

Alcohol as a Cardiovascular Drug: Benefits and Risks

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ABSTRACT

Data from epidemiological, prospective and meta-analysis studies confirming the reduction in cardiovascular outcomes due to moderate alcohol consumption are compelling. There is also a reduction in all-cause mortality. If drinkable alcohol was classified as a drug, it would be routinely prescribed for the prevention and management of several cardiovascular disorders. There may however be a black box warning due to its potential harmful effects. Heavy alcohol intake is associated with an impressive list of serious medical problems. The general consensus however favors legitimately encouraging people to partake in a daily alcoholic drink or two, especially if they are responsible individuals and have risk factors for cardiovascular disease. The benefits and risks of alcohol intake are briefly reviewed in this article.

Keywords: alcohol, hypertension, cardiovascular disease, diabetes mellitus, dyslipidemia, inflammation, obesity, metabolic syndrome, beer, wine

Abbreviations: AHA: American Heart Association; HDL: High density lipoprotein ; LDL: Low density lipoprotein

1. INTRODUCTION

Evidence based data is compelling regarding the cardiovascular benefits of drinking moderate amounts of alcohol on a regular basis. Following data gleaned from the 'French Paradox' (Simini, 2000) several other epidemiological and prospective studies have confirmed the beneficial effects of moderate alcohol intake. These include a lower risk for incident coronary heart disease, incident stroke and cardiovascular and all cause mortality (Paul et al, 2011). The benefit is related to the ethyl alcohol with its HDL raising and anti-clotting effects. Beer and especially red wine, provide added protection stemming from their rich content of polyphenols. However, the risk of progressing to problem drinking is always potentially lurking in moderate drinkers. Heavy drinking is dangerous to the health. It generates a plethora of cardiovascular and non-cardiovascular maladies - which climb rapidly with increasing numbers of drinks imbibed per day. This brief review looks at the cardio-protective effects and risks associated with alcohol intake.

2. DISCUSSION

Several epidemiological studies have convincingly established an association between alcohol intake and lower incidence of cardio-vascular events (Renaud et al, 1992; Gronbaek et al, 1995; Renaud et al, 1998). Several prospective studies have also confirmed this association (Klatsky et al, 2009; Pearson et al, 1994; Friedman et al, 1993). This beneficial effect is seen in both men and women (Gaziano et al, 1993). In a review of 84 studies of alcohol consumption and cardiovascular disease, there was a consistent reduction of 14%-25% in the risk of all cardiovascular outcomes with the consumption of 2.5-14.9 g/day of alcohol (about ≤ 1 drink a day), compared to those abstaining from alcohol (Paul et al, 2011). This benefit was

noted with most alcoholic drinks and is related to their ethyl alcohol content. Some studies indicate that wine provides additional benefits over and above the effects attributed to alcohol, due to its rich content of polyphenolic compounds and a generous amount of resveratrol (Gronbaek et al, 2000; Stervbo et al, 2007).

2.1. Alcohol and its effect on serum lipids

Alcohol has favorable effects on the lipid profile. There have been several epidemiological and prospective studies demonstrating the HDL raising effects of alcohol (Hulley et al, 1981; Haskell et al, 1984; Moore et al, 1988; Miller et al, 1988; Castelli et al, 1977). This effect may be responsible for almost 50% of the alcohol related cardiovascular protective effect (Gordon et al, 1981; Suh et al, 1992; Criqui et al, 1987). The association with LDL is not very convincing although some studies have demonstrated that moderate alcohol consumption appears to be associated with lower LDL levels (Choudhary et al, 1994; Nakanishi et al, 1994; Castelli et al, 1977). The antioxidants in red wine also help reduce LDL peroxidation. There is also an improvement in the HDL and LDL particle size. Alcohol intake is associated with less number of total LDL particles, lower levels of small LDL, small HDL and very-low-density lipoprotein particles, and higher levels of large LDL and medium- and large-sized HDL particles (Mukamal et al, 1992; Paddey et al, 1998; van de Weil et al, 1999).

2.2. Alcohol and anti-clotting effects

The beneficial effects of moderate alcohol consumption on ischemic heart disease are also related to an improvement in plasminogen activator levels, (Ridker et al, 1994; Maxwell et al, 1994; Veenstra et al, 1990) thrombocytopenia and decreased platelet aggregation (Rubin et al, 1994; Miceli et al, 2003; Renaud et al, 1992) lower fibrinogen levels (Meade

et al, 1979) and increased fibrinolytic activity (Hendriks et al, 1994).

2.3. Alcohol and other protective mechanisms

Alcohol may also attenuate cardiovascular mortality, at least in part, through anti-inflammatory effects (Kinlay et al, 2001; Ross, 1999) and an improvement in insulin sensitivity (Davies et al, 2002; Shai et al, 2007; Sierksma et al, 2004). Red wine is rich in antioxidant phenolic and other beneficial compounds, which provide extra cardiovascular protection, mainly through their anti-oxidant activity (Renaud et al, 1993; Klatsky, 1994; Cleophas et al, 1999; Klatsky, 1995; Paoletti et al, 2000). Healthier life styles, a healthier eating pattern with wine drinking and more favorable risk traits in wine drinkers may also be play a role.

2.4. Dangers of excessive alcohol consumption

There exists a J shaped relationship between alcohol consumption and all cause mortality (Keil et al, 1997). One or two drinks per day are associated with the lowest mortality (Gronbaek et al, 2001), while those consuming three or more drinks per day suffer from a higher mortality (Paul et al, 2011). Teetotalers and occasional drinkers demonstrate a higher mortality than those consuming one or two drinks per day (Di et al, 2006). A number of non-cardiovascular and cardiovascular problems contribute to the increased mortality seen in heavier drinkers. Diseases related to heavy consumption of alcohol and chronic alcoholism include hypertension (Klatsky et al, 1977), hemorrhagic stroke (Richard et al, 1986), alcoholic cardiomyopathy (Diamond et al, 1989), several kinds of

cancer (Poschl et al, 2004; Boffetta et al, 2006), cirrhosis (Rehm et al, 2010), pancreatitis (Irving et al, 2009), as well as accidents, suicide, and homicide (Stolle et al, 2009). Cardiac arrhythmias, especially supra-ventricular, are also seen in binge drinkers (Liang et al, 2012). Excessive alcohol consumption is also associated with nutritional deficiencies (Ryle et al, 1984) and neurological disorders such as Wernicke's encephalopathy and peripheral neuropathy (Allan et al, 2006). Drinking during pregnancy is risky for the unborn child (Pruett et al, 2013). And finally, a drink a day always has the risk of progression to problem drinking (Griffith et al, 2012).

3. CONCLUSION

The scientific data is persuasive that low level of alcohol consumption is safe (Pearson, 1996; Friedman et al, 1993) and cardio-protective (Marmot, 1984). There now exists, an evidence based reason to legitimately discuss (Goldberg et al, 2001) and prescribe a daily glass of red wine or equivalent drink (Pearson et al, 1994) to responsible individuals at risk for cardiovascular disease. A drink is one 12 oz. beer, 4 oz. of wine, 1.5 oz. of 80-proof spirits, or 1 oz. of 100-proof spirits. It is generally accepted that men can have 2 drinks a day but women should limit them to one a day. The French Paradox drew attention to the fact that red wine has a greater cardiovascular protective effect. Red wine is high in polyphenols, and the antioxidant, vaso-relaxant, and antithrombotic properties of these compounds confer this additional benefit (Lippi et al, 2010; Gronbaek et al, 2000). And finally, a nutritionally balanced diet and an adequate intake of folic acid is recommended with therapeutic alcohol intake.

REFERENCES

1. Allan D Thomson, Jane Marshall e. The natural history and pathophysiology of Wernicke's encephalopathy and Korsakoff's psychosis. *Alcohol and Alcoholism* 2006, 41(2), 151
2. Boffetta P, Hashibe M. Alcohol and cancer. *Lancet Oncol.* 2006, 7(2), 149-56
3. Castelli WP, Doyle JT, Gordon T, Hames CG, Hjortland MC, Hulley SB, Kagan A, Zukel WJ. Alcohol and blood lipids: the cooperative lipoprotein phenotyping study. *Lancet* 1977, 2, 153-155
4. Choudhury SR, Ueshima H, Kita Y, Kobayashi KM, Okayama A, Yamakawa M, Hirao Y, Ishikawa M, Miyoshi Y. Alcohol intake and serum lipids in a Japanese population. *Int J Epidemiol.* 1994, 23(5), 940-7
5. Cleophas TJ. Wine, beer and spirits and the risk of myocardial infarction: a systematic review. *Biomed Pharmacother* 1999, 53, 417-23
6. Criqui MH, Cowan LD, Tyroler HA, Bangdiwala S, Heiss G, Wallace RB, Cohn R. Lipoproteins as mediators for the effects of alcohol consumption and cigarette smoking on cardiovascular mortality: results from the Lipid Research Clinics Follow-up Study. *Am J Epidemiol.* 1987, 126, 629-637
7. Davies MJ, Baer DJ, Judd JT, Brown ED, Campbell WS, Taylor PR. Effects of moderate alcohol intake on fasting insulin and glucose concentrations and insulin sensitivity in postmenopausal women: a randomized controlled trial. *JAMA.* 2002, 287, 2559-2562
8. Di Castelnuovo A, Costanzo S, Bagnardi V, Donati MB, Iacoviello L, de Gaetano G. Alcohol dosing and total mortality in men and women: an updated meta-analysis of 34 prospective studies. *Arch Intern Med.* 2006, 166(22), 2437-45
9. Diamond I. Alcoholic myopathy and cardiomyopathy. *N Engl J Med.* 1989, 320, 458-460
10. Friedman GD, Klatsky AL. Is alcohol good for your health? *N Engl J Med.* 1993, 329, 1882-1883
11. Gaziano JM, Buring JE, Breslow JL, Goldhaber SZ, Rosner B, VanDenburgh M, Willett W, Hennekens CH. Moderate alcohol intake, increased levels of high-density lipoprotein and its subfractions, and decreased risk of myocardial infarction. *N Engl J Med.* 1993, 329, 1829-1834
12. Goldberg IJ, Mosca L, Piano MR, Fisher EA. AHA Science Advisory: wine and your heart: a science advisory for healthcare professionals from the Nutrition Committee, Council on Epidemiology and Prevention, and Council on Cardiovascular Nursing of the American Heart Association. *Circulation* 2001, 103(3), 472-475
13. Gordon T, Ernst N, Fisher M, Rifkind BM. Alcohol and high-density lipoprotein cholesterol. *Circulation.* 1981, 64(suppl III), III-63-III-67
14. Griffith C, Bogart D. Alcohol consumption: can we safely toast to our health? *Mo Med.* 2012, 109(6), 459-65
15. Gronbaek M, Deis A, Sorenson TI et al. Mortality associated with moderate intakes of wine, beer, or spirits. *B.M.J.* 1995, 6, 1165-1169
16. Grønbaek M, Becker U, Johansen D, Gottschau A, Schnohr P, Hein HO, Jensen G, Sørensen TI. Type of alcohol consumed and mortality from all causes, coronary heart disease, and cancer. *Ann Intern Med.* 2000, 19, 133(6), 411-9
17. Grønbaek MN, Sørensen TI, Johansen D, Becker U, Gottschau A, Schnohr P, Hein HO, Jensen G. Beer, wine, spirits and mortality. *Lakartidningen.* 2001, 98(21), 2585-8
18. Gronbaek M, Becker U, Johansen D et al. Type of alcohol consumed and mortality from all causes, coronary heart disease, and cancer. *Ann Intern Med* 2000, 133(6), 411-419
19. Haskell WL, Camargo C Jr, Williams PT, Vranizan KM, Krauss RM, Lindgren FT, Wood PD. The effect of cessation and resumption of moderate alcohol intake on serum high-density-lipoprotein subfractions: a controlled study. *N Engl J Med.* 1984, 310, 805-810
20. Hendriks HF, Veenstra J, Velthuis-te Wierik EJ, Schaafsma G, Kluit C. Effect of moderate dose of alcohol with evening meal on fibrinolytic factors. *BMJ.* 1994, 308(6935), 1003-600
21. Hulley SB, Gordon S. Alcohol and high-density lipoprotein cholesterol: causal inference from diverse study designs. *Circulation.* 1981, 64 (suppl III), III-57-III-63
22. Irving HM, Samokhvalov AV, Rehm J. Alcohol as a risk factor for pancreatitis. A systematic review and meta-analysis. *JOP.* 2009, 10(4), 387-92
23. Keil U, Chambless LE, Döring A, Filipiak B, Stieber J. The relation of alcohol intake to coronary heart disease and all-

- cause mortality in a beer-drinking population. *Epidemiology*. 1997, 8(2), 150-6
24. Kinlay S, Libby P, Ganz P. Endothelial function and coronary artery disease. *Curr Opin Lipidol* 2001, 12, 383-389
 25. Klatsky AL, Friedman GD, Siegelaub AB, Gerard MJ. Alcohol consumption and blood pressure: Kaiser-Permanente Multiphasic Health Examination data. *N Engl J Med*. 1977, 296, 1194-1200
 26. Klatsky AL. Alcohol and cardiovascular diseases. *Expert Rev Cardiovasc Ther*. 2009, 7(5), 499-506
 27. Klatsky AL. Cardiovascular effects of alcohol. *Scientific American Science and Medicine* 1995, 2, 28-37
 28. Klatsky AL. Epidemiology of coronary heart disease— influence of alcohol. *Alcohol, Clin Exp Res* 1994, 18, 88-96
 29. Liang Y, Mente A, Yusuf S, Gao P, Sleight P, Zhu J, Fagard R, Lonn E, Teo KK; ONTARGET and TRANSCEND Investigators. Alcohol consumption and the risk of incident atrial fibrillation among people with cardiovascular disease. *CMAJ*. 2012, 184(16), E857-66
 30. Lippi G, Franchini M, Favaloro EJ, Targher G. Moderate red wine consumption and cardiovascular disease risk: beyond the "French paradox". *Semin Thromb Hemost*. 2010, 36(1), 59-70
 31. Marmot MG. Alcohol and coronary heart disease. *Int J Epidemiol* 1984, 13, 160-67
 32. Maxwell S, Cruickshank A, Thorpe G. Red wine and antioxidant activity in serum. *Lancet* 1994, 344 193-194
 33. Meade TW, Chakrabarti R, Haines AP, North W RS, Stirling Y. Characteristics affecting fibrinolytic activity and plasma fibrinogen concentrations. *Br Med J* 1979, 1, 153-56
 34. Miceli M, Alberti L, Bennardini F, Di Simplicio P, Seghieri G, Rao GH, Franconi F. Effect of low doses of ethanol on platelet function in long-life abstainers and moderate-wine drinkers. *Life Sci*. 2003, 8, 73(12), 1557-66
 35. Miller NE, Bolton CH, Hayes TM, Bainton D, Yarnell JW, Baker IA, Sweetnam PM. Associations of alcohol consumption with plasma high density lipoprotein cholesterol and its major subfractions: the Caerphilly and Speedwell Collaborative Heart Disease Studies. *J Epidemiol Commun Health*. 1988, 42, 220-225
 36. Moore RD, Smith CR, Kwitrovich PO, Pearson TA. Effect of low-dose alcohol use versus abstinence on apolipoproteins A-I and B. *Am J Med*. 1988, 84, 884-890
 37. Mukamal KJ, Mackey RH, Kuller LH, et al. Alcohol consumption and lipoprotein subclasses in older adults. *J. Clin. Endocrinol. Metab*. 2007, 92(7), 2559-66
 38. Nakanishi N, Yoshida H, Nakamura K, Kawashimo H, Tatara K. Influence of alcohol intake on risk for increased low-density lipoprotein cholesterol in middle-aged Japanese men. *Alcohol Clin Exp Res*. 2001 25(7), 1046-50
 39. Paoletti R, Klatsky AL, Poli A, Zakhari S (eds). *Moderate Alcohol Consumption and Cardiovascular Disease*. Dordrecht, The Netherlands: Kluwer Academic Publishers, 2000
 40. Paul E Ronksley, Susan E Brien, Barbara J Turner et al. Association of alcohol consumption with selected cardiovascular disease outcomes: a systematic review and meta-analysis *BMJ* 2011, 342, d671
 41. Pearson TA, Terry P. What to advise patients about drinking alcohol: the clinician's conundrum. *JAMA*. 1994 272, 967-968
 42. Pearson TA. Alcohol and heart disease. *Circulation* 1996, 94(11), 3023-3025
 43. Pöschl G, Seitz HK. Alcohol and cancer. *Alcohol*. 2004, 39(3), 155-65
 44. Pruett D, Waterman EH, Caughey AB. Fetal alcohol exposure: consequences, diagnosis, and treatment. *Obstet Gynecol Surv*. 2013 Jan; 68(1):62-9
 45. Puddey IB, Croft KD, Abdu-Amsa Caccetta R, Beilin LJ. Alcohol, free radicals and antioxidants. *Novartis Found Symp*. 1998, 216, 51-62
 46. Rehm J, Taylor B, Mohapatra S, Irving H, Baliunas D, Patra J, Roerecke M. Alcohol as a risk factor for liver cirrhosis: a systematic review and meta-analysis. *Drug Alcohol Rev*. 2010, 29(4), 437-45
 47. Renaud S, Criqui MH, Farchi G, Veenstra J. Alcohol drinking and coronary heart disease. In: Verschuren PM (ed.). *Health Issues Related to Alcohol Consumption*. Washington DC: ILSI Press, 1993, 43-80
 48. Renaud SC, Gueguen, Schenker J, D'Houtaud A. Alcohol and mortality in middle-aged men from eastern France. *Epidemiology*. 1998, 9, 184-1880
 49. Renaud SC, De Lorgeril M. Wine, alcohol, platelets, and the French paradox for coronary heart disease. *Lancet*. 1992, 339, 1523-1526
 50. Richard P Donahue, Robert D Abbott, Dwayne M Reed, Katsuhiko Yano. Alcohol and Hemorrhagic Stroke The Honolulu Heart Program. *JAMA*, 1986, 255(17), 2311-2314
 51. Ridker PM, Vaughan DE, Stampfer MJ, Glynn RJ, Hennekens CH. Association of moderate alcohol consumption and plasma concentration of endogenous tissue-type plasminogen activator. *JAMA*. 1994, 272, 929-933
 52. Ross R. Atherosclerosis—an inflammatory disease. *N Engl J Med* 1999, 340, 115-126
 53. Rubin R, Rand ML. Alcohol and platelet function. *Alcohol Clin Exp Res*. 1994, 18(1), 105-110
 54. Ryle PR, Thomson AD. Nutrition and vitamins in alcoholism. *Contemp Issues Clin Biochem*. 1984, 1, 188-224
 55. Shai I, Wainstein J, Harman-Boehm I, et al. Glycemic effects of moderate alcohol intake among patients with type 2 diabetes: a multicenter, randomized, clinical intervention trial. *Diabetes Care*. 2007, 30, 3011-3016
 56. Sierksma A, Patel H, Ouchi N, et al. Effect of moderate alcohol consumption on adiponectin, tumor necrosis factor- α , and insulin sensitivity. *Diabetes Care*. 2004, 27, 184-189
 57. Simini B. Serge Renaud: from French paradox to Cretan miracle. *The Lancet* 355(9197), 48
 58. Stervbo U, Vang O, Bonnesen C. A review of the content of the putative chemopreventive phytoalexin resveratrol in red wine. *Food Chem* 2007, 101(2), 449-457
 59. Stolle M, Sack PM, Thomasius R. Binge drinking in childhood and adolescence: epidemiology, consequences, and interventions. *Dtsch Arztebl Int*. 2009, 106(19), 323-8
 60. Suh I, Shaten BJ, Cutler JA, Kuller LH. For the Multiple Risk Factor Intervention Trial research group. Alcohol use and mortality from coronary heart disease: the role of high-density lipoprotein cholesterol. *Ann Intern Med*. 1992, 116, 881-887
 61. Van Golde PH, Sloots LM, Vermeulen WP, Wielders JP, Hart HC, Bouma BN, van de Wiel A. The role of alcohol in the anti low density lipoprotein oxidation activity of red wine. *Atherosclerosis*. 1999, 147(2), 365-70
 62. Veenstra J, Kluit C, Ockhuizen TH, et al. Effects of moderate alcohol consumption on platelet function, tissue-type plasminogen activator and plasminogen activator inhibitor. *Thromb. Haemost*. 1990, 63, 345-348