

Deadly Duo: Examining the Effects of Metabolic Syndrome on Coronary Heart Disease

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Abstract

Coronary heart disease (CHD) results in 7.6 million deaths annually. Metabolic syndrome (MetS) is a clustering of several of the risk factors of CHD. The prevalence of MetS in Canada can reach up to 33.5%.

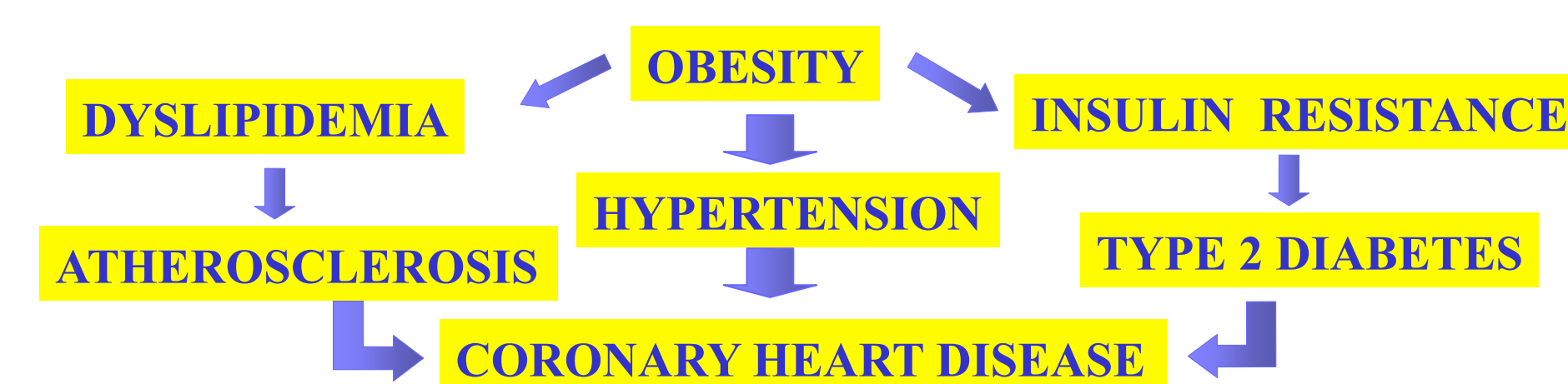
OBJECTIVES: To examine the relationship between MetS and CHD in order to explore the possibility that MetS increases the risk and severity CHD events.

METHODS: A systematic literature review was performed to examine the relationship between MetS and CHD. The endpoints were CHD mortality rates related to MetS, and the severity of CHD events in MetS patients.

RESULTS: Studies indicated that 40% MetS subjects were at high risk of coronary calcium and a 2.02 hazard ratio was observed of MetS associated with CHD. A second study showed that MetS patients were more likely to experience CHD events. Another observed that relative risk of MetS increasing mortality rates was 3.4. Carotid atherosclerosis was present in almost half MetS subjects in another study.

CONCLUSION: MetS appears to increase mortality rates among CHD patients and the risk and severity of CHD events. Additional studies should be conducted to eliminate confounding factors.

Obesity: Relationship to Coronary Heart Disease



Background

Heart disease is defined as the structural and functional abnormalities of the heart. Coronary heart disease, the most common type of heart disease, occurs when there is an accumulation of plaque (atherosclerosis) in the coronary arteries, leading to an inadequate circulation of oxygen-rich blood to the cardiac muscle. Metabolic syndrome is a common precursor to coronary heart disease. This condition involves a clustering of multiple metabolic risk factors including obesity, increased triglyceride and fasting glucose levels, a decrease in HDL levels, and hypertension.

Objectives

- To investigate the relationship between metabolic syndrome and coronary heart disease.
- To explore the effect of metabolic syndrome on the severity of coronary heart disease.

Research Question

Does Metabolic Syndrome, acting as a comorbidity lead to an increased risk of heart disease?

Hypothesis

Due to the common risk factors of both heart disease and metabolic syndrome, it is predicted that the presence of metabolic syndrome will amplify the severity of heart disease.

Methodology

- Systematic literature review of scientific data bases
- MetS was defined by the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III)
- Collection of studies examining the association between metabolic syndrome (MetS) and coronary heart disease (CHD)
- Primary endpoint was the mortality rates CHD patients associated with MetS and secondary endpoint was the severity of CHD events associated with MetS
- Events included in CHD were: atherosclerosis, myocardial infarction, stenoses and coronary artery repair.

Observations

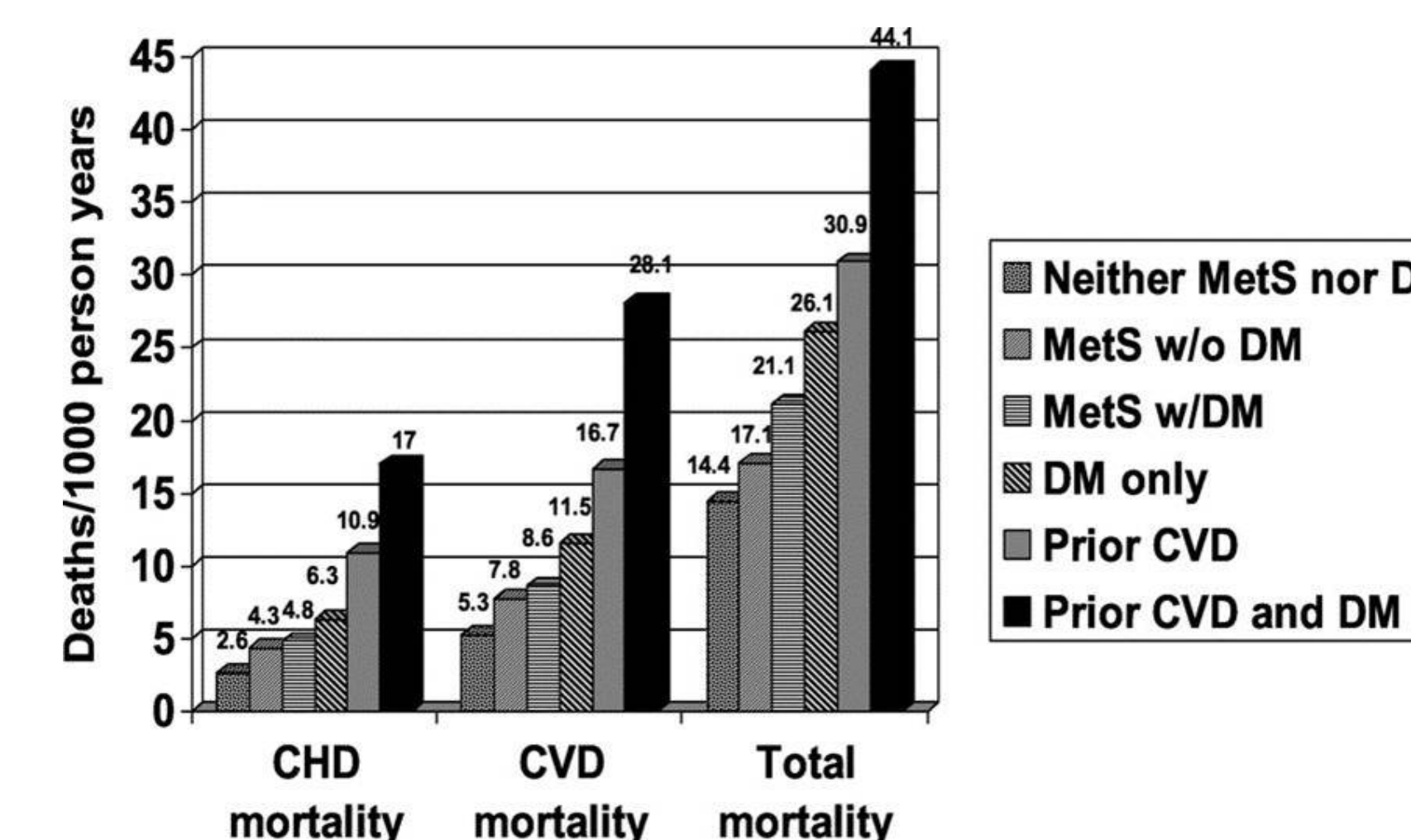
- 7.6 million people die of coronary heart disease annually.
- Between 2004-2005, 177/100,000 Canadians were hospitalized with a myocardial infarction.
- Metabolic syndrome is suggested to increase both the risk and severity of CHD.
- Individuals exhibiting any of the factors associated with metabolic syndrome may be at a higher risk of mortality from heart disease.
- A Canadian study found a 35% prevalence of metabolic syndrome among men and 32% among women.
- 80% of heart disease proceedings are suspected to be preventable in metabolic syndrome cases through the control of blood pressure and cholesterol levels.

Results

Study #1:

Type of Study	Population	Methodology
-Cohort - subjects were observed for 13.3 years	-6255 subjects from the Second National Health and Nutrition Examination Survey - American Adults aged: 30-75 years	- Examine relationship between several comorbidities - Examine mortality rates of subjects with coronary heart diseases (CHD) and cardiovascular disease (CVD).

MetS existed in 19.2% of subjects. The hazard ratio of MetS associated with CHD mortality was 2.02. Women exhibited a slightly higher risk of both CHD mortality than men. 40% of MetS subjects were at high risk of coronary calcium. It is believed that 80% of CHD events are preventable by controlling the MetS characteristics, cholesterol and blood pressure.



The graph demonstrates a positive correlation between the number of comorbidities and the overall mortality rates. Also, MetS subjects are at increased risk of CHD mortality.

STUDY #	Type of Study	Population	Methodology
2	-Cohort - subjects were followed from April 1991- June 2004 for a mean period of 12.6 years	-1080 Quebecois residents - 80% Caucasian	subjects were distributed into 4 groups: 1) <50% stenoses and did not have metabolic syndrome (MetS). 2) <50% stenoses and had MetS 3) >50% stenoses and did not have MetS 4) >50% stenoses and had MetS
3	-Retrospective study - Subjects gathered from 2000-2004 period	-5304 subjects who had an isolated coronary artery bypass grafting (CABG) - 46% of the subjects were MetS positive	-Primary endpoint: operative mortality (death from any cause within 30 days) - Secondary endpoint: morbidity during hospital stay.

Study #2:

Solymos, B.C., Bourassa, M.G., Marcil, M., Levesque, S., Varga, S., & Campeau, L.(2009). Longterm rates of cardiovascular events in patients with the metabolic syndrome according to severity of coronary angiographic alterations. *Coronary Artery Disease*20(1) p.1-8. DOI: 10.1097/MCA.0b013e32831624a5

The results of the hazard ratio calculations showed subjects in group 2 exhibited a higher incidence of MI and angina than group 1 while those in group 4 had a higher incidence rate of angina and stroke than group 3. Subjects with no previous CHD that had MetS also exhibited increased mortality rates.

Study #3:

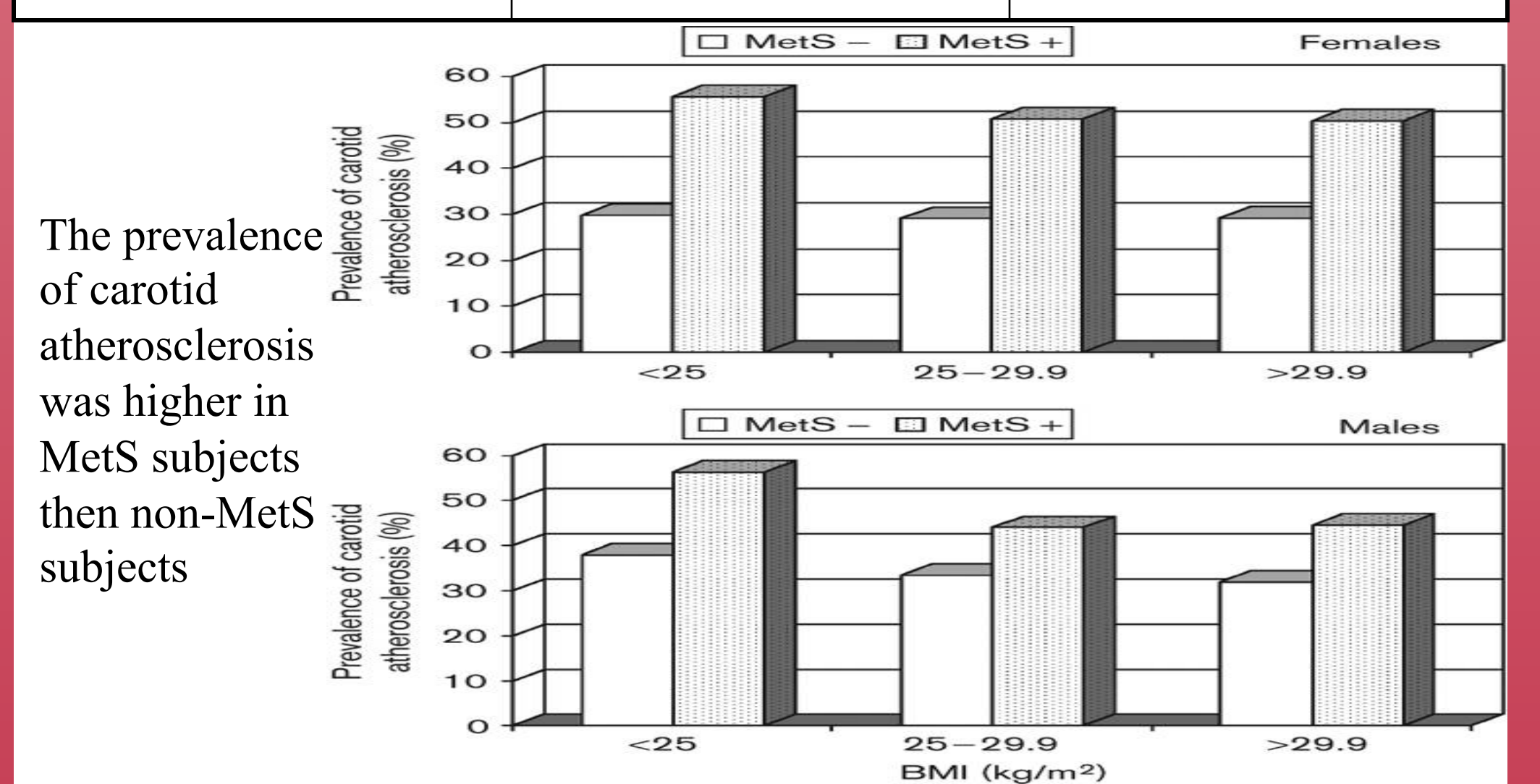
Echahidi N, Pibarot P, Despres JP, Daigle JM, Mohty D, Voisine P et al. (2007). Metabolic syndrome increases operative mortality in patients undergoing coronary artery bypass grafting surgery. *Journal of the American College of Cardiology* 50(9) p. 843-851. Doi: 10.1016/j.jacc.2007.04.075

Subjects with MetS were more likely to be women, have hypertension, diabetes, obesity, peripheral vascular disease, renal failure and history of stroke. The operative mortality rates for patients with MetS was 2.4% while those without was 0.9%. The relative risk of MetS increasing operative mortality was 3.04 (95% CI 1.73 to 5.32) and the most common cause of death was from cardiac events.

Study #4:

Irace, C., Scavelli, F., Carallo, C., Serra, R., Cortese, C., & Gnasso, A.(2009). Body mass index, metabolic syndrome and carotid atherosclerosis. *Coronary Artery Disease* 20(2) p.94-99. DOI: 10.1097/MCA.0b013e328325219e76

Type of Study	Population	Methodology
- Longitudinal	-Free living population from southern Italy - volunteers gathered from the Cardiovascular Disease Prevention Campaign	-Logistic regression analysis: -- Atherosclerosis, BMI and CHD risk factors --Trend between MetS components among BMI categories



The prevalence of carotid atherosclerosis was higher in MetS subjects than non-MetS subjects

Conclusions

- Individuals with MetS appear to experience an increased severity of CHD, higher mortality rates and an increased risk of CHD events
- Individuals with one or more risk factors of MetS appear to have an increased risk of CHD events
- Additional studies should be conducted to eliminate confounding factors.