiovascular disorders. This association remains significant in Australia but the association between processed meat and CVD risk is stronger than the association with red meat [15]. It is therefore particularly important to control the intake of processed meat to manage the risk of cardiovascular disease.

Adults should consume 2-3 servings of milk or dairy products daily to get the adequate amount of calcium and minerals, according to dietary guidelines. Full-fat dairy products have been demonstrated in numerous studies to have a protective impact in the cardiovascular disease. This might be due to full-fat dairy products' high nutritional utilisation and anti-inflammatory effects [16]. Some countries consider dairy consumption as a specific component of primary and secondary cardiovascular disease prevention [17]. However, studies have found that people who consume low-fat milk on a long-term basis have lower mortality rates (31% of men and 41% of women) and a decreased risk of getting ischemic heart disease than people who regularly drink whole milk [17]. They also found that one in two people with cardiovascular disease consumed low-fat milk. Although Australia's dietary guidelines encourage the use of low-fat milk instead of whole milk, reduced whole milk consumption may help Australians with cardiovascular disease morbidity and death since the overall prevalence is only 50%.

The survey collected dietary data from 2011-2013 and compared with data from 1995 found that Australians now consume more poultry and fewer vegetables than in the past [11]. An increased risk of cardiovascular disease is linked to such dietary patterns. Another Australian study examined demographics and dietary fat intake. It was shown that men and women consumed fat differently, with men consuming more fat than normal while women were more likely to consume below-average amounts [18]. These studies all occurred prior to the release of the new dietary guidelines. It has been approximately ten years since the dietary and nutritional intake of Australians was investigated, and there is a lack of up-to-date data to further investigate the dietary factors that contribute to cardiovascular disease risk in Australians.

3. Dietary impact on risk factors of CVD

The Australian diet pattern can affect other risk factors of CVD [19]. The diet pattern which has a high consumption of red meat, added sugar, saturated fat, alcohol, and low consumption of lean meat, vegetables, fruits, whole grain, and dairy products can affect other risk factors of CVD as well. Diet-related risk factors of CVD this article will introduce are hypertension, dyslipidemia, type 2 diabetes mellitus, and obesity.

3.1. Hypertension

Hypertension is recognized as the most important independent risk factor of CVD and also one of the most significant preventable factors of premature mortality. Hypertension and type 2 diabetes mellitus (T2DM) are common comorbidities. People with T2DM are more likely to develop hypertension than those who do not have T2DM and insulin resistance is common in people with hypertension whose risk of developing T2DM is greater than those who do not have hypertension [20]. Thus, the dietary pattern for people with hypertension should also protect them from T2DM.

The most widely spread healthy diet pattern known as the Dietary Approaches to Stop Hypertension (DASH) diet is recommended for people who are suffering from hypertension because of its substantial evidence of reducing blood pressure and high adherence for its taste in the management of hypertension. The DASH diet includes a large amount and variety of fruits, vegetables, and low-fat dairy product and also emphasize value of the intake of whole grains, nuts, and meat from fish and poultry and limit the consumption of red meat, sugar-added beverage, total saturated fat, and total fat [21,22]. Alcohol consumption and sodium can lead to an increase in blood pressure and risk of hypertension. For the sodium limitation, the key is to avoid processed food because the most of salt comes from processed foods or table foods [23]. Thus, eating homemade foods seems to be a beneficial recommendation. Although nutrients such as sodium, potassium, and omega-3 fatty acids affect the risk of hypertension, it is better to emphasize having a varied well-balanced diet rather than focus on single nutrients [24].

In 2017-18, about 34% of Australian with hypertension and only 32% of them managed to improve their hypertension by taking some medication. The distribution of uncontrolled high blood pressure is different in Australia by sex. Women are less likely to have uncontrolled high blood pressure than men [25].

Remoteness is not a likely risk factor for hypertension. For the socioeconomic factor, only the resident of the highest socioeconomic areas has a lower hypertension population and the risk of hypertension for the resident of other socioeconomic areas is similar [25].

3.2. Dyslipidemia

Dyslipidemia can increase the risk of cardiovascular diseases and the key initiatives and progression factor of atherosclerosis [26]. Dyslipidemia is characterized as abnormal rising of low-density lipoprotein cholesterol (LDL-C) concentration. The dropping of high-density lipoprotein cholesterol (HDL-C) and increasing triglycerides (TG) often occur at the same time as well. Thus, the key to the management goal of dyslipidemia is to decrease LDL-C and promote the HDL-C concentration. Improving the concentration of TG is also a treatment target recommended in dyslipidemia management guidelines [27].

Adopting a healthy diet pattern is a basic part of dyslipidemia management. Diet for people with dyslipidemia must be careful with lipid intake. It is known that the high consumption of fat especially trans-fats and saturated fats can increase the LDL-C concentration and causes Atherosclerotic Cardiovascular Disease (ASCVD). Compared with the quantity of lipid intake, the quality of lipid consumption is more important in prevention of dyslipidemia. Although the total fat intake should be limited because the intake of fat from foods is often associated with extra saturated fats intake, the use of supplements of n-3 polyunsaturated fats is strongly recommended. Having unsaturated fats instead of saturated fats in daily food pattern is recommended as well [27].

Variety and quantity of other foods consumption is also an important part of dyslipidemia prevention and management. In conclusion, the food groups which can protect an individual from being dyslipidemia are marine fish, whole grains, nuts and legumes, fruits, and vegetables. In contrast, processed meat and red meat is recognized as a risk factor for dyslipidemia [27].

For nutrition, folate, potassium, fiber, flavonoids, omega-3 fatty acids, unsaturated fatty acids, and phytochemical content benefit the prevention of dyslipidemia, while trans fats, saturated fats, dietary cholesterol, and alcohol intake can increase the risk of dyslipidemia [27]. However, most of the trials failed to prove that the nutritional supplement can reduce the risk of dyslipidemia effectively [22]. Thus, the recommendation for healthy dietary patterns should focus on food groups.

About 63% of adults in Australia have dyslipidemia and only 11% of Australian with dyslipidemia managed to control related lipoprotein levels within normal range by using some form of lipid-modify medication [28]. Remoteness and socioeconomic status is not the factor for distribution of population with dyslipidemia [28].

3.3. Type 2 diabetes mellitus

Diabetes is also an important factor which can increase the risk of cardiovascular diseases. The most common type of diabetes mellitus in the Australia is T2DM and among 1.3 million Australian with diagnosed type 1 diabetes mellitus and T2DM between 2009 and 2014 [29].

People with diabetes are in greater danger of developing heart diseases and diabetes can increase the risk of mortality among people who suffer from heart diseases [24,30]. In Australia, diabetes is the 7th cause of death of men in 2020 raised from the 8th in 2010, and 8th cause of death of women raised from the 9th in 2010. The second cause of death for Australian with diabetes is CVD [31]. There are some food groups and nutrients that can affect the risk of T2DM.

The consumption of animal product such as red meat and processed meat and sugar-sweetened beverages (SSB) promote the risk of T2DM. In contrast, whole grain, low fat dairy products are protective factors of T2DM. Vegetable and fruit intake may benefit the prevention of T2DM. Thus, the dietary pattern suggested by Australian dietary guidelines can prevent T2DM. some nutrients such as total fiber, dietary magnesium, and flavonoids lower the risk of T2DM significantly. However, it is difficult for the public to understand nutrient-based advice [32]. Thus, increasing the proportion of whole grain, vegetable, fruits, and dairy products and decreasing the proportion of meat product exclude of lean meat, SSB in dietary pattern is a better recommendation for the public to prevent T2DM.

In Australia, the remoteness and socioeconomic affect the risk of mortality caused by T2DM. For the most remote area residents with T2DM, their all-cause mortality was 1.6 times higher than major city residents and 1.9 times higher than the general population. For the resident with the lowest socioeconomic status, their all-caused motility was 1.4 times higher than those with the highest socioeconomic [29].

3.4. Overweight and obesity

Overweight and obesity also contribute a great deal to CVD morbidity. The main reason is insufficient physical activity and over consumption of calorie. Such combination can cause excess energy intake and related low energy expenditure, consequently increasing the possibility of being overweight and obesity. The social factor, sex, portion size, and availability of convenience food also affect a person's weight [33]. The poor quality and quantity of food are common crucial issues among Australians of all age groups [19].

Having more whole grains, nuts, dairy products, vegetables and fruits especially those that are rich in fiber and poor in glycemic index (GI) benefit from losing weight. Starchy vegetables such as corn and potato, refined carbohydrates, and added sugar should be avoided for those who plan to lose weight. The dietary pattern should benefit an individual by emphasizing quality and quantity. Among different macronutrient manipulation, although with strict restrictions on calorie intake, many findings show that these diet patterns influence the long-term weight a little. Thus, the dietary pattern

should be the pattern that is suitable for someone to adhere to as well. Hence, compared with focusing on single nutrients or food groups, focusing on dietary patterns could be more acceptable for its higher flexibility [34]. The Mediterranean diet and the DASH diet with calorie restriction are recommended for those suffering from overweight or obesity for their good adherence. They all benefit people by encouraging them to have more vegan-based foods, whole grain, low-fat dairy, and limiting red meat intake [22].

Between 2017 and 2018 in Australia, an individual whose Body Mass Index (BMI) range from 25.0 to 29.9 is recognized as overweight but not obesity and whose BMI is greater than 39.9 is classified as obesity. About 36% of adult were overweight and 31% of adult were diagnosed as obesity in Australia. The rate of overweight and obesity was higher in men than women. About 17% of juveniles aged from 2 to 17 were classified as overweight and 8.2% of them were obesity [33].

Remoteness and socioeconomic status influence the risk of overweight and obesity. For remoteness, the resident of major cities has the lowest rate of overweight and obesity and the rate is similar among residents of other areas. Socioeconomic status is also a risk factor of overweight and obesity. Residents with lower socioeconomic status have a higher rate of population with overweight and obesity [33].

4. Low socioeconomic and CVD

Low socioeconomic status influences other common risk factors as well as being an independent contributor to cardiovascular disease. The 2011 Australian Burden of Disease Study found significant disparities between socioeconomic and rural groups, as well as obvious variances in the burden of disease across states and territories. Cardiovascular disease is responsible for 27% of deaths in Australia [35]. Cardiovascular morbidity and mortality have been shown to be strongly associated with socioeconomic status. Not everyone can afford a balanced diet, despite the fact that it is linked to a lower risk of cardiovascular disease and better physical health. A study investigating the cost of healthy eating habits for Australians found that the cost of adopting healthy eating habits accounted for 40% of the disposable income of households that relied on welfare. Households with average incomes spend only 20% of their disposable income on the same food [36] and therefore the cost of maintaining a healthy diet is too expensive for low-income people. Numerous studies have shown that higher socioeconomic standing is linked to better dietary quality, and that, in addition to directly altering eating patterns, economic status is also linked to other issues like poor nutritional knowledge, unequal access to healthy foods, and various social normative aspects. In Australia, people of all income levels consume food in significantly different ways. Low-income males have much less dietary diversity than other groups, according to research based on the findings of the Australian National Nutrition Survey [37]. Additionally, there are major nutritional disparities in Australia, with low social class individuals typically consuming less nutrients overall and fewer fruits and vegetables [38]. Low-income individuals who follow this food pattern have an increased risk of cardiovascular disease.

5. Conclusion

To understand the relationship between dietary patterns and severe cardiovascular disease conditions in Australia, where cardiovascular disease is a serious problem, this study analyses the impact of dietary patterns on cardiovascular disease in Australia at three levels: nutrient and food group and diet. The risk of cardiovascular disease is influenced differently by the various macronutrients and micronutrients in the diet. Therefore, the emphasis in trying to intervene in cardiovascular disease through diet is on the quality and nutrient composition of the food. Furthermore, Australia's geographical location has led in Australians being exposed to widespread vitamin D deficiency, which increases the risk of cardiovascular disease in Australia. There are still some gaps between the dietary patterns of Australians and the healthy eating guidelines proposed by

the Australian Government. Increased consumption of fruits and vegetables, stricter regulation of red meat and processed food intake, and promotion of low-fat milk consumption are all needed in Australia. All of these eating habits raise the risk of cardiovascular disease and other conditions that are identified in Australia as risk factors for CVD.

Only a small proportion of Australians with hypertension are able to improve their hypertension with medication, and patients are advised to control alcohol and sodium intake. More than half of Australians have dyslipidaemia but only a small proportion of patients take steps to successfully manage their lipid levels. Controlling the quality of lipids consumed in the diet is far more important than controlling the quantity of lipids. The risk of diabetes can be decreased by following the healthy eating guidelines of the Australian government. Since socioeconomic status is significantly correlated with diabetes risk in Australia, it is crucial to monitor how the people with low socioeconomic status preparing their meal. The Mediterranean and DASH diets can be recommended for people who are obese or overweight or at risk due to their healthy dietary composition and high acceptability. Management of these CVD-related factors could reduce the risk of CVD in Australians. For people on low incomes, it is difficult to maintain a healthy diet and other relevant factors such as educational attainment, unequal access to healthy food and social norms can affect their diet. A chronically low quality diet can increase the risk of disease.

References

[1] Statistics ABO. Migration,Australia [internet]. Australian Bureau of Statistics: Canberra, Australia. 2019-20.

[2] Erkkilä A, de Mello VD, Risérus U, Laaksonen DE. Dietary fatty acids and cardiovascular disease: an epidemiological approach. Progress in lipid research. 2008;47(3):172-87.

[3] Hu FB, Stampfer MJ, Manson JE, et al. Dietary saturated fats and their food sources in relation to the risk of coronary heart disease in women. The American Journal of Clinical Nutrition. 1999;70(6):1001-8.

[4] Shah AK, Dhalla NS. Effectiveness of some vitamins in the prevention of cardiovascular disease: a narrative review. Frontiers in Physiology. 2021:1741.

[5] Zhou A, Selvanayagam JB, Hyppönen E. Non-linear Mendelian randomization analyses support a role for vitamin D deficiency in cardiovascular disease risk. European Heart Journal. 2021;43(18):1731-9.

[6] He FJ, Nowson CA, Lucas M, MacGregor GA. Increased consumption of fruit and vegetables is related to a reduced risk of coronary heart disease: meta-analysis of cohort studies. Journal of Human Hypertension. 2007;21(9):717-28.

[7] Partula V, Deschasaux M, Druesne-Pecollo N, et al. Associations between consumption of dietary fibers and the risk of cardiovascular diseases, cancers, type 2 diabetes, and mortality in the prospective NutriNet-Santé cohort. The American Journal of Clinical Nutrition. 2020;112(1):195-207.

[8] Micha R, Shulkin ML, Peñalvo JL, et al. Etiologic effects and optimal intakes of foods and nutrients for risk of cardiovascular diseases and diabetes: Systematic reviews and meta-analyses from the Nutrition and Chronic Diseases Expert Group (NutriCoDE). PLOS ONE. 2017;12(4):e0175149.

[9] Srour B, Fezeu LK, Kesse-Guyot E, et al. Ultra-processed food intake and risk of cardiovascular disease: prospective cohort study (NutriNet-Santé). bmj. 2019;365.

[10] Juul F, Vaidean G, Parekh N. Ultra-processed Foods and Cardiovascular Diseases: Potential Mechanisms of Action. Advances in Nutrition. 2021;12(5):1673-80.

[11] Statistics ABO. Australian Health Survey: Consumption of Food Groups from the Australian Dietary Guidelines. Australian Bureau of Statistics: Canberra, Australia. 2016.

[12] Nguyen B, Bauman A, Gale J, et al. Fruit and vegetable consumption and all-cause mortality: evidence from a large Australian cohort study. International Journal of Behavioral Nutrition and Physical Activity. 2016;13(1):9.

[13] Menu A. Australian Health Survey: Nutrition First Results—Foods and Nutrients. Australian Bureau of Statistics: Canberra, Australia. 2011.

[14] Abdullah MMH, Hughes J, Grafenauer S. Healthcare Cost Savings Associated with Increased Whole Grain Consumption among Australian Adults. Nutrients. 2021;13(6):1855.

[15] Bovalino S, Charleson G, Szoeke C. The impact of red and processed meat consumption on cardiovascular disease risk in women. Nutrition. 2016;32(3):349-54.

[16] Lordan R, Tsoupras A, Mitra B, et al. Dairy Fats and Cardiovascular Disease: Do We Really Need to Be Concerned? Foods. 2018;7(3):29.

[17] Xu X, Kabir A, Barr ML, Schutte AE. Different Types of Long-Term Milk Consumption and Mortality in Adults with Cardiovascular Disease: A Population-Based Study in 7236 Australian Adults over 8.4 Years. Nutrients. 2022;14(3):704.

[18] Baghurst KI, Baghurst PA, Record SJ. Demographic and dietary profiles of high and low fat consumers in Australia. Journal of Epidemiology & Community Health. 1994;48(1):26-32.

[19] Health AIo, Welfare. Poor diet. Canberra: AIHW; 2019.

[20] Petrie JR, Guzik TJ, Touyz RM. Diabetes, Hypertension, and Cardiovascular Disease: Clinical Insights and Vascular Mechanisms. Can J Cardiol. 2018;34(5):575-84.

[21] The sixth report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. Arch Intern Med. 1997;157(21):2413-46.

[22] Yu E, Malik VS, Hu FB. Cardiovascular Disease Prevention by Diet Modification: JACC Health Promotion Series. J Am Coll Cardiol. 2018;72(8):914-26.

[23] Sacks FM, Svetkey LP, Vollmer WM, et al. Effects on Blood Pressure of Reduced Dietary Sodium and the Dietary Approaches to Stop Hypertension (DASH) Diet. New England Journal of Medicine. 2001;344(1):3-10.

[24] Francula-Zaninovic S, Nola IA. Management of Measurable Variable Cardiovascular Disease' Risk Factors. Current cardiology reviews. 2018;14(3):153-63.

[25] Health AIo, Welfare. High blood pressure. Canberra: AIHW; 2019.

[26] Ference BA, Ginsberg HN, Graham I, et al. Low-density lipoproteins cause atherosclerotic cardiovascular disease. 1. Evidence from genetic, epidemiologic, and clinical studies. A consensus statement from the European Atherosclerosis Society Consensus Panel. Eur Heart J. 2017;38(32):2459-72.

[27] Mach F, Baigent C, Catapano AL, et al. 2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and European Atherosclerosis Society (EAS). European Heart Journal. 2019;41(1):111-88.

[28] Health AIo, Welfare. Risk factors to health. Canberra: AIHW; 2017.

[29] Health AIo, Welfare. Deaths among people with diabetes in Australia, 2009–2014. Canberra: AIHW; 2017.

[30] Haffner SM, Lehto S, Rönnemaa T, et al. Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction. N Engl J Med. 1998;339(4):229-34.

[31] Health AIo, Welfare. Deaths in Australia. Canberra: AIHW; 2022.

[32] Schwingshackl L, Hoffmann G, Lampousi AM, et al. Food groups and risk of type 2 diabetes mellitus: a systematic review and meta-analysis of prospective studies. Eur J Epidemiol. 2017;32(5):363-75.

[33] Health AIo, Welfare. Overweight and obesity. Canberra: AIHW; 2022.

[34] Lavie CJ, Laddu D, Arena R, et al. Healthy Weight and Obesity Prevention: JACC Health Promotion Series. J Am Coll Cardiol. 2018;72(13):1506-31.

[35] Care DoHaA. chronic conditions in Australia. canberra: DHAC; 2020.

[36] Kettings C, Sinclair AJ, Voevodin M. A healthy diet consistent with Australian health recommendations is too expensive for welfare-dependent families. Australian and New Zealand Journal of Public Health. 2009;33(6):566-72.

[37] Worsley A, Blasche R, Ball K, Crawford D. Income differences in food consumption in the 1995 Australian National Nutrition Survey. European Journal of Clinical Nutrition. 2003;57(10):1198-211.

[38] Lewis M, Lee AJ. Dietary inequity? A systematic scoping review of dietary intake in low socio-economic groups compared with high socio-economic groups in Australia. Public Health Nutrition. 2021;24(3):393-411.