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## CME/CE Information

**CME/CE Released: 09/06/2011; Valid for credit through 09/06/2012**

### Target Audience

This article is intended for primary care clinicians, cardiologists, endocrinologists, and other specialists who provide care to persons at risk for cardiometabolic disorders.

### Goal

The goal of this activity is to provide medical news to primary care clinicians and other healthcare professionals in order to enhance patient care.

### Learning Objectives

Upon completion of this activity, participants will be able to:

1. Report whether chocolate intake is related to the risk for cardiometabolic disorders overall.
2. Report whether chocolate intake is related to the risk for cardiovascular disease, diabetes, stroke, and heart failure.

### Credits Available

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# Chocolate Intake Benefits the Heart and Brain CME/CE

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### Clinical Context

According to Ogbera in the January 12, 2010, issue of *Diabetology & Metabolic Syndrome*, approximately one fifth of adults worldwide are likely to have metabolic syndrome, a set of factors linked with a greater risk for type 2 diabetes and cardiovascular disease. The consumption of chocolate might be beneficial in the prevention of cardiometabolic disorders. A study by Allen and colleagues in the April 2008 issue of the *Journal of Nutrition* found that daily chocolate consumption had a positive effect on cardiovascular risk

factors.

This meta-analysis by Buitrago-Lopez and colleagues assesses the association between chocolate intake and the risk for cardiometabolic disorders overall, in addition to the risk for cardiovascular disease, diabetes, stroke, and heart failure.

## Study Synopsis and Perspective

In a city renowned for its love of food, it is only fitting that researchers presented the results of a new study in Paris, France, showing that chocolate is good for the heart and brain. In a presentation at the **European Society of Cardiology** (ESC) **2011 Congress**, British investigators are reporting that individuals who ate the most chocolate had a 37% lower risk of cardiovascular disease and a 29% lower risk of stroke compared with individuals who ate the least amount of chocolate.

In the study, published online August 29, 2011 in *BMJ* to coincide with the ESC presentation, **Dr Adriana Buitrago-Lopez** (University of Cambridge, UK) and colleagues state: "Although overconsumption can have harmful effects, the existing studies generally agree on a potential beneficial association of chocolate consumption with a lower risk of cardiometabolic disorders. Our findings confirm this, and we found that higher levels of chocolate consumption might be associated with a one-third reduction in the risk of developing cardiovascular disease."

In this meta-analysis of six cohort studies and one cross-sectional study, overall chocolate consumption was reported, with investigators not differentiating between dark, milk, or white chocolate. Chocolate in any form was included, such as chocolate bars, chocolate drinks, and chocolate snacks, such as confectionary, biscuits, desserts, and nutritional supplements. Chocolate consumption was reported differently in the trials but ranged from never to more than once per day. Most patients included in the trials were white, although one study included Hispanic and African Americans and one study included Asian patients.

Of the seven studies, five trials reported a significant inverse association between chocolate intake and cardiometabolic disorders. For example, individual studies showed reductions in the risk of coronary heart disease (odds ratio 0.43; 95% CI 0.27–0.68), the risk of cardiovascular disease mortality (relative risk [RR] 0.50; 95% CI 0.32–0.78), and the risk of incident diabetes in men (hazard ratio 0.65; 95% CI 0.43–0.97).

Overall, the pooled meta-analysis results showed that high levels of chocolate consumption compared with the lowest levels of chocolate consumption reduced the risk of any cardiovascular disease 37% (RR 0.63; 0.44–0.90) and stroke 29% (RR 0.71; 0.52–0.98). There was no association between chocolate consumption and the risk of heart failure, and no association on the incidence of diabetes in women.

The researchers note that the findings corroborate the results of previous meta-analyses of experimental and observational studies in different populations showing a similar relationship between chocolate and cocoa consumption and cardiometabolic disorders.

"These favorable effects seem mainly mediated by the high content of polyphenols present in cocoa products and are probably accrued through the increasing bioavailability of nitric oxide, which subsequently might lead to improvements in endothelial function, reductions in platelet function, and additional beneficial effects on blood pressure, insulin resistance, and blood lipids," conclude Buitrago-Lopez and colleagues.

**References**

1. Buitrago-Lopez A, Sanderson J, Johnson L, et al. Chocolate consumption and cardiometabolic disorders: systematic review and meta-analysis. *BMJ* 2011;

DOI:10.1136/bmj.d4488. Available at: http://www.bmj.com.

**Related Link**

The Centers for Disease Control and Prevention's Division for Heart Disease and Stroke Prevention aggregates information from a range of sources and provides numerous downloadable materials helpful for patient education.

## Study Highlights

- The investigators identified 4576 articles from MEDLINE (from 1950), EMBASE (from 1980), the Cochrane Library (from 1960), Scopus (from 1996), Scielo (from 1997), Web of Knowledge (from 1970), AMED (from 1985), and CINHAL (from 1981) through October 5, 2010; reference lists; and contact with authors for other articles.
- Inclusion criteria were randomized controlled trials, cohort, case-control, or cross-sectional studies; adult participants 18 years or older; study of the effects of levels of chocolate intake; outcomes related to cardiometabolic disorders; and no language restriction.
- Cardiometabolic disorders included cardiovascular disease, myocardial infarction, stroke, ischemic heart disease, heart failure, diabetes, and metabolic syndrome.
- Exclusion criteria were pregnant participants in studies and use of nonhuman subjects. Types of articles excluded were letters, abstracts, systematic reviews, meta-analysis, ecologic studies, and conference proceedings.
- 7 studies with 114,009 participants were included in the analysis.
- 6 were cohort studies, and 1 was cross-sectional.
- 6 studies occurred in the community, and 1 occurred in the hospital inpatient setting.
- The age range of participants was 25 to 93 years, and most participants were white.
- In each study, the group with the highest chocolate intake was compared vs the group with the lowest chocolate intake.
- Intake of chocolate bars, drinks, and snacks was assessed by food frequency questionnaires in 6 studies and by patient diaries plus dietary history in 1 study.
- The reported outcomes included myocardial infarction, diabetes, cardiovascular disease, coronary heart disease, heart failure, and stroke.
- No studies assessed metabolic syndrome as an outcome.
- Follow-up ranged from 8 to 16 years for the cohort studies.
- Analyses adjusted for age, sex, body mass index, physical activity, smoking, dietary factors, and education.
- Higher chocolate intake was linked with a decreased risk for cardiometabolic disorders in 5 of 7 studies.
- Higher chocolate intake was beneficial in the prevention of cardiometabolic disorders for 12 measures of association, but not for heart failure.
- Subgroup analysis showed that higher chocolate intake was linked with a 37% reduction in any cardiovascular disease and a 29% reduction in stroke risk, but higher intake was not linked with a reduced risk for heart failure.
- 1 study showed that higher chocolate intake was linked with a 31% reduced risk for diabetes.
- There was no significant publication bias.
- Limitations of the analysis include limited generalizability, heterogeneity in types and amounts of chocolate intake, and inaccuracy in reporting chocolate intake.

## Clinical Implications

- Higher chocolate intake is related to a decreased risk for cardiometabolic disorders overall in 5 of 7 studies.

- Higher chocolate intake is related to a reduced risk for cardiovascular disease by 37%, diabetes by 31%, and stroke by 29%. There is no link between chocolate intake and heart failure.

## CME Test

To receive *AMA PRA Category 1 Credit*™, you must receive a minimum score of 70% on the post-test.

According to the study, which of the following statements is *most* accurate?

- Higher chocolate intake is not linked with a risk for cardiometabolic disorders
- Higher chocolate intake is linked with a decreased risk for cardiometabolic disorders
- Higher chocolate intake is linked with an increased risk for cardiometabolic disorders
- Lower chocolate intake is linked with a decreased risk for cardiometabolic disorders
- None of the above

According to the study, higher levels of chocolate consumption are linked with a reduced risk for which of the following conditions?

- Cardiovascular disease only
- Diabetes only
- Heart failure only
- Cardiovascular disease, diabetes, and stroke
- Cardiovascular disease, diabetes, and heart failure

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