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The Prevalence and Trend of Metabolic Syndrome in Mediterranean Regions: A Comprehensive Review

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ABSTRACT

Metabolic Syndrome (MetS) is a cluster of interconnected conditions that increase the risk of cardiovascular disease, type 2 diabetes mellitus, and other chronic illnesses. These conditions include central obesity, hypertension, dyslipidemia, and insulin resistance. Mediterranean regions exhibit unique dietary, genetic, and lifestyle patterns that influence the prevalence of MetS. This review examines recent studies assessing the prevalence, trends, and contributing factors of MetS in Mediterranean populations. Key findings highlight regional differences, impacts of dietary habits, and the importance of lifestyle interventions in managing MetS in these regions.

Introduction

Metabolic Syndrome (MetS) is a major public health concern worldwide, defined by the coexistence of multiple risk factors, such as obesity, hyperglycemia, dyslipidemia, and hypertension, which together elevate cardiovascular disease (CVD) and type 2 diabetes risk(1). The prevalence of MetS is rising globally, but Mediterranean regions are unique due to the well-documented health benefits of the **Mediterranean diet** and lifestyle, which can mitigate MetS risk. However, socioeconomic and lifestyle changes, including urbanization, have led to variations in MetS trends across Mediterranean populations.

This review summarizes the prevalence, trends, and lifestyle contributions to MetS in Mediterranean regions, focusing on regional disparities, demographic factors, and preventive strategies.

Definition and Criteria of Metabolic Syndrome

The diagnosis of MetS is based on guidelines from several international bodies such as:

1. **National Cholesterol Education Program – Adult Treatment Panel III (NCEP-ATP III)**
2. **International Diabetes Federation (IDF)**
3. **World Health Organization (WHO)**

According to the IDF, MetS is diagnosed when central obesity (elevated waist circumference) is accompanied by two or more of the following factors(2):

- Raised triglycerides (≥150 mg/dL)
- Reduced HDL cholesterol (<40 mg/dL for men, <50 mg/dL for women)
- Hypertension (≥130/85 mmHg)
- Elevated fasting glucose (≥100 mg/dL)

Prevalence of Metabolic Syndrome in Mediterranean Regions

1. Southern Europe

Southern European countries, including Spain, Italy, and Greece, show a high prevalence of MetS, though trends vary across regions and age groups.

- In **Spain**, the **Di@bet.es study** reported a MetS prevalence of **31.5%**, with higher rates in individuals over 60 years(3).
- In **Italy**, the prevalence of MetS ranged between **26-38%**, with significant variation based on dietary adherence(4).
- **Greece** has seen a significant increase in MetS prevalence over the past two decades, with studies reporting rates of **28-35%**, attributed to declining adherence to the traditional Mediterranean diet(5).

2. North Africa

North African countries like Morocco, Tunisia, and Algeria report an increasing prevalence of MetS, largely due to urbanization and lifestyle changes.

- A systematic review in **Tunisia** indicated a MetS prevalence of **30.1%**, with obesity and sedentary lifestyles as major contributing factors(6).
- In **Morocco**, studies reveal a prevalence of **25.5%**, with significant gender differences (higher rates in women)(7).
- **Algeria** has documented rising MetS rates, particularly in urban areas, where obesity and hypertension are major contributors(8).

3. Middle Eastern Mediterranean Countries

Countries such as Turkey, Lebanon, and Egypt show alarming trends in MetS prevalence:

- In **Turkey**, the **Turkish Adult Risk Factor Study** reported a prevalence of **41.1%**, making MetS a critical public health issue(9).
- In **Lebanon**, studies have reported a prevalence of **30-36%**, with urban populations at greater risk(10).
- **Egypt** faces significant challenges, with MetS prevalence reaching **39.3%**, particularly among women(11).

Trends and Contributing Factors

1. Dietary Habits

The traditional **Mediterranean diet** is characterized by high consumption of fruits, vegetables, whole grains, nuts, olive oil, and moderate fish and wine intake. This diet has protective effects against MetS due to its anti-inflammatory and antioxidant properties(12). However, adherence to this diet is declining due to urbanization, globalization, and the adoption of Western dietary patterns.

- A study in **Greece** found that individuals adhering to the Mediterranean diet had a **32% lower risk** of developing MetS(13).
- In contrast, **low adherence** has been linked to increased rates of obesity and insulin resistance, particularly in younger populations(14).

2. Physical Inactivity and Urbanization

Urbanization has led to reduced physical activity, increased sedentary behaviors, and higher obesity rates in Mediterranean regions.

- In **Morocco**, sedentary lifestyles were a significant predictor of MetS, particularly among women.
- Similarly, studies in **Turkey** have associated physical inactivity with rising MetS prevalenc.

3. Obesity and Gender Differences

Obesity is a key driver of MetS. Women in Mediterranean regions often exhibit higher MetS prevalence, particularly in North Africa and the Middle East.

- In **Tunisia**, obesity prevalence among women contributes to a higher MetS burden compared to men.

4. Socioeconomic Factors

Lower socioeconomic status (SES) has been linked to increased MetS prevalence due to poor dietary choices, limited healthcare access, and lower physical activity levels(15).

Preventive Strategies and Interventions

1. Promoting the Mediterranean Diet

Encouraging adherence to the Mediterranean diet can significantly reduce MetS prevalence. Educational programs and community interventions have shown promising results(16).

2. Physical Activity Programs

Regular physical activity reduces obesity, improves insulin sensitivity, and lowers blood pressure. Structured exercise programs targeting urban populations can help mitigate MetS risk.

3. Public Health Policies

Governments must implement policies to promote healthy lifestyles, improve healthcare access, and address socioeconomic disparities that contribute to MetS.

Future Directions

Future research should focus on:

- Identifying genetic and epigenetic factors influencing MetS susceptibility in Mediterranean populations.
- Longitudinal studies to monitor the impact of lifestyle interventions on MetS trends.
- Regional comparisons to develop tailored public health interventions.

Conclusion

Metabolic Syndrome is a growing health concern in Mediterranean regions, with prevalence ranging from **25% to 41%** across countries. The decline in adherence to the Mediterranean diet, urbanization, physical inactivity, and socioeconomic disparities are major contributors. Promoting traditional dietary habits, increasing physical activity, and implementing effective public health policies are essential to curb MetS trends in these regions.

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