

Alcohol Consumption and Risk of Hypertension: Does the Type of Beverage or Drinking Pattern Matter?

Luc Djoussé^{a,b,c} and Kenneth J. Mukamal^{b,d}

^aDivision of Aging, Department of Medicine, Brigham and Women's Hospital, Boston, MA, USA

^bHarvard Medical School, Boston, MA, USA

^cMassachusetts Veterans Epidemiology and Research Information Center (MAVERIC) and Geriatric Research, Education, and Clinical Center (GRECC), Boston Veterans Affairs Healthcare System, Boston, MA, USA

^dDivision of General Medicine and Primary Care, Beth Israel Deaconess Medical Center, Boston, MA, USA

While heavy alcohol drinking is associated with higher mortality, certain types of cancer, and cardiomyopathy, data on the influence of light-to-moderate drinking on health have been inconsistent.¹ This is partly due to the practical and ethical difficulties particular to randomized controlled trials of alcohol. Current evidence suggests beneficial effects of light-to-moderate drinking on atherothrombotic events including coronary artery disease, ischemic stroke, and peripheral arterial disease. In addition, recent data suggest that moderate drinking is associated with a lower risk of congestive heart failure.² Underlying physiologic mechanisms to explain these benefits include high-density lipoprotein cholesterol (HDL-C),³ haemostatic and fibrinolytic parameters,³ adiponectin,⁴ and perhaps omega-3 fatty acids.⁵

Despite the apparent benefits of alcohol intake on several cardiovascular risk factors, lingering concern has remained about the effect of alcohol on blood pressure. For example, heavy alcohol intake appears to be associated with a higher risk of both hemorrhagic stroke and ischemic stroke, associations that can be readily attributed to the effects of heavy drinking on blood pressure. Indeed, heavy drinking is a widely recognized and highly prevalent risk factor for hypertension. However, relatively few studies have assessed the role of lighter drinking on the risk of hypertension, with variable results. Furthermore, despite reports suggesting the role of drinking patterns, consumption with meal, of type of beverage consumed on cardiovascular risk,⁶ it remains uncertain whether such factors influence

the risk of hypertension among light-to-moderate drinkers.

Hypertension is highly prevalent in the United States. One in 3 American adults has hypertension and it remains a major risk factor for stroke, coronary heart disease, and kidney failure.⁷ Costs associated with hypertension are estimated at \$73 billion for 2009,⁷ and since the lifetime risk of hypertension is about 90%, these costs are expected to rise in ensuing years as populations age. Clearly, hypertension and its relationship with alcohol consumption require careful clarification.

Because a rise in risk of hypertension could offset any benefit of light-to-moderate drinking on cardiovascular health or glucose metabolism, the first question to address is whether light or moderate alcohol consumption in general, and intake of a particular beverage type or a particular drinking pattern in particular, are associated with excess risk of hypertension. In the current issue of the *Revista Española de Cardiología*, Núñez-Córdoba et al attempt to provide answers to some of these issues.⁸ They analyzed data on 9963 Spanish men and women from the SUN (Seguimiento Universidad de Navarra) study free of hypertension at baseline. After an average follow up of 4 years, they found evidence for a positive and linear association between total alcohol consumption and incident hypertension (P for trend = .01). These data are consistent with much of the existing literature⁹ and suggest that there may not be a threshold below which smaller amounts of alcohol do not raise blood pressure. However, the authors do not present the relative risks associated with specific volumes of drinking, making it difficult to exclude the possibility that the linear trend is driven chiefly by a higher risk in the heaviest drinkers. Klatsky et al have also argued that any higher risk in moderate drinkers may reflect under-reporting of alcohol intake, and the current report does not exclude this possibility.¹⁰

Another consideration in evaluating the overall risk of hypertension associated with alcohol intake

SEE ARTICLE ON PAGES 633-41

Correspondence: Luc Djoussé, MD, MPH, DSc, Division of Aging, Brigham and Women's Hospital and Harvard Medical School, 1620 Tremont St, 3rd floor, Boston MA 02120, USA
E-mail: ldjouss@rics.bwh.harvard.edu

in this study is the treatment of former drinkers. It is reasonable to assume that individuals with borderline hypertension may be counseled to reduce their alcohol intake, and hence the estimated risks associated with both abstinence and light drinking may be biased upward. Studies that include information on previous drinking habits may be more informative in this regard.

As to drinking patterns, previous studies have demonstrated the importance of drinking frequency on the risk of cardiovascular events. Given a fixed amount of alcohol, cardiovascular benefits appear to be greater if alcohol is consumed more frequently than if it is consumed on a single occasion (ie, binge drinking) or less frequently. This hypothesis is supported by short-lived effects of ethanol on HDL-C, fibrinolytic, and haemostatic factors, thereby requiring frequent intake of small amounts of alcohol to sustain anticoagulant effects.

Did the SUN study provide evidence for or against the importance of drinking patterns on the risk of hypertension? Their data in Table 2 offer some insight. In general, more frequent drinking appeared to be associated with higher risk of hypertension, although the magnitude was modest.⁸ There was no clear difference in risk associated with quantity consumed per drinking day except in the most frequent drinkers. In that group, risk was appreciably higher among those who consumed at least 1 drink per drinking day than lesser amounts, but again it cannot be determined whether a threshold in risk exists. Unfortunately, data on the influence of drinking with and without meals on hypertension risk were also not available from the SUN study. Given these limitations, the jury is still out on the influence of drinking patterns, and additional studies are warranted to examine this issue.

It has been suggested by some researchers that wine consumption may confer greater benefits on cardiovascular disease risk than beer or spirits, partly due to antioxidants (eg, resveratrol) contained in wine. However, this hypothesis remains controversial given the lack of support by other research.¹¹ It is noteworthy that subjects who prefer wine over beer or spirits tend to have relatively favorable characteristics (ie, higher education and socioeconomic status, older age, more female than male, and tend to eat a relatively healthier diet).¹²

Despite these caveats, could the antioxidants in wine counterbalance the blood pressure increase inherent to alcohol, much as antioxidants in cocoa appear to?¹³ In the SUN study, there was limited but certainly not conclusive evidence that beer and spirit drinkers were at higher risk of hypertension compared with wine drinkers, even after accounting for differences in their reported alcohol intake (HR=1.18 [0.97-1.44]).⁸ On the other hand,

compared with abstainers of red wine, consumption of any amount of red wine was not associated with an increased risk of hypertension, while there was a positive relation between intake of beer or spirits and incident hypertension.

Unfortunately, these analyses do not settle the question as to whether beverage type influences the relation between alcohol intake and incident hypertension for several reasons.⁸ First, despite adjustment for several important confounding factors, it remains difficult to exclude confounding by the healthier lifestyle of wine drinkers. For example, the authors adjust extensively for diet, but not for social or economic factors that are known to differ by beverage type. In addition, the authors present risks for specific intakes in Table 5 that consistently show no difference among beverage types for modest intakes (ie, 0.1-0.5 drinks per day). This again argues for a threshold in the effect of alcohol on blood pressure and against a difference between beverages. It is also impossible to know whether red wine is consumed in a different pattern than other beverages. Finally, the authors group beer and spirits together, but beer in particular can contribute substantially to antioxidant capacity, even in Spain.¹⁴ Of note, interventional studies do not necessarily support a difference between beverage types in their effects on blood pressure.¹⁵

Overall, there is considerable evidence for a positive relation between alcohol consumption and incident hypertension, although whether the risk is simply linear or steepens above recommended levels of intake remains an important question. Since the association between blood pressure and cardiovascular disease is continuous (even among normotensive and prehypertensive subjects), it may be advisable to limit alcohol consumption among individuals with prehypertension. In such cases, an increased risk of hypertension may offset a possible cardiovascular benefit of moderate drinking, although limited evidence in cohort studies is reassuring that at least the observed lower risk of coronary heart disease related to moderate drinking persists in hypertensive adults.¹⁶ For subjects at lower risk for hypertension, light-to-moderate drinking (up to 1 drink per day for women and up to 2 drinks per day for men) may be considered after the evaluation of global cardiovascular risk profile. For individuals with risk factors for both hypertension and other forms of cardiovascular disease, such as obesity, sedentary lifestyle, and smoking, additional study is needed to evaluate what the net balance of health risks and harms from light alcohol consumption may be. Future studies are also warranted to examine the remaining questions of whether drinking patterns or beverage types influence the relation between alcohol intake and blood pressure.

REFERENCES

1. Gunzerath L, Faden V, Zakhari S, Warren K. National Institute on Alcohol Abuse and Alcoholism report on moderate drinking. *Alcohol Clin Exp Res*. 2004;28:829-47.
2. Djousse L, Gaziano JM. Alcohol consumption and heart failure: a systematic review. *Curr Atheroscler Rep*. 2008;10:117-20.
3. Rimm EB, Williams P, Fosher K, Criqui M, Stampfer MJ. Moderate alcohol intake and lower risk of coronary heart disease: meta-analysis of effects on lipids and haemostatic factors. *BMJ*. 1999;319:1523-8.
4. Beulens JW, van Loon LJ, Kok FJ, Pelsers M, Bobbert T, Spranger J et al. The effect of moderate alcohol consumption on adiponectin oligomers and muscle oxidative capacity: a human intervention study. *Diabetologia*. 2007;50:1388-92.
5. de Lorgeril M, Salen P, Martin JL, Boucher F, de Leiris J. Interactions of wine drinking with omega-3 fatty acids in patients with coronary heart disease: a fish-like effect of moderate wine drinking. *Am Heart J*. 2008;155:175-81.
6. Ellison RC. Importance of pattern of alcohol consumption. *Circulation*. 2005;112:3818-9.
7. Lloyd-Jones D, Adams R, Carnethon M, de Simone G, Ferguson TB, Flegal K et al. Heart disease and stroke statistics--2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*. 2009;119:480-6.
8. Núñez-Córdoba JM, Martínez-González MA, Bes-Rastrollo M, Toledo E, Beunza JJ, Alonso A. Consumo de alcohol e incidencia de hipertensión en una cohorte mediterránea: el estudio SUN. *Rev Esp Cardiol*. 2009;62:633-41.
9. Corrao G, Bagnardi V, Zambon A, Arico S. Exploring the dose-response relationship between alcohol consumption and the risk of several alcohol-related conditions: a meta-analysis. *Addiction*. 1999;94:1551-73.
10. Klatsky AL, Gunderson EP, Kipp H, Udaltsova N, Friedman GD. Higher prevalence of systemic hypertension among moderate alcohol drinkers: an exploration of the role of underreporting. *J Stud Alcohol*. 2006;67:421-8.
11. Djousse L, Arnett DK, Eckfeldt JH, Province MA, Singer MR, Ellison RC. Alcohol consumption and metabolic syndrome: does the type of beverage matter? *Obes Res*. 2004;12:1375-85.
12. McCann SE, Sempos C, Freudenheim JL, Muti P, Russell M, Nochajski TH, et al. Alcoholic beverage preference and characteristics of drinkers and nondrinkers in western New York (United States). *Nutr Metab Cardiovasc Dis*. 2003;13:2-11.
13. Taubert D, Roesen R, Schomig E. Effect of cocoa and tea intake on blood pressure: a meta-analysis. *Arch Intern Med*. 2007;167:626-34.
14. Pulido R, Hernández-García M, Saura-Calixto F. Contribution of beverages to the intake of lipophilic and hydrophilic antioxidants in the Spanish diet. *Eur J Clin Nutr*. 2003;57:1275-82.
15. Zilkens RR, Burke V, Hodgson JM, Barden A, Beilin LJ, Puddey IB. Red wine and beer elevate blood pressure in normotensive men. *Hypertension*. 2005;45:874-9.
16. Bos S, Grobbee DE, Boer J, Verschuren M, Beulens JW. Alcohol consumption and risk of cardiovascular disease among hypertensive women. *Circulation*. 2009;119:e306.