Effects of Alcohol Consumption on HDL Metabolism in Asian Populations

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Abstract

Low serum high-density lipoprotein-cholesterol (HDL-C) is an independent coronary risk factor, because HDL acts to mediate the uptake of peripheral cholesterol and return it to the liver. Therefore, raising HDL-C may be one of the goals in the management of atherogenic dyslipidemia for cardiovascular disease risk reduction. Although lifestyle modification such as diet and exercise may be important to increase HDL-C, effects of dietary factors on HDL-C remained largely unknown. Interracial differences on HDL metabolism may exist. Here we reviewed published articles about effect of alcohol consumption on HDL metabolism in Asian populations, regarding systematic review and meta-analysis and also clinical studies performed in Asian populations as important articles in this review.

Keywords: Alcohol consumption; Asian population; High-density lipoprotein; Meta-analysis

Introduction

The treatment of atherogenic dyslipidemia generally has focused on low-density lipoprotein-cholesterol (LDL-C) reduction to reduce cardiovascular diseases (CVDs). Even though the statin use has significantly reduced cardiovascular events, 15-30% of patients still continue to have CVDs

[1]. Low serum high-density lipoprotein-cholesterol (HDL-C) is an independent coronary risk factor [2], and is also one of the defining features of metabolic syndrome [3]. HDL acts to mediate the uptake of peripheral cholesterol and return it to the liver, which may be the main mechanism for anti-atherogenic property of HDL.

Therefore, raising HDL-C may be one of the goals in the management of atherogenic dyslipidemia for CVD risk reduction. Although lifestyle modification such as diet and exercise may be important to increase HDL-C, effects of dietary factors on HDL-C remained largely unknown. Interracial differences on HDL metabolism may exist. Here we reviewed published articles about effect of alcohol consumption on HDL metabolism in Asian populations. We regarded systematic review and meta-analysis and also clinical studies which were performed in Asian populations as important articles in this review.

Meta-Analyses and Systematic Reviews on Effects of Alcohol Consumption on HDL Metabolism

Light-to-moderate alcohol consumption has been reported to induce an increase of HDL-C in narrative reviews. However, evidences obtained from meta-analyses or systematic reviews of effects of alcohol consumption on HDL metabolism were very limited (Table 1).

Brien et al systematically reviewed interventional studies of the effects of alcohol consumption on biological markers in adults without known CVD [4]. Data sources were Medline (1950 to October 2009) and Embase (1980 to October 2009). They found that alcohol consumption significantly increased HDL-C (pooled mean difference 0.094 mmol/L, 95% confidence interval 0.064 to 0.123), and the major apolipoprotein of HDL, apolipoprotein A1 (0.101 g/L, 0.073 to 0.129). In their study, alcohol showed a dose-response relation with HDL-C (P = 0.013).

Rimm et al also performed a meta-analysis of all clinical studies that assessed the effects of moderate alcohol intake on coronary risk factors [5]. Subjects included men and women free of previous chronic disease and who were not dependent

Table 1. Meta-Analysis and Systematic Review of Effects of Alcohol Consumption on HDL Metabolism

Authors	Aim of study and study design	Subjects studied	Results/conclusions
Brien et al [4]	To systematically review interventional studies of the effects of alcohol consumption on 21 biological markers associated with coronary risk factors in adults without known CVD.	Data sources: Medline (1950 to October 2009) and Embase (1980 to October 2009) without limits.	Alcohol significantly increased HDL-C (pooled mean difference 0.094 mmol/L, 95% CI 0.064 to 0.123). Alcohol showed a dose-response relation with HDL-C (P = 0.013).
Rimm et al [5]	Meta-analysis of all experimental studies that assessed the effects of moderate alcohol intake on coronary risk factors.	Sixty-one data records were abstracted from 42 eligible studies. Men and women free of chronic disease and who were not dependent on alcohol. Coronary risk factors were assessed before and after participants consumed up to 100 g of alcohol a day.	An experimental dose of 30 g of ethanol a day increased HDL-C by 3.99 mg/dL (95% CI 3.25 to 4.73).

CVD: cardiovascular disease; CI: confidence interval; HDL-C: high-density lipoprotein-cholesterol.

on alcohol. Studies were included in which biomarkers were assessed before and after participants consumed up to 100 g of alcohol a day. Sixty-one data records were abstracted from 42 eligible studies. An experimental dose of 30 g of ethanol a day increased HDL-C by 3.99 mg/dL (95% confidence interval 3.25 to 4.73) and also apolipoprotein A1 by 8.82 mg/dL (7.79 to 9.86).

According to the results obtained from a meta-analysis and systematic review, alcohol consumption is associated with elevation of HDL and also apolipoprotein A1.

Clinical Trials to Study Effects of Alcohol Consumption on HDL Metabolism, Performed in Asian Populations

Clinical trials to study effects of alcohol consumption on HDL-C, performed in Asian populations, were shown in Table 2. Chung et al performed a cross-sectional community-based study to investigate the influence of alcohol consumption on biomarkers in a Southern Taiwan Pai-Wan aboriginal community with a high prevalence of alcohol consumption [6]. They found that subjects with alcohol consumption had significantly higher levels of HDL-C than non-drinkers. Minami et al investigated the effect of alcohol restriction on

metabolic variables in Japanese men [7]. Thirty-three male subjects (37 ± 1 years) who habitually drank alcohol (646 mL of ethanol/day) were told either to keep their usual drinking habits for 3 weeks, or to reduce alcohol intake by at least up to a half of their usual drinking amount, by using a randomized crossover design. Three-week alcohol restriction significantly decreased serum HDL-C (P < 0.05). Ayaori et al performed a population-based study and an alcohol withdrawal study [8]. An analysis of 236 healthy males showed no significant association between alcohol consumption and HDL-C. In the withdrawal study, the subjects with a history of daily alcohol consumption (mean ± SD, 81.8 ± 33.0 g/day; range, 40 - 150 g/day) abstained from alcohol for 4 weeks. After withdrawal, HDL-C significantly decreased. Kato et al performed a cross-sectional analysis in 2,103 non-diabetic men and women aged 40 to 79 years from a general Japanese population in Hisayama [9]. In both sexes, HDL-C significantly increased with elevated alcohol intake (P < 0.01). Yano et al investigated cross-sectionally in a random sample of approximately 1,360 elderly Japanese men, aged 60 - 81 years, in Hawaii. In multivariate analyses, HDL-C was positively related to alcohol consumption (P < 0.0001) [10].

According to the results of clinical trials to study effects of alcohol consumption on HDL-C, alcohol consumption is associated with elevation of HDL-C in Asian population.

Table 2. Clinical Trials to Study Effects of Alcohol Consumption on HDL-C, Performed in Asian Populations

Authors	Nationality of subjects	Subjects studied	Study design	Results/conclusions
Chung et al [6]	Taiwanese	The 1,466 aboriginal subjects, 40 - 95 years of age, are a stratified random subpopulation identified during an integrative health care program.	A cross-sectional community-based study. They were sampled for drinking patterns.	Subjects with alcohol consumption had significantly higher levels of serum HDL-C.
Minami et al [7]	Japanese	Thirty-three male subjects (37 ± 1 years) who habitually drank alcohol (646 mL of ethanlol/day).	Thirty-three male subjects (37 ± 1 years) who habitually drank alcohol (646 mL of ethanlol/day) were told either to keep their usual drinking habits for 3 weeks, or to reduce alcohol intake by at least up to a half of their usual drinking amount using a randomized crossover design.	Three-week alcohol restriction significantly serum HDL-C decreased (P < 0.05).
Ayaori et al [8]	Japanese	Two hundred thirty-six healthy males and in the withdrawal study, the subjects with a history of daily alcohol consumption (mean ± SD, 81.8 ± 33.0 g/day; range, 40 - 150 g/day).	A population-based study and an alcohol withdrawal study.	Two hundred thirty-six healthy males showed no significant association between alcohol consumption and metabolic parameters. In the withdrawal study, the subjects with a history of daily alcohol consumption abstained from alcohol for 4 weeks. After withdrawal, HDL-C significantly decreased.
Kato et al [9]	Japanese	Two thousand one hundred three non-diabetic men and women aged 40 to 79 years from a general Japanese population.	A cross-sectional study to determine whether the beneficial effects of alcohol on serum lipids are mediated by insulin levels.	In both sexes, HDL-C significantly increased with elevated alcohol intake.
Yano et al [10]	Japanese in Hawaii	Approximately 1,360 elderly Japanese men, aged 60 - 81 years, in Hawaii, USA.	The relationships of plasma TC, HDL-C, LDL-C and TG to a variety of personal attributes were investigated cross-sectionally in a random sample.	HDL-C was positively related to alcohol consumption (P < 0.0001).

HDL-C: high-density lipoprotein-cholesterol; LDL-C: low-density lipoprotein-cholesterol; TC: total cholesterol; TG: triglyceride.

Conclusion

The underlying mechanisms for alcohol-induced elevation of HDL-C remain largely unknown. Alcohol-induced increase in activity of lipoprotein lipase which transfers of cholesterol and phospholipids from triglyceride-rich lipoproteins to HDL during the lipolysis may be a possible explanation for HDL-C increase due to alcohol consumption [11, 12].

According to the results obtained from a meta-analysis and systematic review, and also clinical trials performed in Asian population, alcohol consumption may be associated with elevation of HDL-C.

Acknowledgement

Conflict of Interests

The authors declare that they have no competing interests.

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