coffee&health

from the institute for scientific information on coffee

The good things in life: can coffee protect against the risk of CVD mortality?

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Foreword

Cardiovascular disease (CVD) remains a major public health concern across Europe, but improvements in medical interventions as well as significant developments in preventative aspects of care have reduced the risk of CVD mortality. With this in mind, it is important to explore and acknowledge factors which might have a protective effect to continue to make strides in reducing CVD mortality.

Eminent cardiovascular experts gathered at the European Association for Cardiovascular Prevention & Rehabilitation's 2015 congress in Lisbon, Portugal, to discuss the latest research in CVD aetiology, prevention, treatment and care. The Institute for Scientific Information on Coffee (ISIC), a not-for-profit organization devoted to the study and disclosure of science related to coffee and health, hosted a Satellite Symposium on the subject of 'Coffee and CVD Mortality' where leading researchers in this field presented the latest research. Esther Lopez-Garcia led with research on the role of lifestyle factors in CVD mortality risk reduction, Alicja Wolk presented the epidemiological evidence on coffee and CVD mortality, and Carlo La Vecchia detailed the conclusions from meta-analyses on coffee and CVD mortality.

The Symposium provided a unique opportunity to highlight and consider recent research, which has shown an association between moderate coffee consumption and a reduced risk of CVD mortality. This report details the research presented at the Symposium and highlights the potential role of coffee in CVD mortality risk reduction.

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Executive summary

Research presented within this report suggests that a moderate intake of coffee (3-5 cups per day) may provide protection against CVD mortality risk. The association between coffee consumption and CVD mortality risk is illustrated by a 'U-shaped' pattern in recent meta-analyses. The lowest CVD mortality risk is seen at an intake of approximately 3 cups of coffee per day, with a percentage risk reduction of up to 21%. It is important to note that results differ between varying populations; it is suggested that 2 cups of coffee per day may offer the greatest protection in a Japanese population, whilst 3 cups may provide the greatest protection in UK and US populations.

The precise mechanisms of action behind the suggested association are unknown, but areas of interest include the role of coffee and caffeine intake in reducing the risk of type 2 Diabetes, a condition where CVD mortality risk is increased, and a reduced inflammatory response. The antioxidant profile of coffee has also been proposed as a potential mechanism which might affect the association between coffee consumption and reduced CVD morality risk.

Further work is required to confirm the association between coffee consumption and CVD mortality risk and to understand the underlying mechanisms of action.

Introduction: the scale of cardiovascular disease in Europe

Cardiovascular disease (CVD) is a term that covers diseases of the heart and blood vessels including coronary heart disease and cerebrovascular disease such as stroke. Data published in 2014 in the European Heart Journal shows that cardiovascular diseases, principally coronary heart disease and stroke, remain the primary cause of death across Europe, responsible for 51% of all deaths in women and 42% of all deaths in men.[1] Over four million people die from CVD annually in Europe and overall, CVD is estimated to cost the EU economy €196 billion every year. Around 54% of the total cost is associated with health care, 24% with productivity losses and 22% with informal care of people with CVD.[2]

Cardiovascular Disease – a preventable condition?

The Global Burden of Disease Study 2013 assessed changes in population growth and ageing globally, contrasting this with changes in age specific cardiovascular mortality rates.[3] Data from the majority of countries studied showed that CVD mortality rates are significantly lower than population growth, suggesting that changes in lifestyle and improvements in healthcare can help to control the negative impact that demographic changes could have on CVD mortality rates.[3]

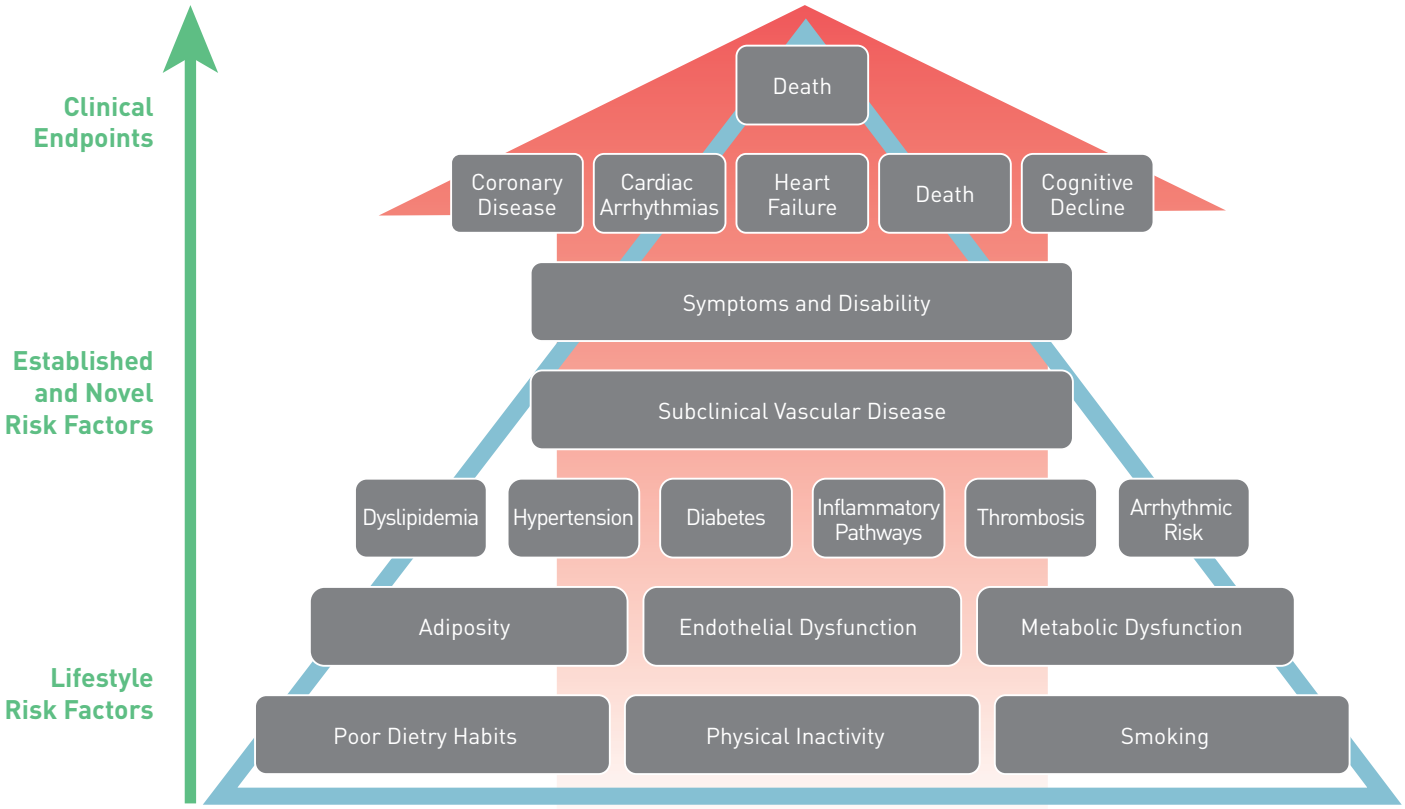


Figure 1: CVD Mortality Pathway – from lifestyle factors to health outcomes [Mozaffarian et al. (2008)]

The role of lifestyle factors in reducing the risk of CVD mortality

Lifestyles choices including poor dietary habits, smoking, significant alcohol consumption and a lack of physical activity, have been shown to affect CVD mortality. 28% of CVD deaths are attributable to smoking, 17% to lack of physical activity, 14% to being overweight, 13% to poor diet quality and 7% to high alcohol intake.[4] Such lifestyle choices are associated with long-term adverse conditions such as diabetes, hyperlipidaemia and hypertension, which in turn can increase the risk of CVD.[5]

A Swedish study has shown that in males, a combination of 5 healthy behaviours (a healthy diet, moderate alcohol consumption (10 to 30 g/day), no smoking, being physically active and having no abdominal adiposity) could prevent 79% of myocardial infarction events, although all factors were only present in 1% of participants.[6] Additionally, a US study suggests that half of CVD cases in women could be avoided by modifying lifestyle choices, as approximately 73% of CHD cases and 46% of clinical CVD were attributable to an unhealthy lifestyle.[7] Research also suggests that following a Mediterranean-style diet is associated with a 7% reduction in overall mortality risk and a 4% reduction in the risk of CVD mortality.[8]

Novel research into other behavioural choices not only confirms the importance of lifestyle factors but also suggests that a reduced risk of mortality is associated with sleeping for 7 - 8 hours per day, spending less than 8 hours sitting per day and having daily interaction with friends.[9] The authors concluded that when compared to those with none or one of a set of health y behaviours, those with six positive behaviors (never smoking or stopped smoking for more than 15 years, being very or moderately physically active, having a healthy diet score above the median in the cohort, sleeping 7 - 8 hours per day, spending less than 8 hours per day sitting, and seeing friends daily) could reduce their all-cause mortality risk by up to 14 years.[9]

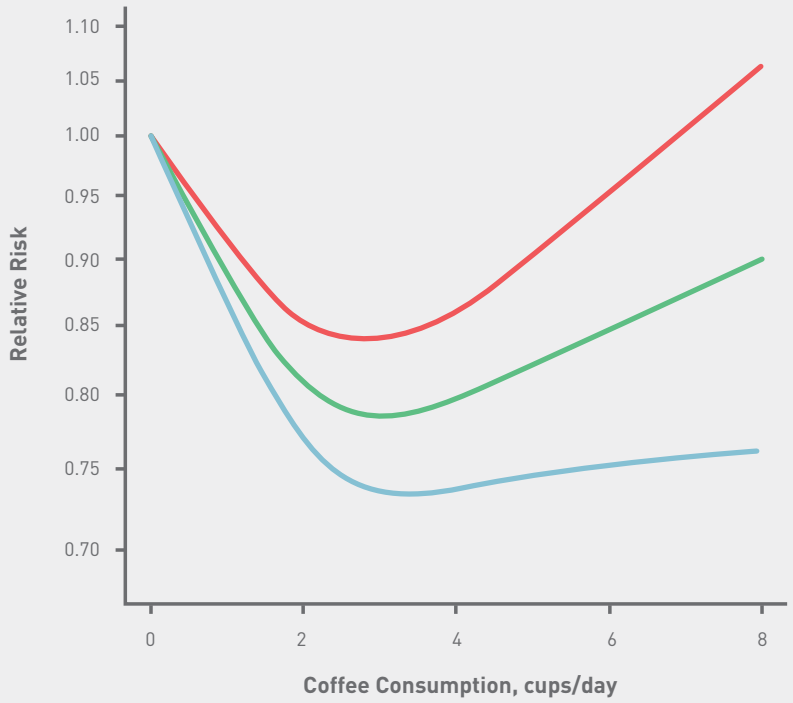
Coffee and Cardiovascular Disease – an overview of the latest research

Several studies reviewing coffee consumption and CVD mortality have found no association, and some suggest that coffee consumption may be protective against CVD.

A 2013 review of seventeen studies on coffee consumption and mortality, totaling 1,054,571 participants, suggests a significant inverse, i.e. favourable association between coffee consumption and CVD mortality risk, especially in women.[10] Intakes of coffee at 3-5 cups per day showed the most significant protective effect, whilst quantities over 5 cups per day were associated with a smaller reduction in total mortality.[10]

Coffee consumption	N. Studies	RR (95% CI) [a]	*P for heterogeneity*
Cardiovascular disease (CVD) mortality			
Level of consumption			
Drinking <3 cups/day versus low[b]			
All subjects	14	0.87 (0.79-0.96)	< 0.001
Men	11	0.92 (0.79-1.05)	< 0.001
Women	7	0.80 (0.71-0.90)	0.009
Drinking >3 cups/day versus low[b]			
All subjects	14	0.88 (0.77-1.02)	< 0.001
Men	11	0.92 (0.73-1.11)	< 0.001
Women	8	0.80 (0.66-0.96)	0.005
Highest (when >4 cups/day) versus low[c]			
All subjects	11	0.86 (0.77-0.97)	0.044
Men	8	0.90 (0.73-1.11)	0.006
Women	6	0.80 (0.71-0.89)	0.748

Figure 2: Coffee and cardiovascular disease – Associations between dose and relative risk [Malerba et al. (2013)]



A further 2013 American study of over 2500 CVD deaths suggests a positive association between coffee consumption and all-cause mortality in men, and also in men and women below 55 years of age.[11]

Two 2014 meta-analyses suggest an association between coffee consumption and CVD risk, proposing a 'U-shaped' pattern whereby optimal protective effects were achieved with 3-5 cups of coffee per day.[12,13] The greatest risk reduction may be seen at 3 cups of coffee per day, with a reduced CVD mortality risk at 21%.[13]

Figure 3: Relative risk of CVD in relation to coffee consumption [Crippa et al. (2014)]

Geographical variability

Variability regarding the optimal level of coffee consumption has been observed across differing countries, for instance results from Japan suggest an inverse, i.e. favourable, association at 2 cups of coffee per day, whilst studies from Europe and the US showed an inverse association at approximately 3 cups per day. Further results from a cohort study in Japan of 3425 strokes and 910 incidences of CHD suggest that higher green tea consumption as well as coffee consumption (3 - 6 times per week and 1 - 2 cups per day) were inversely associated with risk of CVD and stroke.[14]

A study of European and African-American adults suggests that a reason for variability in the effect of coffee consumption on individuals may be attributable to genetics and individual responses to caffeine.[15]

Mechanisms of action behind the suggested favourable association between coffee consumption and CVD mortality risk

Although the precise mechanism of action behind the suggested inverse, i.e. favourable association between coffee consumption and CVD mortality risk is not known, a number of theories are proposed.

Data shows a statistically significant negative association between coffee consumption and subsequent risk of type 2 diabetes. Drinking 3-4 cups of coffee per day is associated with an approximate 25% lower risk of developing type 2 diabetes compared to consuming none or less than 2 cups per day.[16] People with diabetes typically have a higher CVD mortality risk, and some research suggests that the association between coffee consumption and a reduced risk of type 2 diabetes may also be linked to a decreased CVD risk.[17] Caffeine intake has also been associated with lower body weight and with decreased platelet aggregation, which may also impact CVD mortality.[18]

Additional research suggests that coffee's anti-inflammatory properties may reduce risk of incident gout, induce higher adiponectin levels in Japanese males, inhibit inflammation in postmenopausal women, and produce beneficial effects on subclinical inflammation.[10,19] Although the impact of these effects on CVD mortality is unknown, the role of the inflammatory mechanism is of interest.

The antioxidant potential of different foods and beverages may also provide further insight into potential mechanisms. Different antioxidant compounds found in coffee may affect the body, but there is a need for further research on the bioactive and potential health-giving roles of these compounds before conclusions can be drawn.[20] Figure 4 highlights the key sources of antioxidants in the diet, taking absorption into consideration. [21] Fruits, whole grains, vegetables and coffee are suggested to be key dietary sources of antioxidants.

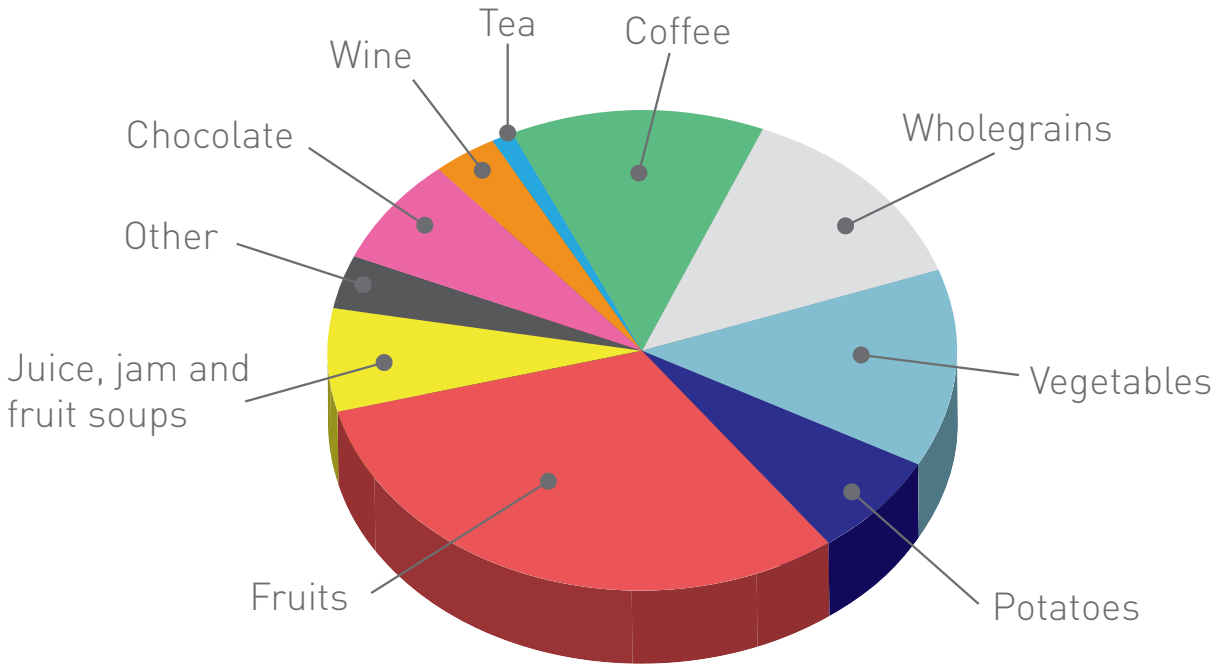


Figure 4: Key sources of antioxidants in the diet [Rautiainen S. (2012)]

Conclusion

Recent research supports the view that moderate coffee consumption at approximately 3 – 5 cups per day may have a protective effect against CVD mortality risk. The mechanisms of action behind the associations are unclear, however areas of interest for future research include the anti-inflammatory and antioxidant properties of coffee, and the known association between coffee consumption and type 2 diabetes risk reduction as CVD mortality is typically higher in this group. Due to the variation between studies on CVD and coffee consumption, further work is required to understand the associations in more detail.

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EuroPRevent 2015
THE EACPR ANNUAL MEETING

The annual EuroPRevent Congress from the European Association for Cardiovascular Prevention and Rehabilitation provides a forum for leading experts to present their research and share knowledge in an international forum. The theme of the 2015 Congress was 'Addressing Inequalities in Cardiovascular Health'.

During the congress on 14 May 2015, ISIC hosted a symposium titled 'Coffee and CVD Mortality', with an expert panel of academics from across Europe.

The symposium was co-chaired by António Vaz Carneiro of the Faculty of Medicine, University of Lisbon, and Pedro Marques-Vidal, Secretary of the EACPR's Prevention, Epidemiology and Population Science Section.

Three expert speakers explored the role nutrition and coffee can play in preventing CVD mortality:

- **Esther Lopez-Garcia**, Associate Professor, Universidad Autonoma, Madrid, Spain.
- **Alicja Wolk**, Professor of Nutritional Epidemiology, Karolinska Institute, Stockholm, Sweden.
- **Carlo La Vecchia**, Professor of Epidemiology, Department of Clinical Sciences and Community, University of Milan, Italy.

About ISIC

The Institute for Scientific information on Coffee (ISIC) is a not-for-profit organization founded in 1990, devoted to the study and disclosure of science related to coffee and health. ISIC's activities are focused on:-

- the study of scientific matters related to coffee and health
- the collection and evaluation of studies and scientific information about coffee and health
- the support of independent scientific research on coffee and health
- active dissemination of balanced coffee and health scientific evidence and knowledge to a broad range of stakeholders.

ISIC respects scientific research ethics in all its activities. ISIC's communications are based on sound science and rely on evidence and scientific studies derived from peer-reviewed scientific journals and other publications.

In supporting independent scientific research, ISIC adheres to the following principles:

- ISIC supports and encourages researchers to publish all obtained results, regardless of the outcome
- ISIC encourages academic freedom and therefore shall not control the content of publications
- ISIC sponsors research only when appropriate independent bodies have approved the respective protocols prior to the beginning of the study (such as Ethical Clearance Committee)
- All ISIC-sponsored publications must clearly identify ISIC as sponsor

ISIC members are seven of the major European coffee companies: illycaffè, Mondelez International, Lavazza,Nestlé, Paulig, DE Master Blenders 1753 and Tchibo.

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