

Review



Nutritional Therapy for Asian Patients at Risk for Atherosclerotic Cardiovascular Disease

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ABSTRACT

The burden of atherosclerotic cardiovascular disease (ASCVD) remains high worldwide, and its prevalence has increased in Asian countries over the last two decades. The increase in ASCVD may arise from complex interactions between genetic and lifestyle/environmental factors. Abnormal blood cholesterol levels, elevated blood glucose, obesity, elevated blood pressure, smoking, and family history are common risk factors of ASCVD. There is an increased burden of ASCVD in Asian countries, maybe due to rapid economic development and lifestyle changes in these countries. Nutrition is one of the major modifiable risk factors for ASCVD. Despite this, there are insufficient nutritional therapies for prevention and management of ASCVD in Asian patients. There is also a lack of relevant research in Asian populations. In this review, we describe the current nutritional guidelines and the findings from previous landmark studies regarding management and/or prevention of ASCVD. We also summarize the recommendations regarding evidence-based nutrition therapy/management strategies that may be effective in Asian subjects to prevent onset and/or to treat ASCVD.

Keywords: Atherosclerosis; Nutrition therapy; Nutritional management; Asians

INTRODUCTION

Atherosclerotic cardiovascular disease (ASCVD) involves build-up of cholesterol plaques in arteries, resulting in myocardial infarction, ischemic stroke, and peripheral arterial disease. ASCVD is a major cause of morbidity and mortality globally. Approximately 80% of the ASCVD burden occurs in low- and middle-income countries.¹ The rates of ASCVD in Asian countries, which account for more than half of the world's population, have doubled in the past 20 years,^{2,3} particularly in South Asian countries. In contrast, the rates of ASCVD in the US and other developed countries have decreased by half in the last 30 years.

Prevalence of ASCVD is closely related to various risk factors, including genetic predisposition, lifestyle, biochemical/physiological characteristics, and subclinical disease markers.⁴ Genetics, including their effect on body weight and diabetes, are important in regulation of metabolic parameters.^{5,6} However, the rapid increase in prevalence of ASCVD in Asians suggests that changes in lifestyle/environmental factors (e.g., tobacco use, unhealthy

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diet, physical inactivity, and overconsumption of alcohol) also are key contributors. The increased rate of ASCVD and other non-communicable diseases in many Asian countries is a result of increasing economic development and potentially a ‘nutrition transition’.⁷

However, nutritional therapies for prevention and management of ASCVD in Asian patients are insufficient. Based on previous studies, dietary factors such as inappropriate eating habits and nutrient intake (e.g., low intake of fruit, whole grains, vegetables, nuts and seeds, omega-3 fatty acids, fiber; excessive intake of sodium; and iron deficiency)⁸ play a major role in development of ASCVD. An animal source-rich diet that involves meat, eggs, and cheese promotes macrophage foam cell formation, which can lead to atherosclerosis and cardiovascular events, such as myocardial infarction, stroke, and death.^{9,10} Dietary glycemic index and glycemic load are also associated with postprandial glycemia and insulinemia.¹¹

In this review, we summarize the current nutritional management/guidelines for ASCVD and describe the effects of previous nutritional interventions on managing or preventing ASCVD. We suggest that evidence-based customized nutrition therapy is an effective approach for prevention and/or treatment of ASCVD in Asian populations.

NUTRITIONAL MANAGEMENT OF ASCVD PATIENTS

1. Conventional nutritional management in ASCVD patients

Several diets have been shown to decrease the risk of ASCVD. For instance, the Mediterranean (MED) diet and the Dietary Approach to Stop Hypertension (DASH) diet (**Table 1**) are effective at preventing primary and secondary cardiovascular disease (CVD).^{9,12,13} The MED diet emphasizes consumption of fish and plant-based oils and nuts and is characterized by high omega-3 fatty acid intake and an omega-6: omega-3 ratio of 2:1-1:1. In addition, this diet is characterized by high intake of seasonal and local fruits, vegetables, and whole grains and low intake of red meat and sweets. In previous studies,^{14,15} the MED diet was associated with lower insulin level¹⁴ and 15% lower risk of diabetes compared to those on other diets.¹⁵

The DASH diet promotes a life-long heart-healthy eating style and lowers blood pressure (BP) and low-density lipoprotein cholesterol (LDL-C) in the blood.^{16,17} The DASH eating plan recommends vegetables, fruits, whole grains, fat-free or low-fat dairy products, fish, poultry, beans, nuts, and vegetable oils. It also encourages limiting foods that are high in saturated fat, such as fatty meats, full-fat dairy products, tropical oils (such as coconut, palm kernel, and palm oils), and sugar-sweetened beverages and sweets (**Table 1**).

Table 1. Compositions of the MED and DASH diets¹⁸

MED diet*	DASH diet
- High intake of fruits, vegetables, whole grains (cereals, breads, rice, pasta), and fatty fish (rich in omega-3 PUFA)	- High intake of vegetables, fruits, low-fat fermented dairy products, whole grains, poultry, fish, and nuts
- Low intake of red meat (emphasis on lean meats); substitute lower-fat or fat-free dairy products for higher-fat dairy foods; use oils (olive or canola), nuts (walnuts, almonds, or hazelnuts), or margarines blended with rapeseed or flaxseed oils for butter and other fats	- Low intake of sweets, sugar-sweetened beverages, red meats; saturated fat, total fat, and cholesterol
	- Rich in potassium, magnesium, and calcium; protein and fiber.

PUFA, polyunsaturated fatty acid; MED, Mediterranean, DASH, Dietary Approach to Stop Hypertension.

*The MED diet tends to have a moderate total fat content (32%-35% of total calories), relatively low saturated fat content (9%-10% of total calories), high fiber content (27-37 g/day), and high PUFA content (particularly omega-3s).

The therapeutic lifestyle changes (TLC) diet was developed by the Adult Treatment Panel III of the National Cholesterol Education Program Guidelines (2013).¹⁸ In the TLC diet, saturated fat accounts for <7% of the total calories recommended, and cholesterol intake is <200 mg/day. Increases in viscous (soluble) fiber (10–25 g/day) and plant stanol/sterol (2 g/day) intake are recommended to reduce LDL-C, as are weight management and increased physical activity.

The American College of Cardiology/American Heart Association (ACC/AHA) task force¹⁹ recommends consumption of cardioprotective foods such as plant proteins (e.g., soy protein, nuts, and legumes), plant sterols, fiber, and soluble fiber-containing nutrients to promote heart health. MED and vegetarian (portfolio) diets that encourage consumption of vegetables, fruits, whole grains, and fish can improve heart health and lower cholesterol levels.

Despite these data, there are limited evidence-based dietary patterns and treatments for ASCVD subjects from different ethnic groups. In addition, customized nutritional management, including individual dietary requirements, clinical status, and social environment, is recommended by the guidelines.¹⁹

2. Previously evaluated nutritional interventions

To gain a better understanding of ASCVD risk factors, researchers have attempted to quantify their effects. One such study estimated the number of type 2 diabetes mellitus (T2DM) cases attributable to lifestyle in the US (The United States Diabetes Prevention Program [DPP]).²⁰ Around the same time, the Finnish Diabetes Prevention Study²¹ quantified the health effects of lifestyle modification. Among modifiable lifestyle factors, a healthier diet and physical activity were most important. In both studies, subjects in the intervention groups (who had impaired glucose tolerance or impaired fasting glucose) were educated about low-calorie, low-fat diets and fiber intake. After three to four years, 58% fewer people in the intensive lifestyle intervention groups converted to T2DM than in the control groups.^{20,21} The DPP study reported that intensive lifestyle interventions had favorable effects on CVD risk factors, such as lipid levels and BP control after 10 years.²²

Another notable study is the Optimal Macronutrient Intake Trial to Prevent Heart Disease, which tested the effects of partial substitution of carbohydrates with protein and unsaturated fat on BP, blood lipid levels, and estimated CVD risk in American subjects. This trial tested the effects of three healthy variations of the DASH diet pattern: a carbohydrate-rich diet similar to the DASH diet, a higher-protein diet, and a higher-unsaturated fat diet. All of these diets met the major nutrient recommendations of the Dietary Guidelines for Americans in 2005. After a 19-week intervention, all three diets reduced total and LDL-C levels, BP, and estimated coronary heart disease risk.²³

3. Nutritional interventions in Asian countries

ASCVD-related mortality across Asia has been reported to be heterogeneous.²⁴ Asian populations may therefore benefit from lifestyle modifications to reduce development of ASCVD. However, only a handful of lifestyle-based intervention studies have been performed in Asian countries. South Asians have an increased risk of ASCVD and develop disease approximately 10 years earlier than other populations. Low intake of vegetables and fruits was associated with a 2- to 3-fold increased risk of incident CVD.²⁵ South Asians tend to eat a diet that is high in saturated and hydrogenated fats from ghee (clarified butter), coconut, Vanaspati (hydrogenated vegetable oils), and refined carbohydrates.²⁵ One previous study²⁶ demonstrated that a community-based lifestyle intervention helped medically underserved

South Asian immigrants lose significant weight (-1.5 kg, $p=0.04$) and decrease hemoglobin A1C (-0.43% , $p<0.01$). In another lifestyle modification study in India, 28.5% of subjects in the lifestyle modification group (95% confidence interval [CI], 20.5–37.3, $p=0.018$) showed the highest relative risk reduction compared with the control group of T2DM subjects after 30 months of follow-up.²⁷

In China, a study of patient-centered cognitive behavioral therapy led to improved waist circumference, serum triglycerides (TG), and systolic BP.²⁸ Through cognitive behavior therapy, subjects were encouraged to try new recipes to increase intake of high-quality food rich in protein, potassium, and calcium; reduce fat intake; increase consumption of fruit and vegetables; and alter night-time snack habits.

A traditional Japanese dietary pattern, which is characterized by low salt content and refraining from excessive alcohol intake, has been reported to improve lipid metabolism by decreasing risk factors for ASCVD onset. Recommendations include adhering to the traditional Japanese dietary pattern and adopting lifestyle changes such as smoking cessation, maintaining appropriate body weight, and performing aerobic exercise. Another study found that weight-loss interventions, including dietary intervention, led to reduced total cholesterol, LDL-C, and TG and increased high-density lipoprotein cholesterol level in overweight and obese T2DM subjects.²⁹

The traditional Korean diet is considered a ‘healthy’ diet because it emphasizes plant-based side dishes instead of energy-dense Western style foods. One previous study showed that the Korean traditional dietary pattern had beneficial effects in hypertensive and type 2 diabetic patients. After 12 weeks of intervention, subjects who ate a traditional Korean diet had lower hemoglobin A1C, heart rate, body mass index, body fat percentage, and waist–hip ratio than at baseline ($p<0.05$). In another study, 1 year of lifestyle interventions was shown to have preventive effects of 0.752 (adjusted odds ratio [OR], 95% CI: 0.644–0.879) and 0.499 (adjusted OR, 95% CI: 0.251–0.992) for T2DM and acute myocardial infarction in respective subjects with metabolic syndrome.³⁰ However, in Korea, hypertension (26.9%) and hypercholesterolemia (21.5%) are highly prevalent. Recently, unhealthy eating patterns such as skipping breakfast (27.6% of subjects) and eating out or convenience food consumption (24.8%) have been reported.

Nearly half of CVD-related deaths globally are predicted to occur in the Asia-Pacific region.³¹ Predisposing genetic factors may interact with nutritional and environmental factors to increase the susceptibility of ASCVD in populations from this region to ASCVD.³² ASCVD events, however, are preventable and controllable by reducing risk factors such as diet and lifestyle. Therefore, evidence-based guidelines for diet and lifestyle that include region-specific strategies are needed to reduce CVD risk in Asian populations.

NUTRITION TREATMENT AND MANAGEMENT GUIDELINES TO REDUCE CLINICAL RISK FACTORS OF ASCVD

A number of major medical societies worldwide, primarily from America and Europe, has released management guidelines for different populations at risk of developing ASCVD. Although regional guidelines have also been published specifically for ASCVD management, there are no equivalent region-wide guidelines for Asia. Therefore, regional societies and practitioners rely on international guidelines, despite the differences between these and Asian

Table 2. Comparing the recommendations to reduce clinical risk factors for ASCVD between the ACC/AHA and Korea

Clinical risk factors	2013/2019 ACC/AHA guideline recommendations ^{18,34}	Korean recommendations ^{35,39,40,44,45,*}
ASCVD	<ol style="list-style-type: none"> 1. Increase intake of vegetables, fruits, legumes, nuts, whole grains, and fish 2. Replace saturated fat with dietary monounsaturated and polyunsaturated fats 3. Reduce intake of cholesterol and sodium 4. Minimize intake of processed meats, refined carbohydrates, and sweetened beverages 5. Decrease intake of <i>trans</i> fats 	<ol style="list-style-type: none"> 1. Reduce intake of calories from saturated fat and <i>trans</i> fat 2. Replace saturated fat with dietary polyunsaturated fat
Overweight/obesity	<ol style="list-style-type: none"> 1. Counseling and comprehensive lifestyle interventions, including calorie restriction 2. Restriction of certain food types (such as high-carbohydrate foods, low-fiber foods, and/or high-fat foods) 	<ol style="list-style-type: none"> 1. Individualized calorie restriction and intake of carbohydrate, protein, and fat 2. High dietary quality 3. Limit alcohol consumption
T2DM	<ol style="list-style-type: none"> 1. Tailored nutrition plan focusing on a heart-healthy dietary pattern 2. Maintain optimal weight 3. Increase consumption of plant-based foods and consume large amounts of polyunsaturated and monounsaturated fatty acids 4. Avoid <i>trans</i> fatty acids and limit saturated fatty acid intake 	<ol style="list-style-type: none"> 1. Individualized medical nutrition therapy by a clinical dietitian 2. Reduce energy intake while maintaining a healthy eating pattern 3. Individualize intake of carbohydrates, protein, and fat (in general, carbohydrates should account for approximately 50–60% of total calories) 4. Limit sodium intake to 2,000 mg/day 5. Increase dietary fiber intake (20–25 g/day), and fiber should originate from various sources such as whole grains 6. Restrict alcohol consumption
Dyslipidemia	<ol style="list-style-type: none"> 1. A dietary pattern that emphasizes intake of vegetables, fruits, and whole grains; includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils, and nuts; and limits intake of sweets, sugar-sweetened beverages, and red meats. 2. A dietary pattern that achieves 5%–6% of calories from saturated fat. 3. Restrict percentage of calories from saturated fat. 4. Decrease percentage of calories from <i>trans</i> fat 	<ol style="list-style-type: none"> 1. Decrease intake of calories from saturated fat and <i>trans</i> fat 2. Replace saturated fat with dietary polyunsaturated fat 3. Decrease total calories from alcohol and carbohydrates
Hypertension	<ol style="list-style-type: none"> 1. Lose weight 2. Follow a heart-healthy diet 3. Decrease sodium intake 4. Supplement dietary potassium 5. Limit alcohol consumption 	<ol style="list-style-type: none"> 1. Eat a balanced diet (carbohydrates, proteins, fats, fiber, minerals, vitamins) 2. Decrease sodium intake 3. Reduce intake of simple sugars, saturated fat, and total fat 4. Follow the Mediterranean diet and consume fish twice per week 5. Increase intake of vegetables and fruit 6. Consume adequate amounts of coffee

ASCVD, atherosclerotic cardiovascular disease; ACC/AHA, American College of Cardiology/American Heart Association; T2DM, type 2 diabetes mellitus.

*Korean recommendations: 2018 Evidence-based Recommendations for Dyslipidemia in Primary Care; 2018 Korean Society for the Study of Obesity Guideline for the Management of Obesity; 2015 Treatment Guidelines for Diabetes; 2015 Korean Guidelines for the Management of Dyslipidemia; 2018 Korean Society of Hypertension Guidelines for the Management of Hypertension.

populations. Due to lack of region-specific guidelines, practitioners in Asian countries are attempting to bridge the gap between major international guidelines and the unique needs of local populations in optimal management of ASCVD or CVD. In this section, we summarize the international and Korean guidelines regarding nutrition management. (Table 2).

1. Obesity/weight loss

Obesity is a progressive, complicated, chronic disease that result in excess adiposity due to energy imbalance. To achieve cardiovascular benefits in adults, weight loss (through reduced energy intake) is the first step in obesity management.³³ In particular, caloric restriction should be adopted by overweight or obese individuals who have more than one CVD risk factor. The 2019 ACC/AHA and 2013 AHA/ACC/The Obesity Society guidelines emphasize counseling and comprehensive lifestyle interventions, including calorie restriction, by restricting certain food types (such as high-carbohydrate foods, low-fiber foods, or high-fat foods) to achieve and maintain weight loss.³⁴ The guidelines for obesity management in Korea also emphasize individualized caloric restriction by modifying carbohydrates, protein, and fat intake; eating a high-quality diet; and limiting alcohol consumption.³⁵

2. T2DM/glycemic control

It is important to manage T2DM comprehensively to prevent ASCVD.³⁶ Compared to those without diabetes, patients with T2DM have significantly increased risk of ASCVD.^{37,38} Lifestyle interventions are therefore very important in diabetic subjects.³⁶ There are three general points of agreement between ACC/AHA and American Association of Clinical Endocrinologists/American College of Endocrinology guidelines for treating diabetes in Americans:

- There should be a tailored nutrition plan focusing on a heart-healthy dietary pattern to improve glycemic control.
- Optimal weight should be maintained.
- There should be increased consumption of plant-based foods and polyunsaturated and monounsaturated fatty acid contents in the diet should be high. In addition, *trans* fatty acids should be avoided, and saturated fatty acids (SFAs) should be limited.

The 2015 Korean treatment guidelines for diabetes³⁹ also recommend limiting sodium intake and alcohol consumption.

3. Dyslipidemia/LDL-C

Atherosclerosis is driven by atherogenic lipoproteins and inflammation. Therefore, dyslipidemia is both a primary and major risk factor in development and progression of ASCVD. Major dyslipidemia clinical practice guidelines approach primary prevention based on the following principles: achieving 5%–6% of calories from saturated fat; limiting the percentage of calories from *trans* fat; and following a healthy dietary pattern that emphasizes intake of vegetables, fruits, and whole grains, including low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils, and nuts, and limiting intake of sweets, sugar-sweetened beverages, and red meat.¹⁸ Korean guidelines to maintain a healthy weight to manage dyslipidemia⁴⁰ recommend the following: reducing daily total fat intake to <30% of total caloric intake; reducing caloric intake from saturated fat to <7% of the total caloric intake; avoiding *trans* fat; maintaining cholesterol at <300 mg daily; replacing saturated fat with dietary polyunsaturated fat; reducing total calories from alcohol and carbohydrate; and limiting energy intake.

4. Hypertension/BP level

Hypertension is an important risk factor for cerebrovascular disease, CVD, heart failure, and many more chronic diseases.³⁶ Framingham and other epidemiological studies have showed that systolic and diastolic BP is positively associated with CVD.⁴ The 2019 ACC/AHA guidelines for adults with elevated BP or hypertension recommend weight loss, a heart-healthy dietary pattern, sodium reduction, dietary potassium supplementation, and limited alcohol.³⁴ The Korean guidelines for hypertension⁴⁰ similarly recommend consumption of a balanced diet that has <90 mmol (<2 g) per day of sodium intake and is high in fruits, vegetables, low-fat dairy products, and fish. This diet also recommends reduction of simple sugars, saturated fat, and total fat consumption.

5. Asian guidelines to reduce clinical risk factors of ASCVD

The Cholesterol Clinical Practice Guidelines²⁷ suggest that age, sex, and ethnic-specific guidelines should consider the severity of an individual's clinical stage for primary and secondary prevention of ASCVD. In Asia, the applicability of dietary patterns is largely untested. The optimal target levels of clinical risk factors of ASCVD are largely unknown. Therefore, there is need for a description of the heterogeneous approaches and current

Table 3. Summary of nutrition guidelines for Asian countries to reduce clinical risk factors of ASCVD

Asian country	Recommendations	Guidelines
Japan	<ul style="list-style-type: none"> - Limit total energy intake and maintain an appropriate body weight - Limit the percentage of energy derived from fat for an appropriate total energy intake - For an appropriate total energy intake, reduce the amount of SFAs or substitute SFAs with PUFAs and reduce the intake of <i>trans</i> fatty acids - Increase intake of omega-3 PUFAs - Increase intake of MUFAs as part of appropriate total energy intake - Decrease cholesterol intake to <200 mg/day - Increase consumption of (green and yellow) vegetables, seaweed, fruit, soy, and soy products - Decrease consumption of processed foods - Follow the low-salt Japanese dietary pattern with reduced consumption of fat on meat and animal fats such as beef tallow, lard, and butter and consume a combination of soy, fish, vegetables, seaweed, mushrooms, fruits, and unpolished grains 	Japan Atherosclerosis Society guidelines for prevention of ASCVDs 2017 ³⁶
China	<ul style="list-style-type: none"> - SFAs should be <7% of total energy - Dietary cholesterol should be less than 300 mg/day - Dietary fiber should be 25–40 g/day - Total energy should be adjusted to a level to maintain an ideal body weight or reduce body weight 	2016 Chinese guidelines for the management of dyslipidemia in adults ⁴⁶
Taiwan	<ul style="list-style-type: none"> - DASH diet rich in fruits and vegetables, rich in low-fat dairy products, and low in saturated fat and cholesterol - Adequate weight reduction - Reduction of excess alcohol intake - Avoid <i>trans</i> fat intake - EPA and DHA are recommended - Sodium restriction to 2–4 g/day 	2017 Taiwan lipid guidelines for high risk patients ⁴⁷
Malaysia	<ul style="list-style-type: none"> - Total fats should account for 20%–25% of the daily calorie intake with an upper limit of 30% of total energy - Saturated fat should account for <10% of total calories. SFAs should be replaced by PUFAs, MUFAs, or complex carbohydrates such as whole grains and oatmeal - <i>Trans</i> fats should be 1% of total calories - Dietary cholesterol should be <200 mg/day - Total carbohydrates should be 50%–60% of total calorie intake with an emphasis on whole grains - Proteins should account for 15%–20% of total calories with an emphasis on vegetable proteins - Patients with hypertriglyceridemia should consume 2–4 g/day of omega-3 fatty acids from food and/or supplements - Consume fiber-rich foods that contribute at least 20–30 g of fiber/day. - Consume 2–3 g/day of plant sterols and stanols 	Malaysian Ministry of Health Management of dyslipidemia guidelines 2017 ⁴⁸

ASCVD, atherosclerotic cardiovascular disease; SFA, saturated fatty acid; PUFA, polyunsaturated fatty acid; MUFA, monounsaturated fatty acid; EPA, eicosatetraenoic acid; DHA, docosahexaenoic acid; DASH, Dietary Approach to Stop Hypertension.

guidelines used to manage clinical risk factors of ASCVD in Asia is necessary.⁴¹ A number of countries in Asia have developed or are in the process of developing local clinical practice guidelines for prevention and management of ASCVD risk factors among local populations. These guidelines have the following 5 points of general agreement (**Table 3**):

- Limiting total energy intake and maintaining an appropriate body weight
- Limiting the percentage of energy derived from fat, reducing the amount of SFAs or substituting SFAs with polyunsaturated fatty acids (PUFAs), and reducing the intake of *trans* fatty acids
- Increasing the intake of omega-3 PUFAs
- Decreasing cholesterol intake
- Increasing consumption of vegetables and fruits

NUTRITIONAL MANAGEMENT OF ASCVD

1. Evidence-based customized nutrition therapy

The nutrition care process (NCP) (American Nutrition and Dietetics, 2007)⁴² is a problem-solving model that clearly describes the observed nutrition problems of a patient using standardized international dietetics and nutrition terminology.⁴³ The NCP is a well-known,

systematic method that can be used to develop an evidence-based, patient-centered nutritional care plan. It can also be designed to consider nutrition-related behavior, environmental conditions, and individualized aspects of health status. The NCP was originally designed by the American Dietetic Association and is now used by clinical dietitian/nutritionists in South Korea and elsewhere. The NCP model has the following four components: nutrition assessment, diagnosis, intervention, and monitoring/evaluation by a registered dietitian to support nutritional care. In the first step of *nutrition assessment*, clinical and nutrition-related risk factors, dietary problems, and nutritional status are assessed. *Nutrition diagnosis* is based on standardized international dietetics and nutrition terminology following the problem/etiology/symptom statement. During *nutrition intervention*, diet-related problems and patient risk factors are modified with a focus on the goals and priorities of the patient. In the *monitoring/evaluation* step of the NCP, individual goal achievements are evaluated based on patient food intake and nutritional outcomes.

2. Considerations for successful nutrition management

First, a team-based care approach is an effective strategy for preventing CVD.³⁴ Therefore, multidisciplinary intervention and implementation are necessary. Healthcare providers, including a nutrition expert, should first assess the patient's current eating pattern. After this, the provider should then suggest healthful dietary choices by considering patient preferences to achieve sustainable dietary changes and eating behaviors that will reduce the risk of CVD. In 2013, the AHA and ACC published Intensive lifestyle intervention guidelines that comprehensively describe nutrition, physical activity, and behavior therapies that can be delivered over a minimum of 6 months by trained interventionists such as registered dietitians, psychologists, exercise specialists, and health counselors.¹⁸

Next, a well-trained nutrition expert (clinical dietitian) is needed. These specialists provide systematic nutritional assessments, nutritional diagnoses, and appropriate nutrition education and counseling to subjects at risk of ASCVD. They can also establish an evaluation and ongoing management plan after nutritional intervention. Therefore, a nutrition specialist must be educated about CVD and trained to provide appropriate nutritional interventions, as necessary.

Next, one must recognize inconsistencies and gaps to facilitate strong adherence to the recommended healthy dietary pattern through a patient-centered nutritional environment and behavioral assessment. The recommended diet should be high in *vegetables, fruit, whole grains, seafood, legumes, and nuts* and low in *red and processed meats, sugar-sweetened beverages, and refined grains*.

Finally, regional, sociocultural, and economic factors should be considered to ensure that the dietary plan is accessible, and that the patient will be able to adhere to it.

3. Nutritional therapy guidelines for Asian subjects at risk for ASCVD

The published nutritional guidelines for prevention and/or management of ASCVD are mostly based on studies performed in Western countries. However, optimal nutritional management for Asian subjects may differ from that of Western subjects. Based on the available guidelines and previous studies, we suggest the following nutritional guidelines to decrease the risk of ASCVD:

- Limit the amount of energy consumed to maintain a healthy weight
- Emphasize a diet incorporating vegetables, fruits, legumes, nuts, whole grains, and fish

- Minimize intake of processed meats, refined carbohydrates, and sweetened beverages
- Replace SFAs with dietary MUFAs and PUFAs and limit intake of *trans* fat
- Reduce cholesterol, sodium, and alcohol intake

CONCLUSION

Nutrition is one of the major modifiable risk factors of ASCVD worldwide. Much of the ASCVD burden in Asia could be decreased by public health efforts to reduce risk factors, including unhealthy diet and physical inactivity.

Based on previous studies and available scientific evidence, we made various nutrition recommendations for prevention and treatment of ASCVD in Asian populations. First, we recommend customized nutrition counseling using an NCP by a clinical dietitian and comprehensive lifestyle interventions that consider patient regional, sociocultural, and economic factors to ensure adherence. Second, energy intake should be limited to that needed to maintain a healthy weight. Third, calories from total fat intake, SFA, *trans* fat, and cholesterol should be minimized, while there should be increased intake of foods rich in PUFAs and MUFAs. A balanced diet (carbohydrates, proteins, fats, fiber, minerals, and vitamins) that is rich in fruits, vegetables, whole grains, low-fat dairy products, poultry, fish, legumes, vegetable oils, and nuts is recommended. This diet is similar to the MED diet and also recommends reduced consumption of foods with added sugar. Finally, we recommend limiting sodium intake and alcohol consumption.

Despite these data, additional local evidence is required to form expert opinions on prevention and treatment of ASCVD in Asian populations. Individual countries should continue to review and revise dietary guidelines based on region-specific data.

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