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Age-associated metabolic effects of binge drinking

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"While the epidemiologic evidence … indicates that moderate drinking is likely to confer cardiometabolic benefits, some methodological limitations in the studies conducted thus far raise uncertainties on a number of unresolved issues."

There is a large body of consistent epidemiologic evidence supporting the notion that light-to-moderate alcohol consumption is associated with lower cardiovascular mortality and morbidity, and a reduced incidence of Type 2 diabetes when compared with both abstention and heavy drinking [1]. This association also explains the beneficial effects of moderate alcohol consumption on total mortality observed in both men and women of middle-aged populations [2]. The epidemiologic evidence is corroborated by laboratory and physiologic studies supporting the existence of plausible biologic pathways underlying the cardiovascular benefits of moderate drinking. Some of these biologic mechanisms include favorable effects on metabolic pathways, such as an improvement of the lipid profile, especially high-density lipoprotein (HDL)-cholesterol [3] and enhanced insulin sensitivity [4]. In particular, it has been estimated that at least 50% of the protective effect of moderate alcohol consumption on cardiovascular disease may be attributable to alcohol-induced elevation of HDL-cholesterol [3]. However, both beneficial and detrimental effects of alcohol consumption have been reported on other important cardiometabolic risk factors, such as triglycerides, obesity and the metabolic syndrome as a whole, whereas alcohol-induced hypertension is likely to contribute to the increased cardiovascular risk associated with heavy drinking [1].

While the epidemiologic evidence, with reasonable biologic plausibility, indicates that moderate drinking is likely to confer cardiometabolic benefits, some methodological limitations in the studies conducted thus far raise uncertainties on a number of unresolved issues. For example, the magnitude of these benefits may be biased by the choice of reference categories, since it has been argued persuasively that quitters may well be less healthy for reasons unrelated to the fact that they are not currently drinking [5]. Therefore, studies that fail to distinguish former drinkers from lifetime abstainers may overestimate the health benefits of moderate alcohol consumption.

"…it has been shown that consuming alcohol in a concentrated fashion … without food may counteract any potential benefit associated with moderate alcohol consumption."

A further issue resides in the role of drinking pattern. In fact, a number of the studies conducted thus far were not originally designed to examine the effects of alcohol consumption on health and did not employ standard quantity–frequency questions to assess intake. Moreover, most of these studies did not adequately measure drinking pattern, and that is a problem, not only because it renders uncertain the actual volume of alcohol consumed, but because the pattern of drinking is likely to influence the effect of alcohol consumption on health. Clearly, the effect on health of having seven drinks on a Saturday night are likely to differ from that of having a glass of wine with dinner every evening of the week. Yet the volume measures employed in many of the studies define both as one drink a day (moderate

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drinking). Substantial evidence from studies designed to specifically investigate drinking pattern now verifies that the way alcohol is consumed (i.e., frequency and intensity of consumption, binge drinking and drinking with/without meals) may modify the underlying association between alcohol consumption and both total mortality and cardio–metabolic risk [6]. In particular, a number of studies suggest that a binge pattern of drinking or heavy episodic drinking may counteract the cardio–metabolic benefits of alcohol consumption. For example, a pattern of high intensity and low frequency of drinking has been associated with increased central adiposity [7]. Likewise, lifetime drinking intensity has been associated with unfavorable metabolic effects, such as impaired fasting glucose, high triglycerides, and the metabolic syndrome overall, with a dose–response relationship (i.e., the higher the drinking intensity the higher the prevalence of the metabolic syndrome [8]). Moreover, it has been shown that consuming alcohol in a concentrated fashion (weekend only) and without food may counteract any potential benefit associated with moderate alcohol consumption on the cardiovascular system [9–10]. Altogether, these findings emphasize the importance of the frequency and intensity of alcohol consumption as the primary determinants of its association with the cardio–metabolic risk. These findings are also supported by the physiological mechanisms of increased clotting and reduced threshold for ventricular fibrillation associated with irregular heavy drinking occasions [6]. Thus, a recommendation that moderate drinking confers health benefits, without considering the risks associated with 'unhealthy' patterns of drinking, could potentially lead to unbalanced advice given to individuals and the population at large with regard to drinking habits.

> "...a binge pattern of drinking, especially when initiated at younger ages, may produce long-term detrimental effects on cardiovascular and metabolic health."

Furthermore, cardiovascular and metabolic diseases represent end points influenced by a lifetime of risk exposures. However, in most studies of alcohol-related chronic-health conditions, alcohol intake has been assessed at a single point in time, under the assumption that drinking patterns are fairly stable over the lifetime. In cases in which this assumption is met, current and past drinking patterns are very similar, making it difficult, if not impossible, to disaggregate acute and chronic effects of alcohol on health. It has been suggested, however, that alcohol consumption varies considerably over the course of a lifetime [11], but the relation of this variability to health is poorly understood. For example, findings from the British Regional Heart Study, based on five measurements of alcohol intake over 20 years of follow-up, indicate that the baseline U-shaped relationships of alcohol intake with CVD and all-cause mortality changed after taking into account variation over time in alcohol intake. Specifically, risks associated with nondrinking were reduced, while risks associated with moderate and heavy drinking increased [12]. These findings suggest that previous epidemiologic studies may have overestimated the benefits on CVD risk from moderate alcohol consumption and underestimated the risks associated with heavy drinking.

Recently, we sought to examine the impact of lifetime drinking trajectories on the cardiovascular risk factors included in the cluster of the metabolic syndrome, in the attempt to account for the effects of variability of drinking habits over time [13]. Trajectory analyses are a set of semiparametric group-based approaches for modeling developmental trajectories of behaviors over time. In this specific study, participants were lifetime regular drinkers selected from healthy controls for the Western New York Health Study in which lifetime lifestyle was ascertained retrospectively. Lifetime regular drinkers were defined as those who drank at least once a month for a period of at least 6 months during their lifetime. Trajectory analyses were based on estimates of standardized total adjusted ounces of ethanol for each decade between 10 to 59 years. Two groups with distinct lifetime drinking trajectories were obtained, an early peak and a stable trajectory group. Compared with stable trajectory drinkers, early peak drinkers had earlier onset of regular drinking, drank heavily in late adolescence and early adulthood tapering off in middle age, averaged more drinks per drinking day, drank less frequently, preferred beer or liquor to wine, were more likely to drink without food, drank for fewer years, had lower lifetime alcohol intakes, and were more likely to abstain when interviewed. After controlling for potential confounders, early-peak trajectories were associated with an unfavorable cardiometabolic profile. Specifically, they exhibited higher likelihoods of low HDL-cholesterol (1.62; 95% confidence interval [CI]: 1.27–2.08), abdominal obesity (1.48; 95% CI: 1.23–1.78), overweight (1.32; 95% CI: 1.10–1.60), and the metabolic syndrome overall (1.31; 95% CI: 1.00–1.71) compared with stable drinkers. These findings further emphasize that a binge pattern of drinking, especially when initiated at younger ages, may produce long-term detrimental effects on cardiovascular and metabolic health. Binge drinking is likely to be associated with other unhealthy lifestyle habits and drinking patterns (e.g., drinking without meals), as well as with a higher likelihood of alcoholism. This is an issue of considerable public-health significance given the increasing trends in the prevalence of binge drinking among both adolescents and young adults in many Western countries [14]. Further studies are needed to clarify the impact of variability of drinking patterns over time on cardiovascular and metabolic health in order to better inform public health guidelines.

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