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Randomized control trials

Effects of red wine polyphenols and alcohol on glucose metabolism and the lipid profile: A randomized clinical trial

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SUMMARY

Background & aims: Epidemiological data suggest that moderate red wine consumption reduces cardiovascular mortality and the incidence of diabetes. However, whether these effects are due to ethanol or to non-alcoholic components of red wine still remains unknown. The aim of the present study was to compare the effects of moderate consumption of red wine, dealcoholized red wine, and gin on glucose metabolism and the lipid profile.
Methods: Sixty-seven men at high cardiovascular risk were randomized in a crossover trial. After a run-in period, all received each of red wine (30 g alcohol/d), the equivalent amount of dealcoholized red wine, and gin (30 g alcohol/d) for 4 week periods, in a randomized order. Fasting plasma glucose and insulin, homeostasis model assessment of insulin resistance (HOMA-IR), plasma lipoproteins, apolipoproteins and adipokines were determined at baseline and after each intervention.
Results: Fasting glucose remained constant throughout the study, while mean adjusted plasma insulin and HOMA-IR decreased after red wine and dealcoholized red wine. HDL cholesterol, Apolipoprotein A-I and A-II increased after red wine and gin. Lipoprotein(a) decreased after the red wine intervention.
Conclusions: These results support a beneficial effect of the non-alcoholic fraction of red wine (mainly polyphenols) on insulin resistance, conferring greater protective effects on cardiovascular disease to red wine than other alcoholic beverages.
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1. Introduction

Consistent epidemiological data suggest that moderate alcohol consumption is associated with a reduced risk for fatal and nonfatal coronary heart disease and for cardiovascular disease (CVD) mortality, independently of the type of alcoholic beverage consumed.[1] The effect of alcohol in moderation on reducing the incidence of diabetes,[2–4] a strong risk factor for CVD, may be a mediating mechanism. A meta-analysis of 20 cohort studies comprising 477,200 subjects indicated that moderate alcohol consumption (<60 g/d in men and <50 g/d in women) was inversely associated with diabetes risk. The dose–response trend showed that the strongest inverse association was observed for 22–24 g/d.[2] Furthermore, in a meta-analysis of 15 prospective studies, the relative risk of developing type-2 diabetes was lower in moderate alcohol drinkers than in abstainers or heavy drinkers, independently of the type of alcoholic beverage consumed.[3] Nevertheless, in a prospective study in healthy women, an inverse association between moderate alcohol intake and lower diabetes risk was most apparent in those who reported wine or beer drinking compared to women who reported liquor intake.[4]

A salient feature of alcohol consumption is the increase in HDL-cholesterol (HDL-C) and apolipoprotein (Apo) A-I concentrations.[5] HDL-C and ApoA-I positively affect insulin secretion and pancreatic β-cell survival, thereby enhancing insulin sensitivity (IS).[6] Since insulin resistance increases the risk of both CVD and diabetes,[7]

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moderate alcohol consumption could possibly decrease these risks by improving IS. However, clinical trials assessing the short-term effects of moderate consumption of different alcoholic beverages on IS are few and the results are contradictory, as some studies have shown a positive effect[8,9] while most have reported no benefit.[10–14]

Among alcoholic beverages, red wine (RW) is of note because it provides both alcohol and abundant polyphenolic compounds, which are thought to provide additional benefits on lowering CVD risk.[15] To determine the possible differential effects on risk markers of alcohol and polyphenols in RW, dealcoholized red wine (DRW) or grape extracts, which are rich in grape polyphenols but devoid of ethanol, may be used. Consumption of DRW in two studies had no effect on fasting concentrations of lipids and lipoproteins or IS.[12,13] In another study lyophilized grape powder (an analog of a polyphenolic extract of wine) decreased LDL-cholesterol (LDL-C) and ApoB concentrations in women.[16] Furthermore, concentrated red grape juice decreased LDL-C and ApoB and increased HDL-C and ApoA-I concentrations in healthy volunteers as well as in hemodialysis patients,[17] but IS was not assessed in these studies using grape products.[16,17] Thus, it remains unclear whether the protective effects of alcoholic beverages on the risk of CVD and diabetes are due to ethanol or to their non-alcoholic components (mainly polyphenols). Therefore, we designed a randomized clinical trial to compare the effects of moderate alcohol consumption (30 g alcohol/d) through the ingestion of gin, a non-polyphenolic alcoholic beverage, RW, a high polyphenolic alcoholic beverage, and the equivalent amount of DRW, a high-polyphenol non-alcoholic beverage, on IS, serum lipids, and other cardiometabolic markers in subjects at high risk of CVD.

2. Subjects and methods

2.1. Subjects

A total of 73 male moderate alcohol consumers aged between 55 and 75 years were recruited for the study in the outpatient clinic of the Internal Medicine Department of our institution from January 2008 to December 2010. The subjects included were at high risk for CVD because of family history of premature CVD and/or the presence of diabetes, hypertension, dyslipidemia, and overweight/obesity. Exclusion criteria included documented CVD, human immunodeficiency virus infection, chronic liver disease, malnutrition, neoplastic or acute infectious diseases, and customary use of vitamin supplements. Participants were offered free beverages but no monetary compensation. The Institutional Review Board of the hospital approved the study protocol, and all participants gave written consent.

2.2. Study design and diet monitoring

The study was an open, randomized, controlled, crossover trial with three intervention periods (Fig. 1). Two weeks prior to the study the subjects were asked to maintain their usual diet and to refrain from consuming any alcoholic beverage. Baseline data were collected after this run-in period. Following this, participants were individually randomized by the dietitian in a crossover design among three treatment sequences lasting 4 weeks each, in which the test beverages were provided. Randomization was based on a computer-generated random number table, resulting in six possible diet sequences. A dietitian assigned participants to interventions and instructed them to consume gin (100 mL/day, containing 30 g of ethanol), RW (272 mL/day, containing 30 g of ethanol and 798 mg of total polyphenols), or DRW (272 mL/day, containing 1.14 g of ethanol and 733 mg of total polyphenols). No washout periods were included between the interventions. The phenolic composition of the RW and DRW used in the study is detailed in Table 1. The total phenolic content of the three beverages was determined with the Folin-Ciocalteu method, and the phenolic profile was determined by HPLC-DAD, as described previously.[18] No significant differences were observed in the phenolic content of RW and DRW, while gin contained no detectable phenolic compounds.

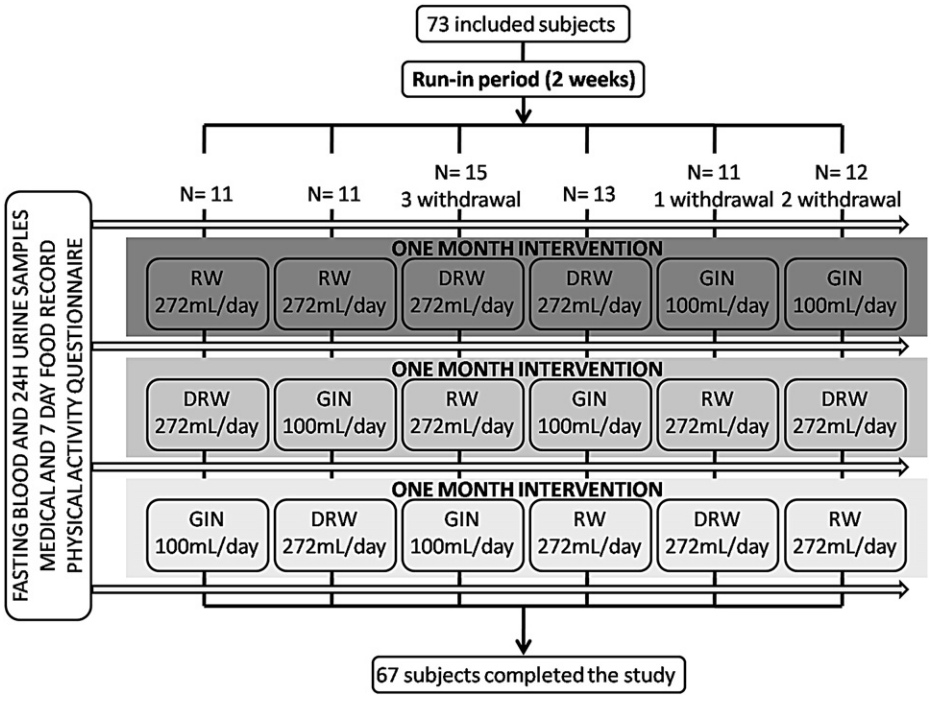

Fig. 1. Flow chart of the subjects included in the study. RW: red wine; DRW: dealcoholized red wine.