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Meta-analyses

Alcohol consumption and risk of metabolic syndrome: A meta-analysis of prospective studies

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SUMMARY

Background & aims: Epidemiological evidence suggests that alcohol consumption is related to the incidence and development of metabolic syndrome. However, data on this issue are unstable and controversial. We conducted a meta-analysis to provide a quantitative assessment of the association between alcohol intake and risk of metabolic syndrome.

Methods: We searched the Pubmed and Embase databases up to May 2013 to identify prospective cohort studies related to alcohol consumption and metabolic syndrome. Summary effect estimates with 95% confidence intervals (CI) were derived using a fixed or random effects model, depending on the heterogeneity of the included studies.

Results: Six prospective studies involving 28,862 participants with 3305 cases of metabolic syndrome were included in the meta-analysis. On the basis of the Newcastle Ottawa Scale system, 83.3% of the studies were identified as relatively high-quality. In our primary analysis, compared with nondrinker, very light drinker was associated with decreased risk of metabolic syndrome [pooled relative risk (RR) 0.86, 95% CI: 0.75–0.99, fixed-effect model] while heavy drinker was associated with increased risk of metabolic syndrome (pooled RR 1.84, 95% CI: 1.34–2.52, fixed-effect model). No indications of heterogeneity and publication bias were found in these two groups. Estimates of total effects were generally consistent in the sensitivity and stratification analyses.

Conclusion: The present meta-analysis of prospective studies suggested that heavy alcohol consumption might be associated with an increased risk of metabolic syndrome while very light alcohol consumption seemed to be associated with a reduced risk of metabolic syndrome.

1. Introduction

Metabolic syndrome is a widely accepted concept that includes the constellation of various metabolic abnormalities and confers an increased risk for cardiovascular events and death.[1] It has become a major problem in public health because the prevalence of metabolic syndrome in adult is around 20–25% all over the world.[2] Although there are many therapeutic options for managing metabolic syndrome, lifestyle modification remains the primary therapy for the disease.[3]

Alcohol consumption is one of the most prevalent lifestyle habits throughout the world. Previous research has suggested that alcohol consumption is an influencing factor for metabolic syndrome. However, available literature on the association between alcohol consumption and metabolic syndrome are inconsistent and controversial, of which the protective, detrimental or J-shaped associations have been reported. Such controversy may be attributed to the complex effects of alcohol consumption on each component of metabolic syndrome.[4,5]

Combined with early epidemiological studies, the real pattern of alcoholic beverages consumption on risk of metabolic syndrome has not been clearly elucidated. An earlier meta-analysis on the association between alcohol consumption and metabolic syndrome is also limited in establishing causality for including only cross-sectional data.[6] As a result, the aim of the present meta-analysis is to assess the overall association between alcohol consumption and incident metabolic syndrome and to obtain a causality of the risk.

2. Methods

2.1. Search strategy

We conducted a systematic review of the published works without language restrictions and in accordance with the preferred

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reporting items for systematic reviews and meta-analyses (PRISMA) statement whenever applicable.[7,8] We searched Pubmed and Embase from their inception to May 2013 and systematically identified prospective studies that evaluated the association between alcohol consumption and incident metabolic syndrome. We used the following main search terms with no restrictions: "metabolic syndrome" or "insulin resistance syndrome" or "syndrome X" in combination with "alcohol" or "ethanol" or "drinking behavior" or "alcoholic beverages" or "wine" or "beer" or "liquor" or "spirit". We also scanned the reference lists from published original articles and previous reviews for more relevant studies not identified in the databases search.

2.2. Study selection

We included studies in the meta-analysis that met all of the following criteria: (1) the study had a prospective cohort design, (2) published original data relevant to a possible association between alcohol drinking and risk of metabolic syndrome. In case of multiple publications from one study population, the most recent publication was included in order to avoid duplicate observation, unless more inclusive and detailed data was found in other publications. To gather more relevant information, we consulted researchers with professional knowledge at this area for the presence of unpublished reports.

2.3. Data extraction

Two of our reviewers independently evaluated all relevant articles and identified eligible studies from the databases. During data abstraction, differences and disagreements were resolved through discussion to come to an agreement. Following information was recorded by a standardized data extraction form: last name of the first author, publication year, name of the study, geographic region of original study, composition and age range of study population, mean length of follow-up, number of cases and participants, definitions of metabolic syndrome, unadjusted and adjusted relative risk (RR) with corresponding 95% confidence interval (CI), and adjustment factors of interest. We contacted authors of the primary studies for additional information when necessary.

Alcohol consumption was converted to grams per day to help direct comparison between studies. When the upper level for the highest category was open ended, the width of the previous interval was added to the lower limit. One study from America reported alcohol data by using drinks and not gram, therefore, the average alcohol consumption was assumed using a conversion that based on typical drink sizes of the country (1 drink = 12.6 g alcohol).[9,10] In this meta-analysis, to better estimate the dose–response relationship between alcohol drinking and risk of metabolic syndrome, alcohol consumption was categorized into 6 groups: nondrinker: 0 g/d, very light drinker: 0.1–5 g/d, light drinker: 5.1–10 g/d, moderate drinker: 10.1–20 g/d, moderate–heavy drinker: 20.1–35 g/d, heavy drinker: >35 g/d. We assign each study to those groups on the basis of the calculated average consumption of alcohol. Where the alcohol intake category was considered as reference, the RR was reformulated to make nondrinkers as the reference group.

2.4. Quality assessment

Our data analyses were rely mainly on the published results. Therefore, the methodological quality of the included studies was important. Hence, a 9-scores system on the basis of the Newcastle Ottawa Scale (NOS) was used to assess the quality of the included studies.[11] Each study included in the meta-analysis was judged on

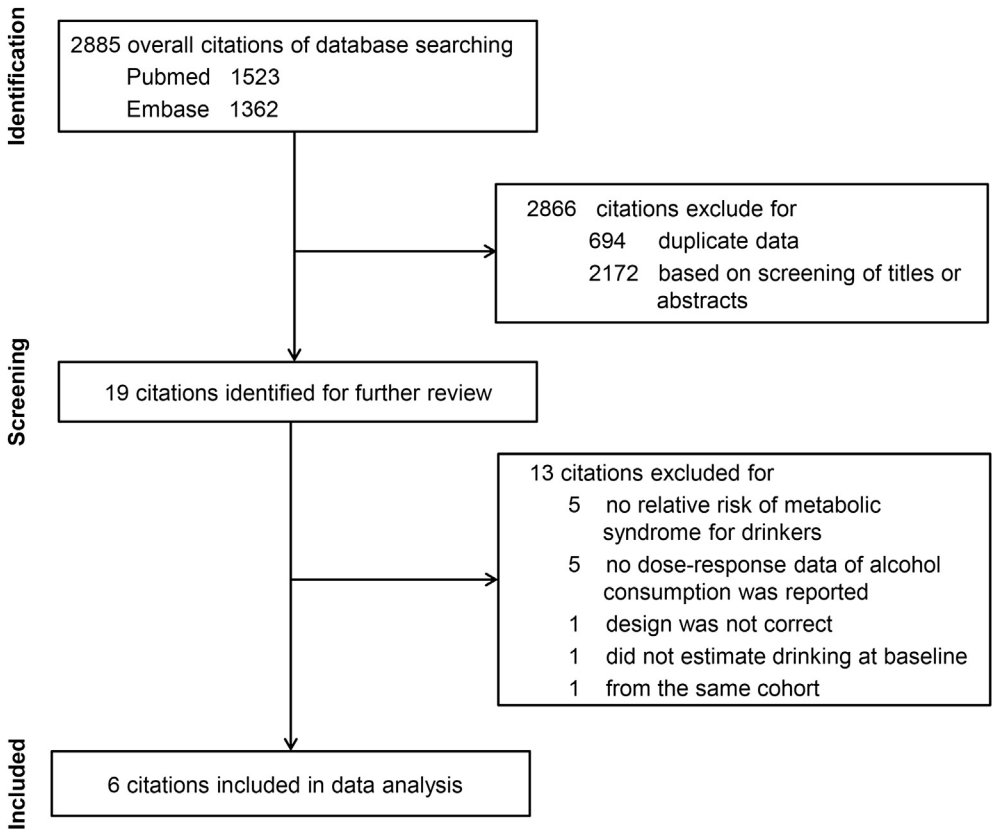

Fig. 1. Flow diagram of included studies in the systematic review.

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