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Alcohol consumption and health status of family members: health impacts without ingestion

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Abstract

Background—Over several decades, many cohort studies from the medical epidemiology literature have observed that compared to abstainers, moderate drinkers experience lower risk for a range of diseases. It was very difficult to separate the hypothesised physiological protective effect of moderate drinking from its well correlated confounders in observational study settings.

Aims—To investigate the association between current alcohol consumption levels of randomly selected family members and the current self-reported health status of other members living within the same family, using a large scale representative general population survey.

Method—Poisson regression models of the association between randomly selected key respondent alcohol consumption and health status of co-habiting family members using data from the 2008, 2009 and 2010 National Health Interview Surveys. Self-reported alcohol consumption of randomly selected key participants and self-reported health status of adult and child (parent reported) family members living in the same household were measured and compared.

Results—After controlling for a large range of commonly reported confounders, inverse associations were evident between light and moderate alcohol consumption of key participants and the prevalence of adverse health status among their family members, including children.

Conclusions—The superior health status attributed to family members of light and moderate drinkers is highly likely to be spurious and due to residual confounding rather than physiologically protective effects of alcohol. Unaccounted for confounding is likely to underpin apparent 'protective effects' due to moderate drinking commonly reported from observational studies of all-cause mortality, heart disease, stroke, and other chronic diseases.

Keywords

Alcohol; chronic disease; socioeconomic status; bias; epidemiology

Introduction

Over several decades, many cohort studies from the medical epidemiology literature have observed that compared to abstainers, moderate drinkers experience lower risk for a range of diseases including, coronary heart disease (CHD) and stroke^{1–3}, diabetes^{4,5}, dementia and Alzheimer's disease^{6,7}, and even all-cause mortality⁸. These observations have led to the ongoing debate on whether moderate alcohol consumption may produce physiological protective effects or, alternatively, whether the observed associations may be produced by a cluster of true health protective affects that strongly correlate with moderate drinking^{9–18}. Investigations via observational studies on the hypothetical protective effects of moderate

drinking are likely to be endless. This is because under uncontrolled circumstances (as for all observational studies including cohort studies and case-control studies), people change their drinking behaviours from time to time, often because of health reasons^{16, 19}. Yet studies which truly control alcohol intake of individuals, randomising amounts across subjects, are unlikely to be conducted among the general population given the known carcinogenic effects of alcohol and associated ethical implications. Indeed, it is very difficult to separate the hypothesised physiological protective effect of moderate drinking from its well correlated confounders in observational study settings¹⁵. In this study, we employ an alternative approach that examines the association between alcohol consumption patterns of an individual and the health status of their co-living family members. It is well known that co-living family members share clusters of major health related factors including socioeconomic determinants, environmental factors, lifestyle and genetic susceptibility²⁰. If moderate drinking is a strong marker for clusters of health protective factors, then compared to abstainers and other types of drinkers, family members (including children) of moderate drinkers would be expected to have better health status. In other words, the moderate drinking behaviour of an individual would appear to have a 'protective effect' on the health of their family members – an association which could not be readily explained as a physiological effect of alcohol.

Method

This study used data from the 2008, 2009 and 2010 National Health Interview Surveys (NHIS). Data from the three waves of surveys were combined and analyzed together. The aim of this study was to investigate the association between current alcohol consumption levels of randomly selected family members and the current self-reported health status of other members living within the same family. Self-reported health status has been showed to be a reliable and valid indicator of health²¹. Details of the survey sampling strategy and data collection methods have been described elsewhere^{22–24}. Briefly, the NHIS were nationally focused and conducted by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC). All the surveys used the same sample design as the 2006 survey. The NHIS were conducted to provide comprehensive estimates of health indicators at the national level, and state stratified samples were drawn from all 50 states and the District of Columbia to ensure the samples are representative^{22–24}.

Households were the basic unit of the NHIS. For each selected household, if there was more than one family residing in a household, all families in the household were selected. The NHIS collected basic demographics and information on health status from each household member. In addition, one randomly selected adult (>18yrs), the key participant, was interviewed in detail regarding their health and health-related behaviour, including alcohol use in the last 12 months. Records for each family member and alcohol consumption status of the key participant were linked using a combination of ID codes for each family. We used self-reported health status as our main indicator of health. Adult health status was divided into two groups for comparison: excellent, very good, and good (adult high); and fair and poor (adult low). Child health status was also divided into two groups: excellent, very good (child high); and good, fair and poor (child low). About 15% of adult participants had fair or poor health status (adult low), and some 20% of children participants had good, fair or poor health status (child low).

We applied similar classifications for alcohol consumption patterns (drinking patterns) as the NHIS surveys^{22–24}. Alcohol consumption was grouped as follows: (1) Lifetime abstainer, <12 drinks in lifetime; (2) Former infrequent, 12+ drinks in lifetime but never as many as 12 in one year and none in the past 12 months; (3) Former regular, 12+ drinks in lifetime, 12+ drinks per year, but none in past 12 months; (4) Current infrequent drinker, 12+ drinks in lifetime and 1–11 drinks in past 12 months; (5) Current light, 12+ drinks in

lifetime, and no more than 3 drinks per week in past 12 months; (6) Current moderate, 12+ drinks in lifetime, and 4 – 14 drinks per week (male) or 4 – 7 drinks per week (female) in the last 12 months; (7) Current heavier: 12+ drinks in lifetime, and more than 14 drinks per week (male) or more than 7 drinks per week (female) in past 12 months; and (8) drinking status not reported. Frequency or amount of alcohol consumption for 18 former drinkers and 292 current drinkers was missing, and data for these participants were therefore excluded from the analysis. The association between key participant drinking level and their own health status was first examined using multivariate Poisson regression with robust estimation of variance. We then conducted three further analyses to investigate the association between key participant alcohol consumption and the health status of other family members, also using Poisson regression with robust estimation of variance. We asked three questions: (1) Among families where key participants live with a partner (married or in a de facto relationship), does alcohol consumption of the key participant predict the health status of their partner?; (2) Among families with more than one adult member, does alcohol consumption of the key participant influence the proportion of adult family members who self-report as being in poor or fair health? (3) Among families in which the key participant is a parent of children living in the same family, does the key participant's alcohol consumption predict the (parent reported) health status of their children?

Consistent with cohort studies that have aimed to produce 'unbiased' estimations of the physiological effects of alcohol consumption^{1,2}, a number of potential confounders were adjusted for in the analyses. To predict the health status of key participants and their partners, both multivariate models included: alcohol consumption of key participants; gender; age strata; race; marital status; education; income of either the key participant or partner depending on which individual's health status was being examined for those who worked for paid last year, or ratio of family income to the poverty threshold for those who did not work for paid last year; region of residence; and year of survey. In the analysis of health status of all adult family members, the multivariate model included: alcohol consumption and race of key participants; proportion of family members who were 65 years or older; educational level of the adult with the highest educational attainment in the family; ratio of family income to the poverty threshold; region of residence; and survey year. In the analysis of health status of children, the multivariate model included: alcohol consumption; gender; age strata and marital status of key participants; gender; age strata and race of the key participant's children; education of the adult with the highest educational attainment in the family; ratio of family income to the poverty threshold; whether the children and the key participant were biologically related; region of residence; and year of survey. About 16% of the educational attainment variable and the income variable were missing. Multiple imputations were therefore used to estimate values for cells with missing data (10 imputations were created). Two Poisson models were produced for each test of association, the first excluded observations with missing values and the second included the imputed estimations for educational attainment. All analyses were performed with STATAR 11.

Results

The overall results of tests of association between key participant alcohol consumption and their family member's health status have been summarized in Figure 1 with details available in supplementary Tables A1 to A5. This study included 76,320 key participants, about 50% of whom were living with a partner. The characteristics of key participants and their partners (for those who were living together) are shown in supplementary Table A1. Partners had relatively similar distributions of demographic characteristics as key participants, however, key participants included those who did not live with a partner (Table A1).

As expected, it was observed that key participants who consumed alcohol at moderate and light levels self-reported better health status compared to lifelong abstainers. The prevalence of poor or fair health status was significantly higher among former drinkers (Table A2 and Figure 1). Key participant alcohol consumption predicted the health status of their partners in a similar manner as for the key participants themselves. Partners of light or moderate drinkers had significantly lower prevalence of poor or fair health status compared to partners of life time abstainers, and partners of former drinkers were significantly more likely to self-report poor or fair health (Table A3 and Figure 1). There were similar associations between alcohol consumption of key participants and all adult family members (Table A4 and Figure 1). Level of alcohol consumption by key participants also predicted children's health status. Children of key participants who were light, moderate and heavier current drinkers were more likely to be reported as having excellent or very good health. The cumulative risks of a child being in less desired health were highest among children of former infrequent drinkers.

Estimates obtained from analyses with multiple imputations of missing values were similar to those derived from the original data with missing values. The prevalence of poor or fair health status of key participants as well as partners, all adult family members and children was influenced by the variables controlled in the analysis (Table A2 – A5).

Discussion

Analysis of a large representative survey of the US population has revealed inverse associations between key participant light and moderate alcohol consumption and the prevalence of perceived adverse health status among their adult family members, after controlling for a range of confounders. It is highly improbable that the alcohol consumed by key participants could have imparted any 'protective' physiological effects on their family members. Nevertheless, correlation of alcohol consumption among family members may exist (the alcohol consumption of surveyed family members was unknown) such that the apparent 'beneficial' effect on perceived health status of light and moderate alcohol consumption by key participants may in part be due to similar alcohol consumption patterns in other adult family members²⁵. However, the inverse association was also present among children of key participants. Indeed, the trend in health status prevalence ratios across drinking groups observed among key participants' children (under 17yrs) who, as a group, would largely be abstinent from alcohol, and for whom alcohol would be more likely to cause harm than benefit, was strikingly similar to that found for the key participants themselves. We postulate that the observed inverse associations between light, moderate and heavy drinking parents and perceived health status of their children are not due to the physiological effects of alcohol on children but, rather, indicative of residual confounding effects that strongly correlate with alcohol consumption behaviours.

This study provides unique evidence to support the view that the widely found 'protective' effects of light to moderate alcohol consumption on various diseases in epidemiological studies²⁶ are, as other studies have suggested^{13, 15, 16}, potentially spurious and due to residual confounding effects.

Conclusion

An inverse association exists between light/moderate drinking and the likelihood of adverse health status among adult and child family members of drinkers, even when a wide range of known confounders are controlled for. These associations are likely to be spurious and attributable to residual confounding rather than physiologically protective effects of alcohol. Unaccounted for confounding is likely to underpin apparent 'protective effects' of moderate drinking commonly reported from observational studies of all-cause mortality, heart disease

and other chronic diseases¹³. Current methods of accounting for confounding in observational studies are likely to be inadequate and alternative approaches are required to investigate the effects of alcohol consumption on health in the future.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Figure 1.

Association between key participant alcohol consumption pattern and health status of co-habiting adult (0 = excellent or very good; 1 = good, poor, fair) and child (0 = excellent, very good, good; 1 = fair, poor) family members (see Tables A2 – A5 for detailed estimations).

Drinking group: drinking status of key participant

1 Lifetime abstainer (reference group)

2 Former infrequent

3 Former regular

4 Current infrequent

5 Current light

6 Current moderate

7 Current heavier

8 Drinking status not reported