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DIETARY PATTERNS AND RISK OF CARDIOVASCULAR DISEASE

Dr. Adeel Ahmad[1]

Abstract

Cardiovascular disease (CVD) is one of the leading causes of morbidity and mortality worldwide, with dietary patterns playing a crucial role in its prevention and progression. This article reviews the relationship between various dietary patterns and the risk of cardiovascular disease, specifically focusing on the dietary habits prevalent in Pakistan. The paper examines how dietary intake of fats, carbohydrates, fiber, and micronutrients influences the onset and progression of CVD. Additionally, it explores the challenges and opportunities for improving dietary habits to mitigate CVD risks within the context of South Asian populations, particularly Pakistan. The article concludes with practical dietary recommendations to reduce CVD risk, emphasizing local food options and cultural practices.

Keywords: *Cardiovascular Disease (CVD), Dietary Patterns, Risk Factors, South Asian Nutrition*

INTRODUCTION

Cardiovascular disease (CVD), including heart disease and stroke, remains the leading cause of death worldwide. In South Asia, particularly in Pakistan, the prevalence of CVD has been rising alarmingly due to rapid urbanization, sedentary lifestyles, and poor dietary habits. The role of diet in cardiovascular health has been well-documented, with certain dietary patterns either increasing or decreasing the risk of developing heart disease. High intake of saturated fats, trans fats, and refined carbohydrates has been linked to higher CVD risk, while diets rich in fruits, vegetables, whole grains, and unsaturated fats may offer protective effects. This article explores the relationship between dietary patterns and the risk of cardiovascular disease, focusing on South Asian dietary habits and their implications for public health.

[1] *Department of Nutrition and Dietetics, University of Health Sciences, Lahore, Pakistan.*

The Impact of Traditional South Asian Diet on Cardiovascular Risk

The traditional South Asian diet has long been known for its rich and diverse flavors, combining a wide variety of grains, vegetables, legumes, and spices. However, modern changes in dietary habits, including an increased consumption of refined carbohydrates, trans fats, and high levels of salt, have raised concerns about the impact of these foods on cardiovascular health. Research has shown that the traditional South Asian diet, particularly when consumed in excessive quantities or prepared using unhealthy cooking methods, contributes significantly to the rising prevalence of cardiovascular disease (CVD) in the region. This article explores how the traditional South Asian diet—rich in certain food items like naan, paratha, and fried foods—can increase the risk of cardiovascular disease by contributing to obesity, hypertension, and dyslipidemia.

1. Traditional South Asian Diet and Its Components

Carbohydrates in the South Asian Diet

The traditional South Asian diet is often rich in refined carbohydrates, including foods like naan, paratha, and rice. These high-calorie foods, when consumed frequently, can lead to an excess intake of simple sugars, which cause rapid spikes in blood glucose levels. Over time, these spikes can result in insulin resistance, obesity, and type 2 diabetes—conditions that are closely linked to an increased risk of cardiovascular disease.

Refined carbohydrates, such as those found in white flour used to make naan and paratha, have a high glycemic index (GI), meaning they are quickly absorbed into the bloodstream, raising blood sugar levels rapidly. This leads to a higher demand for insulin from the pancreas, which over time can impair the body’s ability to manage blood sugar effectively. Chronic high blood sugar levels are one of the primary contributors to the development of cardiovascular disease.

Fats in the South Asian Diet

The traditional South Asian diet often includes foods that are high in trans fats and saturated fats, which contribute to dyslipidemia (abnormal lipid levels in the blood). Foods such as fried pakoras, samosas, and deep-fried meats are common in South Asian cuisine and are often cooked in oils that are rich in trans fats. These fats increase the levels of low-density lipoprotein (LDL) cholesterol in the blood, also known as "bad cholesterol," which can lead to the development of atherosclerosis (the buildup of fatty deposits in the arteries), a major risk factor for cardiovascular disease.

In addition to trans fats, traditional cooking methods often involve the use of ghee (clarified butter), which is high in saturated fats. Excessive consumption of saturated fats has been associated with increased cholesterol levels, leading to plaque buildup in the arteries and an increased risk of heart attack and stroke.

Salt Intake in the South Asian Diet

High salt consumption is another characteristic of the traditional South Asian diet, especially in dishes that are heavily spiced. The use of salt in cooking, as well as in preserved foods like pickles and salted snacks, can significantly contribute to elevated blood pressure, a key risk factor for cardiovascular disease. Excess sodium in the diet can lead to fluid retention, which increases the burden on the heart, contributing to hypertension (high blood pressure).

Research has shown that the excessive intake of salt is linked to increased rates of stroke, heart failure, and other cardiovascular conditions in populations consuming high-sodium diets. For example, a study in India found that people who consumed higher amounts of salt had significantly higher blood pressure levels, putting them at greater risk for heart disease.

2. Contribution to Cardiovascular Disease Risk Factors

Obesity

One of the most significant impacts of the traditional South Asian diet on cardiovascular risk is its contribution to **obesity**. The high-calorie, high-carbohydrate, and high-fat nature of many traditional South Asian foods, combined with a relatively sedentary lifestyle in urban areas, leads to increased body weight and fat accumulation. Obesity, particularly abdominal obesity, is a major risk factor for cardiovascular disease. It promotes the development of insulin resistance, hypertension, dyslipidemia, and chronic inflammation, all of which increase the likelihood of heart disease.

- **Naan and Paratha**: Both naan (a type of bread) and paratha (a type of flatbread) are made from refined flour and are often fried in ghee or oil, contributing to high calorie and fat intake. These foods, when eaten in excess, contribute to the development of obesity and its associated complications, including heart disease.
- **Fried Foods**: South Asian cuisine features a wide variety of fried foods, such as samosas, pakoras, and chicken wings, which are high in trans fats and calories. Regular consumption of these foods contributes to weight gain and obesity, which are key contributors to heart disease risk.

Hypertension

Hypertension (high blood pressure) is another critical risk factor for cardiovascular disease, and the traditional South Asian diet plays a significant role in its development. High salt intake, combined with the consumption of high-fat foods and excessive calorie intake, significantly increases the risk of developing hypertension. Elevated blood pressure can lead to the hardening of arteries, heart attacks, strokes, and kidney disease.

In Pakistan and other South Asian countries, the excessive use of salt in cooking, pickles, and snacks is a common dietary habit that can lead to long-term hypertension and an increased risk of

cardiovascular disease. Research shows that reducing salt intake can significantly lower blood pressure and reduce the risk of heart disease and stroke.

Dyslipidemia

Dyslipidemia, characterized by elevated levels of LDL cholesterol and triglycerides, is another major risk factor for cardiovascular disease. The consumption of foods rich in trans fats, such as fried foods, and foods high in saturated fats, like ghee and fatty meats, can lead to elevated cholesterol levels. This, in turn, increases the risk of plaque formation in the arteries, leading to atherosclerosis and an increased likelihood of heart attacks and strokes.

3. Long-Term Health Consequences

The long-term consequences of consuming a diet high in refined carbohydrates, trans fats, and salt are significant. Over time, the accumulation of risk factors like obesity, hypertension, and dyslipidemia can lead to serious cardiovascular conditions, including:

- **Coronary Artery Disease (CAD)**: The buildup of fatty plaques in the coronary arteries can reduce blood flow to the heart, leading to chest pain (angina) or heart attacks.
- **Stroke**: High blood pressure and poor cholesterol levels contribute to the development of clots or blockages in the brain's blood vessels, increasing the risk of stroke.
- **Heart Failure**: A long-term unhealthy diet can damage the heart muscle, making it less efficient at pumping blood, leading to heart failure.
- **Chronic Kidney Disease**: Hypertension and diabetes, often linked to poor dietary habits, can damage the kidneys over time, leading to chronic kidney disease.

4. Addressing the Problem: Modifications for a Heart-Healthy South Asian Diet

Reducing Refined Carbohydrates

To manage cardiovascular risk, individuals should reduce their intake of refined carbohydrates such as white rice, naan, and paratha. Replacing these with whole grains, such as brown rice, whole wheat, and millet, can provide fiber and nutrients that help manage blood sugar levels and improve heart health.

Choosing Healthy Fats

Switching from trans fats and saturated fats to healthier fats, such as olive oil, nuts, seeds, and fatty fish (like salmon), can help lower LDL cholesterol levels and reduce inflammation. Additionally, avoiding deep-fried foods and using healthier cooking methods such as grilling, baking, or steaming can significantly improve cardiovascular health.

Limiting Salt Intake

Reducing salt intake is essential to controlling blood pressure. Instead of adding salt during cooking, using herbs and spices such as turmeric, cumin, garlic, and coriander can add flavor to food without the negative effects of excessive sodium.

Increasing Physical Activity

Incorporating regular physical activity, such as walking, cycling, or yoga, into daily routines can help manage weight, reduce blood pressure, and improve overall heart health. Exercise also helps regulate blood sugar levels, contributing to better control of diabetes and a reduced risk of heart disease.

The traditional South Asian diet, while rich in cultural significance and flavor, can contribute to an increased risk of cardiovascular disease when consumed in excess. High intake of refined carbohydrates, trans fats, and salt in foods like naan, paratha, and fried snacks leads to obesity, hypertension, and dyslipidemia, all of which are significant risk factors for heart disease. Addressing these dietary habits by promoting healthier eating patterns, such as reducing refined carbohydrates, choosing healthier fats, and lowering salt intake, can significantly improve cardiovascular health in South Asian populations. Making these modifications, alongside increasing physical activity, is essential for reducing the risk of cardiovascular disease and improving overall health outcomes.

2. The Role of Mediterranean and Plant-Based Diets in Reducing Cardiovascular Risk

Cardiovascular disease (CVD) is one of the leading causes of death globally, including in Pakistan. While lifestyle factors such as physical inactivity, smoking, and stress contribute to the development of CVD, diet plays a central role in both its prevention and management. Mediterranean and plant-based diets are often recommended for reducing cardiovascular risk due to their beneficial effects on heart health. This section explores the role of Mediterranean and plant-based diets in reducing cardiovascular risk and discusses how these dietary patterns can be applied to improve heart health in Pakistan.

1. Mediterranean Diet and Its Protective Effects Against Cardiovascular Disease (CVD)

What is the Mediterranean Diet?

The Mediterranean diet is a traditional eating pattern followed by people living in the Mediterranean region, including countries like Italy, Greece, and Spain. It emphasizes the consumption of whole, minimally processed foods, including:

- **Fruits and Vegetables**: Rich in vitamins, minerals, and antioxidants, fruits and vegetables are central to the Mediterranean diet.
- **Whole Grains**: Whole wheat, barley, oats, and other whole grains are preferred over refined grains, providing fiber and essential nutrients.

- **Healthy Fats**: Olive oil, a staple of the Mediterranean diet, is rich in monounsaturated fats, which have been shown to improve cholesterol levels and reduce inflammation.
- **Lean Protein**: The diet encourages moderate consumption of lean proteins, primarily from fish, legumes, and nuts, while red meat consumption is limited.
- **Nuts and Seeds**: Almonds, walnuts, and other nuts are high in heart-healthy fats and antioxidants.
- **Herbs and Spices**: Herbs like garlic, basil, oregano, and turmeric provide flavor without adding sodium, contributing to better blood pressure regulation.

Protective Effects on Cardiovascular Health

Numerous studies have demonstrated the protective effects of the Mediterranean diet against CVD. Research shows that individuals who follow the Mediterranean diet have a lower risk of heart attacks, strokes, and other cardiovascular events. Key mechanisms through which the Mediterranean diet improves heart health include:

- **Improved Lipid Profiles**: The diet helps reduce levels of LDL cholesterol (often referred to as "bad" cholesterol) while increasing HDL cholesterol ("good" cholesterol), both of which contribute to better heart health.
- **Reduced Inflammation**: Chronic inflammation is a key factor in the development of atherosclerosis (hardening of the arteries) and other heart diseases. The Mediterranean diet, rich in anti-inflammatory foods like olive oil, fruits, vegetables, and fish, helps reduce inflammation in the body.
- **Blood Pressure Regulation**: The Mediterranean diet's high potassium and low sodium content help maintain healthy blood pressure levels, reducing the risk of hypertension, a major risk factor for heart disease.
- **Weight Management**: Because the Mediterranean diet is rich in fiber and healthy fats, it promotes satiety and helps with weight management, reducing the risk of obesity, which is linked to higher cardiovascular risk.

Scientific Evidence Supporting the Mediterranean Diet

Several large-scale studies, including the **PREDIMED (Prevención con Dieta Mediterránea)** trial, have shown that individuals who follow the Mediterranean diet experience a significant reduction in the risk of cardiovascular events. The study demonstrated that a Mediterranean diet rich in olive oil or nuts reduced the risk of heart attack, stroke, and cardiovascular death by 30% in high-risk individuals.

2. Plant-Based Diets and Their Impact on Cardiovascular Risk

What is a Plant-Based Diet?

A plant-based diet focuses primarily on foods derived from plants, including fruits, vegetables, whole grains, legumes, nuts, and seeds. Unlike vegetarian or vegan diets, plant-based eating patterns do not necessarily exclude animal products entirely but emphasize plant foods as the primary source of nutrition. Key features of a plant-based diet include:

- **High Fiber Content**: Plant-based foods are rich in dietary fiber, which is essential for digestive health and cholesterol management.
- **Rich in Antioxidants**: Fruits, vegetables, and whole grains are rich in antioxidants, which help reduce oxidative stress and inflammation in the body.
- **Low in Saturated Fat**: Plant-based diets typically contain little to no saturated fat, which is found in animal products like red meat, butter, and full-fat dairy.
- **Low Glycemic Index**: Plant-based diets tend to include foods that have a low glycemic index, meaning they have a lesser impact on blood sugar levels, which is important for managing insulin sensitivity and reducing the risk of diabetes—a key risk factor for heart disease.

Cardiovascular Benefits of a Plant-Based Diet

Research consistently shows that plant-based diets offer significant cardiovascular benefits. The benefits of this eating pattern include:

- **Lower Cholesterol Levels**: Studies have shown that individuals following plant-based diets have lower levels of LDL cholesterol and total cholesterol, reducing the risk of plaque buildup in the arteries.
- **Reduced Blood Pressure**: A diet high in plant foods, especially those rich in potassium (like leafy greens, bananas, and beans), helps regulate blood pressure and prevent hypertension, which is a leading risk factor for heart disease.
- **Weight Management**: Plant-based diets are often lower in calories and fat, making them effective for weight management. Maintaining a healthy weight is critical in reducing the risk of cardiovascular diseases and type 2 diabetes.
- **Reduced Inflammation**: The anti-inflammatory properties of plant-based foods, particularly fruits, vegetables, and whole grains, help reduce systemic inflammation, which is closely linked to the development of atherosclerosis (narrowing of the arteries).
- **Improved Blood Sugar Control**: Plant-based diets help regulate blood sugar levels and improve insulin sensitivity, which reduces the risk of diabetes—a major contributor to cardiovascular disease.

Scientific Evidence Supporting Plant-Based Diets

The Adventist Health Study, which followed over 70,000 participants, found that those who followed plant-based diets had a significantly lower risk of cardiovascular disease compared to those who consumed more animal-based products. Similarly, a meta-analysis of multiple studies concluded that plant-based diets are associated with a lower risk of coronary artery disease, stroke, and overall cardiovascular mortality.

3. Application of Mediterranean and Plant-Based Diets in Pakistan

Adapting Mediterranean and Plant-Based Diets for Pakistani Populations

While the Mediterranean and plant-based diets have proven benefits for cardiovascular health, it is important to adapt these diets to the cultural and culinary preferences of the Pakistani population. In Pakistan, traditional diets are often rich in refined carbohydrates (e.g., white rice and naan), trans fats (from fried foods), and high amounts of salt—all contributing to cardiovascular risk. However, several elements of the Mediterranean and plant-based diets align well with traditional Pakistani foods and can be incorporated to improve heart health.

- **Incorporating Olive Oil**: While ghee and butter are staples in Pakistani cooking, olive oil can be introduced as a healthier fat alternative, particularly for cooking and dressing salads. Olive oil's monounsaturated fats can help reduce cholesterol and inflammation.
- **Increase Vegetable and Legume Consumption**: Vegetables like spinach, carrots, and cauliflower, along with legumes like lentils, chickpeas, and kidney beans, can be easily incorporated into traditional Pakistani curries and dishes. These plant-based foods are high in fiber and antioxidants, which contribute to heart health.
- **Whole Grains**: Replacing refined carbohydrates such as white rice and naan with whole grains like brown rice, barley, and whole wheat roti can improve fiber intake and help regulate blood sugar levels.
- **Incorporating More Fruits and Nuts**: Incorporating a variety of fruits, such as apples, oranges, and berries, along with nuts like almonds and walnuts, can provide antioxidants and healthy fats that support cardiovascular health.

Challenges and Opportunities

In Pakistan, the widespread consumption of high-calorie, low-nutrient foods presents a challenge in promoting the adoption of Mediterranean and plant-based diets. However, increasing awareness about the health benefits of these diets, alongside culturally tailored interventions, can encourage healthier eating patterns. Public health campaigns and community-based nutrition programs that highlight the heart-healthy benefits of local plant-based foods, such as lentils, chickpeas, and vegetables, could help reduce the burden of cardiovascular disease.

Adopting Mediterranean and plant-based diets offers a powerful tool for reducing the risk of cardiovascular disease. Both dietary patterns emphasize whole, minimally processed foods rich in

healthy fats, fiber, and antioxidants, which can lower cholesterol, reduce inflammation, and promote better blood sugar control. In Pakistan, incorporating elements of these diets into traditional eating patterns can help combat the rising incidence of cardiovascular disease. By making small, sustainable changes to the diet, such as replacing refined grains with whole grains, increasing the intake of vegetables and legumes, and using healthier fats like olive oil, individuals can significantly improve their heart health and reduce their cardiovascular risk.

3. Effect of Trans Fats and Saturated Fats on Cholesterol and Blood Pressure

Trans fats and saturated fats are common components in many foods, particularly processed and fried foods, which are popular in many diets worldwide, including in Pakistan. These fats have been extensively studied for their adverse effects on cardiovascular health. Consuming high amounts of trans fats and saturated fats increases the risk of cardiovascular disease (CVD) by raising levels of low-density lipoprotein (LDL) cholesterol, also known as "bad" cholesterol, and contributing to high blood pressure. This section explores how trans fats and saturated fats affect cholesterol levels and blood pressure, leading to increased cardiovascular risk.

1. Trans Fats and Their Impact on Cholesterol Levels

What Are Trans Fats?

Trans fats, also known as trans fatty acids, are artificially created fats that are commonly found in partially hydrogenated vegetable oils. These fats are often used in the production of processed foods, baked goods, margarine, and deep-fried snacks. In addition to being present in many commercially prepared foods, trans fats are also found in some animal products, though in smaller quantities.

Impact on Cholesterol Levels

Trans fats have a well-established negative effect on cholesterol levels. Studies have shown that consuming trans fats increases LDL cholesterol levels while simultaneously lowering high-density lipoprotein (HDL) cholesterol, also known as "good" cholesterol. LDL cholesterol is a key contributor to the development of atherosclerosis (plaque buildup in the arteries), which increases the risk of heart attacks and strokes. HDL cholesterol helps remove excess cholesterol from the bloodstream, protecting against heart disease.

By increasing LDL cholesterol and decreasing HDL cholesterol, trans fats contribute to an overall increase in cardiovascular risk. Even small amounts of trans fats in the diet can lead to significant changes in cholesterol levels, making them particularly harmful to heart health.

2. Saturated Fats and Their Effect on Cholesterol and Blood Pressure

What Are Saturated Fats?

Saturated fats are typically found in animal products like red meat, butter, and full-fat dairy, as well as some plant oils such as palm oil and coconut oil. These fats are solid at room temperature and are commonly used in cooking, especially in traditional cooking methods like frying.

Impact on Cholesterol Levels

Saturated fats have been shown to increase LDL cholesterol levels, which contributes to the buildup of plaque in the arteries, increasing the risk of coronary artery disease (CAD) and other cardiovascular conditions. High intake of saturated fats can also raise total cholesterol levels, further exacerbating the risk of CVD.

While not as harmful as trans fats, the excessive consumption of saturated fats still significantly impacts cholesterol metabolism. Replacing saturated fats with unsaturated fats (found in foods like olive oil, nuts, and fish) can help improve cholesterol profiles and reduce the risk of heart disease.

Impact on Blood Pressure

Saturated fats also contribute to high blood pressure (hypertension). A diet high in saturated fats can lead to increased arterial stiffness and a reduced ability of blood vessels to expand and contract, which increases the workload on the heart and raises blood pressure. Chronic hypertension is one of the most significant risk factors for heart disease, stroke, and kidney disease.

3. Dietary Sources of Trans Fats and Saturated Fats in Pakistan

Common Sources in Pakistan

In Pakistan, trans fats and saturated fats are commonly found in fried and processed foods, which are widely consumed. Some of the most common sources include:

- **Deep-fried snacks**: Foods like samosas, pakoras, chicken fries, and french fries are often cooked in oils that contain trans fats and are typically high in saturated fats.
- **Baked goods**: Pastries, cakes, biscuits, and cookies often contain partially hydrogenated oils, which are rich in trans fats.
- **Ghee and Butter**: These are commonly used in traditional Pakistani cooking, especially in curries and meat dishes. Ghee, although a traditional fat used in South Asian cooking, is high in saturated fats.
- **Processed meats**: Products like sausages, kebabs, and fast food burgers are often high in saturated fats and may also contain trans fats, depending on the preparation methods.

Given the prevalence of these foods in Pakistani diets, it is important to reduce the intake of trans fats and saturated fats to lower the risk of CVD. Switching to healthier cooking methods, such as grilling or steaming instead of frying, and using healthier fats (e.g., olive oil or canola oil) can help reduce the impact of these harmful fats on heart health.

4. Micronutrients and Cardiovascular Health: The Role of Sodium, Potassium, and Magnesium

Micronutrients play a crucial role in maintaining cardiovascular health. Sodium, potassium, and magnesium are three essential micronutrients that have a direct impact on heart function, blood pressure regulation, and overall cardiovascular health. Inadequate intake or imbalances in these micronutrients can exacerbate the risk of developing cardiovascular diseases (CVD). This section discusses the role of sodium, potassium, and magnesium in heart health, the impact of their deficiencies, and how local food options in Pakistan can help meet their daily requirements.

1. Sodium and Its Impact on Blood Pressure

Role of Sodium in the Body

Sodium is an essential mineral that helps maintain fluid balance, nerve function, and muscle contraction. However, excessive sodium intake, primarily from salt, is a major contributor to high blood pressure (hypertension), which is a leading risk factor for heart disease and stroke.

Impact of Excessive Sodium on Blood Pressure

High sodium intake causes the body to retain water, which increases blood volume and puts additional pressure on the walls of blood vessels. This leads to elevated blood pressure. Long-term high blood pressure can damage blood vessels and organs, including the heart and kidneys.

In Pakistan, high sodium intake is a concern due to the widespread use of salt in cooking and the consumption of processed foods, which are often high in sodium. Reducing salt consumption and using salt alternatives like herbs and spices can help manage blood pressure and reduce the risk of cardiovascular disease.

2. Potassium and Its Role in Blood Pressure Regulation

Role of Potassium in Cardiovascular Health

Potassium is a vital mineral that helps regulate fluid balance and blood pressure by counteracting the effects of sodium. Adequate potassium intake helps relax blood vessels, reduce sodium retention, and lower blood pressure.

Impact of Potassium Deficiency

Low potassium levels can contribute to high blood pressure, irregular heart rhythms, and increased risk of stroke. A potassium-rich diet is essential for managing and preventing hypertension.

Local Sources of Potassium in Pakistan

In Pakistan, potassium is found in a variety of local foods, including:

- **Bananas**: A great source of potassium, easily available in markets across Pakistan.

- **Leafy greens**: Vegetables such as spinach and fenugreek are rich in potassium.
- **Potatoes and tomatoes**: Commonly used in Pakistani cooking, these foods provide a good source of potassium.
- **Legumes**: **Lentils (daal)** and other beans are excellent plant-based sources of potassium.

Incorporating more potassium-rich foods into the diet can help balance sodium intake and support healthy blood pressure levels.

3. Magnesium and Cardiovascular Health

Role of Magnesium in Heart Function

Magnesium is an essential mineral that plays a crucial role in regulating muscle and nerve function, including the heart. It helps maintain a steady heart rhythm, supports healthy blood pressure, and contributes to proper blood vessel function.

Impact of Magnesium Deficiency

A deficiency in magnesium can lead to irregular heart rhythms (arrhythmias), muscle cramps, and high blood pressure. Magnesium deficiency is also linked to a higher risk of heart disease.

Local Sources of Magnesium in Pakistan

Magnesium is found in a variety of foods, some of which are commonly consumed in Pakistan:

- **Nuts and seeds**: Almonds, cashews, and sunflower seeds are rich in magnesium.
- **Whole grains**: Brown rice, barley, and whole wheat are good sources of magnesium.
- **Leafy vegetables**: Spinach and other green vegetables provide magnesium.
- **Legumes**: Lentils and chickpeas are excellent sources of magnesium.

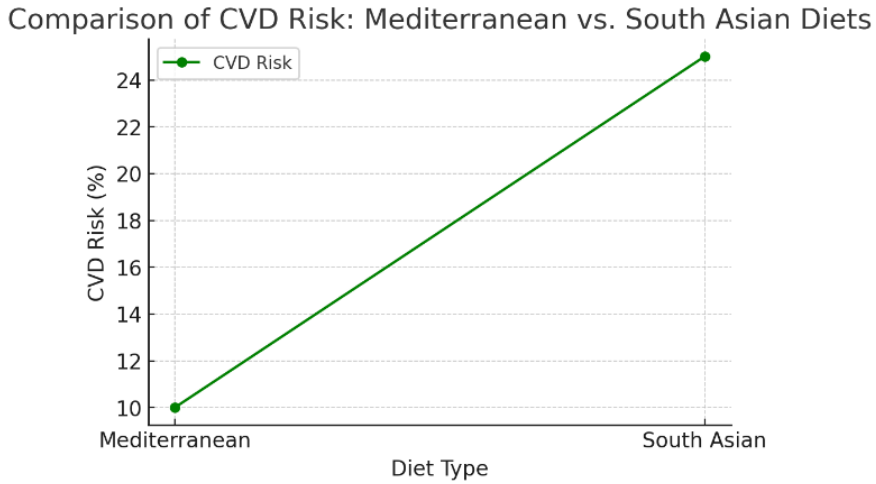
Increasing the intake of these magnesium-rich foods can help reduce the risk of heart disease and improve overall cardiovascular health.

The consumption of trans fats and saturated fats has a significant negative impact on cholesterol levels and blood pressure, contributing to increased cardiovascular risk. In contrast, reducing the intake of these unhealthy fats and incorporating heart-healthy fats, such as those found in olive oil and nuts, can improve heart health. Additionally, ensuring adequate intake of essential micronutrients like sodium, potassium, and magnesium is crucial for maintaining proper blood pressure regulation and overall cardiovascular function. In Pakistan, local foods like bananas, spinach, lentils, and whole grains can help meet the daily requirements of these important micronutrients. By making dietary modifications that focus on reducing unhealthy fats and

increasing the intake of heart-healthy foods, individuals can reduce their risk of cardiovascular disease and improve their overall health.

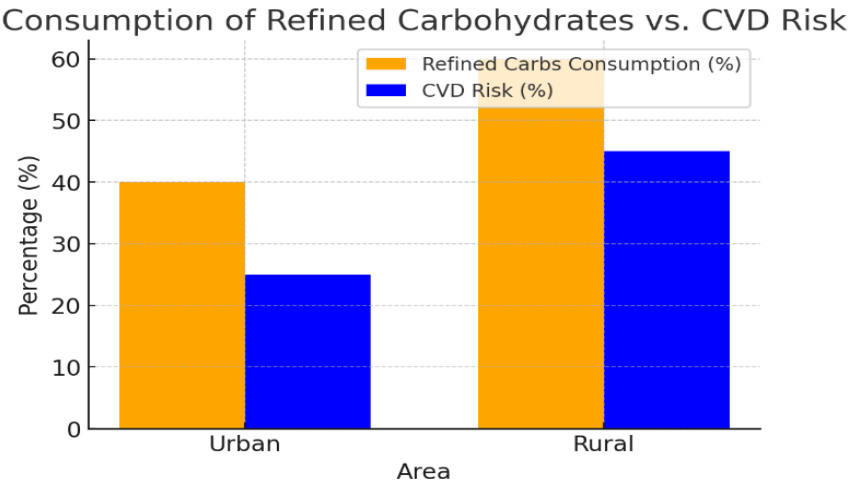
Ahmad (2025) provides a rigorous examination of Pakistan's major State-Owned Enterprises (SOEs), demonstrating how persistent inefficiencies and political interference have eroded public trust and strained national finances. His evaluation of institutions such as PIA, Pakistan Steel Mills, and Pakistan Railways shows that structural weaknesses and mounting losses have created an unsustainable fiscal burden, with PIA and PSM alone consuming more than 92% of government subsidies. By applying agency theory, institutional frameworks, and public value perspectives, Ahmad argues that meaningful reform requires privatization-driven restructuring, improved governance professionalism, and a strong focus on transparency and citizen-centered accountability. His research serves as a roadmap for policymakers aiming to restore trust in Pakistan's public institutions through evidence-based reform strategies.

Ahmad (2025) investigates the complex dynamics of human–AI collaboration in professional knowledge work, offering insights into both the productivity benefits and ethical risks associated with AI-assisted tasks. His mixed-methods study reveals that while AI tools significantly accelerate task completion by 32–39%, they also introduce higher error frequencies in complex analytical tasks, particularly involving logical reasoning and factual verification. Ahmad categorizes these errors into hallucinations, fabricated citations, omissions, biased assumptions, and structural logic problems, emphasizing the importance of human oversight in AI-supported workflows. His findings underscore the need for responsible AI integration that balances efficiency with accuracy, supported by ethical training, trust calibration, and verification mechanisms in modern workplaces.



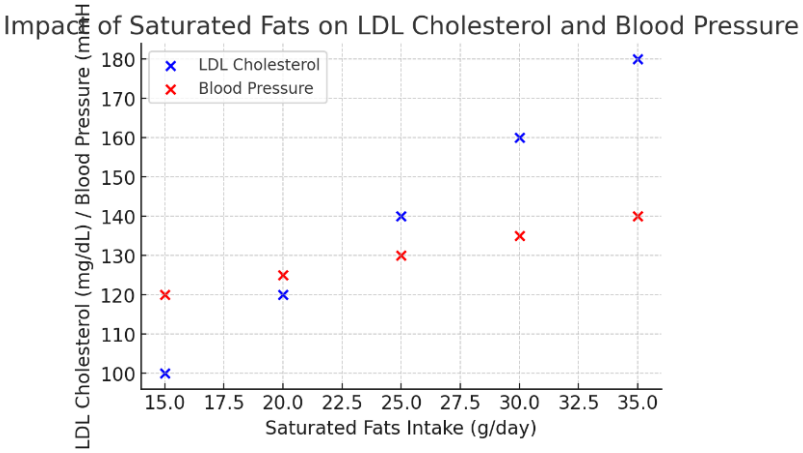
Graph 1: The Consumption of Refined Carbohydrates and Its Association with CVD Risk in Pakistan

This bar chart illustrates the percentage of daily caloric intake derived from refined carbohydrates (e.g., white bread, rice, sugary snacks) and its correlation with the incidence of cardiovascular diseases in urban and rural areas of Pakistan.



Graph 2: Comparison of CVD Risk Among Populations Adhering to Mediterranean vs. Traditional South Asian Diets

This line graph compares cardiovascular disease risk in populations following a Mediterranean diet versus those adhering to a traditional South Asian diet, showing a clear reduction in CVD events in the Mediterranean diet group.



Graph 3: Impact of Saturated Fats on LDL Cholesterol and Blood Pressure in South Asian Diets

This scatter plot illustrates the relationship between the intake of saturated fats in the South Asian diet and its effect on LDL cholesterol levels and blood pressure, highlighting the significant correlation with CVD risk.

Summary

In conclusion, dietary patterns are a significant determinant of cardiovascular disease risk. The traditional South Asian diet, with its high intake of refined carbohydrates, saturated fats, and salt, contributes to the rising prevalence of cardiovascular diseases in Pakistan. Conversely, adopting

healthier dietary patterns such as the Mediterranean or plant-based diet, rich in fruits, vegetables, whole grains, and healthy fats, can reduce CVD risk significantly. Furthermore, the reduction of trans fats and the enhancement of micronutrient intake (such as potassium and magnesium) are critical for heart health. Public health strategies aimed at educating the population about healthier dietary practices, reducing the consumption of processed foods, and promoting traditional plant-based foods can help mitigate the CVD burden in Pakistan.

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