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Alcohol and mortality: is there a U-shaped relation in elderly people?

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Abstract

Objective: to assess the relation between alcohol intake and mortality among seven cohorts of middle-aged and elderly Danes.
Design: prospective population study with baseline assessment of alcohol- and tobacco consumption, educational level and body mass index, and a mean of 11.5 years follow-up of mortality.
Subjects: 16 304 men and women aged 50 years or more.
Main outcome measure: number and time of deaths from 1974 to 1995 as ascertained by the national central person register.
Results: the effect of alcohol intake on mortality did not differ between middle-aged (50–64 years, mean = 56.6 years) and elderly subjects (>64 years old, mean = 69.9 years). There was a U-shaped risk function in both age groups, which persisted also when adjusting for age, sex, smoking habits, level of education and body mass index. Abstaining women had a relative risk of 1.29 (95% confidence limits 1.17–1.42) as compared with light drinkers (1–6 drinks per week), while the relative risk for abstaining men was 1.22 (95% confidence limits; 1.08 to 1.37) as compared with light drinkers. Heavy drinking women (>28 drinks per week) had a relative risk of 1.23 (95% confidence limits; 0.85 to 1.78) and heavy drinking men (more than 69 drinks per week) had a relative risk of 2.11 (95% confidence limits 1.66–2.69), both compared with light drinkers.
Conclusion: among the middle-aged and elderly women and men, a light alcohol intake is associated with lower mortality than abstention or heavy drinking.

Keywords: *alcohol, elderly people, mortality*

Introduction

In several large population studies abstainers and heavy drinkers have shown a higher mortality than moderate drinkers [1–5]. The deleterious effects of heavy drinking on morbidity and mortality from, for example, liver cirrhosis, several cancers, suicides, traffic accidents and work-related injuries are well described [6–8]. At the lower end of the consumption scale, it has been suggested that abstainers are at a higher risk of mortality from cardiovascular disease [9–10].

In a previously reported cohort study from Copenhagen we found no statistical interaction between age and the effect of alcohol on mortality [2]. A recent large American study found that the beneficial effect of a light alcohol intake was greater among older than among younger women [3]. Here, women at high risk of cardiovascular disease (due to risk factors such as old age, diabetes mellitus, family history of coronary heart

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Table 1. Characteristics of the over-50-year-old participants from the Copenhagen Centre for Prospective Population Studies, according to sub-population

Study	Year(s)	Age (years)		No. (and %) of subjects, by sex and age				Observation time (years)	Follow-up time (years)	
		Mean	Maximum	Men		Women			Mean	Maximum
				Subjects	Deaths	Subjects	Deaths			
Copenhagen City Heart study	1976–78	60	93	3998	2310	4607	1708	120 686	14.2	18.9
Copenhagen Male study	1985–86	62	75	2588	555	0	0	26 383	8.4	10.0
Glostrup Population study 1897	1977	80	80	89	89	126	123	1660	7.4	18.4
Glostrup Population study 1914	1974	70	70	375	195	344	115	6472	8.9	11.6
MONICA I	1982	55	60	922	192	839	101	20 560	11.7	13.1
MONICA II	1987	55	60	369	43	353	20	6231	8.6	9.3
MONICA III	1991	60	70	580	47	559	26	4793	4.2	4.8
Total	-	-	-	9476	3431	6828	2093	186 785	11.5	-

MONICA, Monitoring of Trends and Determinants in Cardiovascular Diseases.

disease, high cholesterol and hypertension) were found to experience an additional effect of a light alcohol intake with regard to all-cause mortality [3]. Since the relation between alcohol intake and mortality among elderly people has been only sparsely studied [11–14], the aim of the present study was to analyse the effect of alcohol on mortality among middle-aged and elderly men and women.

Population and methods

The Copenhagen Centre for Prospective Population Studies comprises three Danish prospective population studies: the Copenhagen City Heart study, the Copenhagen Male study and the Glostrup Population study—which also comprises the Monitoring of Trends and Determinants in Cardiovascular Diseases (MONICA) studies [15–17]. Characteristics of the different population studies are shown in Table 1. A total of 6905 women and 9629 men aged 50 years or more were included in the study. Subjects above age 50 were only excluded if there were missing data ($n = 93$) or if they had participated in more than one study ($n = 137$), in which case they were excluded from the cohort to which they contributed the shortest observation time.

In all three population studies the subjects completed a self-administered questionnaire concerning health-related issues including drinking and smoking habits, as well as duration of school education, and the answers were checked by the staff during the examination.

Alcohol intake

All participants were asked in multiple-choice format about the average number of drinks consumed per week. One beverage contains between 9–13 g of alcohol. The subjects were classified according to the total weekly alcohol intake of <1, 1–6, 7–13, 14–27, 28–41, 42–69 or ≥70 beverages per week.

Smoking habits

The subjects reported if they were never-smokers, ex-smokers or current smokers. Current smokers were categorized according to the amount of tobacco smoked per day. For the analysis, five groups were defined: never-smokers, ex-smokers and smokers of 1–14 g, 15–24 g or >25 g per day.

School education

The subjects were asked to categorize themselves according to duration of school education (<8 years, 8–10 years or >10 years).

Table 2. Alcohol consumption by sex, age and outcome

Alcohol intake (drinks per week)	No. (and %) of subjects, by sex and age							
	Men				Women			
	50–64 years		>64 years		50–64 years		>64 years	
	Subjects	Deaths	Subjects	Deaths	Subjects	Deaths	Subjects	Deaths
<1	686	222 (32.4)	447	252 (56.4)	1841	464 (25.2)	921	539 (58.5)
1–6	1359	373 (26.7)	586	337 (57.5)	2108	434 (20.7)	535	252 (47.1)
7–13	1424	385 (27.0)	615	345 (56.1)	669	130 (19.4)	197	112 (56.9)
14–27	1910	438 (22.9)	792	405 (51.1)	382	84 (22.0)	90	48 (53.3)
28–41	756	256 (33.9)	228	117 (51.3)	59	17 (28.8)	6	5 (83.3)
42–69	416	161 (38.7)	118	64 (54.2)	22	8 (36.4)	4	0 (0)
>69	110	62 (56.4)	17	14 (82.4)	6	0 (0)	0	0 (0)
Total	6661	1897 (28.5)	2803	1534 (54.7)	5087	1137 (22.4)	1753	956 (54.5)

Body mass index

The participants had their height and weight in light clothes measured. Body mass index was calculated as weight divided by height squared (kg/m^2).

The survival status of the population samples was followed until 9 January 1995, using the unique person identification number in the national central person register. The observation time for each participant was the period from the initial examination until 9 January 1995 or until death, disappearance or emigration during the observation period. The mean follow-up time for each cohort is shown in Table 1. The total observation time was 186 785 years.

Statistical analysis

The data were analysed by means of Cox regression analysis in SPSS Win 6.1.

The first series of models included age, gender, and alcohol intake. A second series of models included age, gender, alcohol intake and either body mass index, school education or smoking. The final model included all six factors.

Finally, the mortality rate ratios were estimated, after stratification on the two age groups: middle-aged (50–64 years) and elderly (older than 64 years).

Results

In all the cohorts of The Copenhagen Centre for Prospective Population Studies men reported drinking more than women. Apart from a lower average intake among elderly compared with the middle-aged subjects, alcohol intake among men and women had a similar pattern of distribution in the two age groups. In the whole population under study, 40.5% of the women and 12.0% of the men were abstainers (defined as having an alcohol intake of <1 drink per week). Only a small fraction (0.5%) of the women, but 7.0% of the men, had an intake of >41 drinks per week (Table 2). Among the elderly population there was a larger fraction of abstaining women (52.5%) and of abstaining men (15.9%) than in the sample as a whole.

Of the 16 304 subjects aged 50 years or more, 5524 died during follow-up. Separate analyses revealed U-shaped relations between alcohol intake and mortality in all the cohorts. In the pooled analysis, abstainers (<1 drink per week) had an increased mortality risk of 1.27 (95% confidence limits 1.17–1.37), compared with those who drank 1–6 drinks per week. The risk function increased steadily from 1.00 among light drinkers to reach 1.91 (95% confidence limits 1.51–2.42) among those who drank >69 drinks per week (Figure 1).

The population was divided into middle-aged and elderly, and we found identical U-shaped risk functions

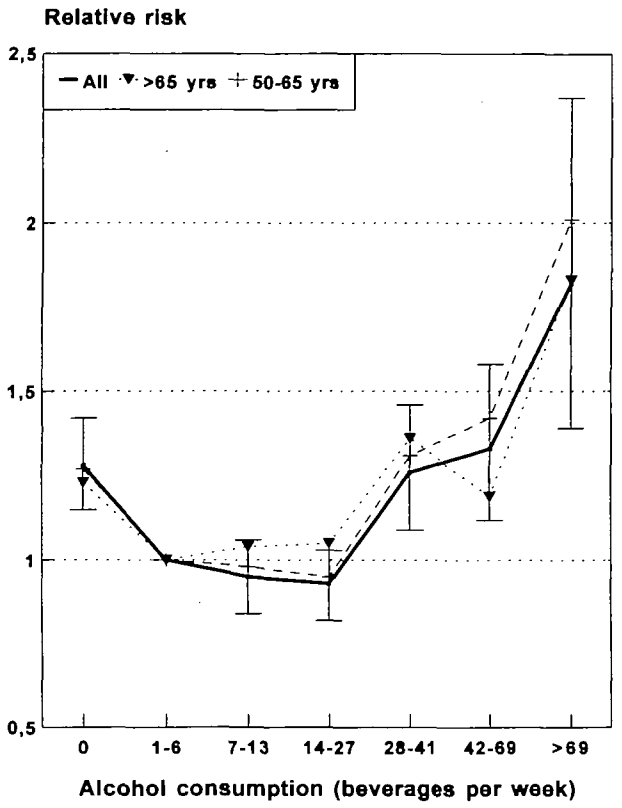

Figure 1. Relative risk of mortality in relation to alcohol intake for middle-aged (—) and elderly (.....) people. Risk was set at 1.00 at lowest mortality at 1-6 beverages per week. Vertical lines are 95% confidence intervals for points depicting estimates for all subjects.

in the two groups (Figure 1). Middle-aged abstainers had an increased risk of 1.28 (95% confidence limits 1.15-1.42) and elderly abstainers had an increased risk of 1.25 (95% confidence limits 1.12-1.40) compared with light drinkers.

No interaction between alcohol intake and gender was found. This was confirmed by an analysis of the data stratified on gender, in which two U-shaped risk functions appeared (data not shown). Thus, abstaining women had an increased risk of 1.29 (95% confidence limits 1.17-1.43) compared with light drinkers, while the risk was 1.22 (95% confidence limits 1.08-1.38) among men. Both women and men with a high alcohol intake had an increased risk of dying. Women who drank ≥28 drinks per week had an increased risk of 1.23 (95% confidence limits 0.85-1.78) compared with light drinkers. Men who drank >69 drinks per week had a risk of 2.11 (95% confidence limits 1.66-2.69).

The above mentioned analyses were all controlled for the chosen co-variates. Adjustment for age, sex, body mass index, level of education and smoking habits did not significantly alter the estimates.

Discussion

We found a uniform pattern of U-shaped curves for alcohol intake and mortality in both middle-aged and elderly subjects.

Many clinical and epidemiological studies have found evidence supporting that light to moderate alcohol intake, perhaps by various intermediate factors, reduces the risk of cardiovascular disease [18, 19]. Mean serum high-density lipoprotein concentration is higher among light drinkers than among abstainers, [20, 21] and alcohol has been shown to decrease platelet aggregation [22-24].

The relation between alcohol intake and all-cause mortality has been assessed in numerous prospective population studies from different countries. The incidence of various causes of deaths differs from age group to age group. Thus, in women, the proportion of deaths that are due to breast cancer decreases after middle-age while the relative frequency of death from cardiovascular disease increases. The question of a specific effect-modification by age has only sparsely been addressed. Fuchs *et al.* [3] found that the beneficial effect of a light alcohol intake was higher among elderly than among younger women.

The Copenhagen Centre for Prospective Population Studies comprises cohorts examined at different points in time. This means that the subjects have been questioned about their alcohol intake over a period during which both the availability and acceptability of alcohol in Denmark has changed. It further implies large differences in mean observation time cohort to cohort (Table 1). Our finding that the U-shaped relation between alcohol intake and mortality remained among elderly people of different time periods, indicates that the risk function is stable and independent of these factors.

Our findings are consistent with those of Scherr *et al.*, who described a U-shaped relation between alcohol and mortality among subjects aged 65 or older [11]. The descending leg of the U-shaped risk function has been attributed to higher mortality from coronary heart disease among abstainers than among moderate drinkers. In a small cohort, Colditz *et al.* found that there was a beneficial effect on risk of coronary heart disease from a light alcohol intake in elderly people [13].

The U-shaped relation between alcohol and mortality persists in old age, and may have public health implications. Firstly, the motivation for drinking rather than not drinking may differ between younger and elderly people. Secondly, the risk of inducing addiction in a population of older people may be smaller. On the other hand, one should not exaggerate the benefits of an increase in alcohol intake amongst elderly subjects, particularly those who abstain. Falls are more frequent among those who drink alcohol than among those who do not [25].

Our results may be a consequence of previous

alcohol habits over a longer period of time, and do not imply that it is advisable to encourage elderly people to drink moderately. This type of evidence would require measurements of the alcohol habits at more than one point in time.

In conclusion, a light to moderate alcohol intake in older as well as middle aged people is predictive of a reduction in mortality from all causes compared with those who abstain or drink heavily.

Key points

- The relationship between alcohol intake and all-cause mortality has been shown to be U- or J-shaped.
- In a pooled analysis from several large cohorts from Copenhagen, a uniform pattern of U-shaped relations between alcohol intake and all-cause mortality was found among middle-aged and elderly men and women.

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