ALCOHOL CONSUMPTION IN RELATION TO FACTORS ASSOCIATED WITH ISCHEMIC HEART DISEASE

A Cotwin Control Study

MARTEN MYRHED, BIRGITTA FLODERUS

Department of Medicine, Serafimer Hospital, and Department of Environmental Hygiene, Karolinska Institute, Stockholm, Sweden

Moderately alcohol-discordant male twin pairs, aged 45-65 years, have been examined with respect to ischemic heart disease (IHD) and associated factors. No conclusion can yet be drawn with regard to manifest or subclinical IHD, while significant disparities were found with regard to systolic and diastolic blood pressures, high cigarette consumption, hyperglycemia, and serum cholesterol; the greater number of findings of pathological values were found in the high alcohol-consumption as compared to the low alcohol-consumption cotwins. These findings offer a possible explanation for the increased number of reports showing a connection between high consumption of alcohol and occurrence of ischemic heart disease.

An association between excessive consumption of alcohol and ischemic heart disease (IHD) has been indicated by a growing number of studies during the last years (Sundby 1967, Schmidt and de Lint 1972, Pell and D'Alonzo 1973, Wilhelmsen et al. 1973, Myrhed 1974). Earlier research has shown the role of a genetic factor in the development of IHD (Russek and Zohman 1958, Thomas 1958 and 1959, Rose 1964, Epstein 1964 and 1965, Lundman 1973). A study of alcohol-discordant twin pairs, hence, would seem to be of interest because of the possibilities to minimize the influence of genetic factors. The primary aim of the investigation at hand has been to find out the relation between alcohol consumption and IHD by concentrating upon an examination of factors which usually are considered to precede manifest disease. The individual questions posed can be expressed as follows:

1*a*. Is long-standing alcohol consumption associated with elevated blood pressure?

1*b*. Is alcohol consumption connected with a heavy consumption of tobacco and impaired lung function?

1*c*. Is the consumption of alcohol of importance for carbohydrate metabolism, glucose tolerance test, and uric acid level?

1*d*. Is long-standing consumption of alcohol associated with atherogenic lipid metabolism and lipid profile?

2. Is there a relationship between alcohol consumption and manifest IHD in living alcohol-discordant twins, based on a case history, cardiovascular status and ECG at rest and during work?

The group investigated was selected from the Swedish Twin Registry (Cederlöf 1966, Cederlöf et al. 1970, Myrhed 1974). This registry was set up during the years 1959-1961 and contains in principle 90% of all same-sexed twin pairs born in Sweden during the years 1886-1925.

The registry includes about 10,000 twin pairs, of which about 4,300 pairs are male (Fig. 1). By means of a questionnaire study in 1967, information on alcohol consumption and alcohol behavior was obtained for the twin population, from which 93 male pairs in the age range 45-65 years could be selected as being discordant with respect to alcohol. A total of 70 pairs, 14 MZ and 56 DZ, have been examined at Serafimer Hospital in Stockholm. Since the same tendencies have been found for all pairs, regardless of zygosity, pooled results will

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be presented. Fig. 2 shows the criterium for discordance, i.e., the difference in consumption of alcohol required within the twin pairs at hand. The criteria have been >10,000 vs. < 2,000 g of absolute alcohol/year. These calculations are based on the figures: 1 bottle of beer = 12 g, 1 bottle of light wine = 60 g, and 1 bottle of strong spirits = 250 g of absolute alcohol. At the bottom of Fig. 2 two hypothetical examples are shown of what differences in consumption can occur within the pairs. Within the first pair, the alcohol-positive member, here termed the high consumer, consumes 2 bottles of strong spirits per month and a bottle of beer every day. With this consumption he reaches a little under 1,000 g absolute alcohol per month. The brother in this case abstains totally from alcohol. In the other example, the high consumer drinks 3 bottles of beer per day while the low-consuming brother is allowed ½ bottle of strong spirits per month.

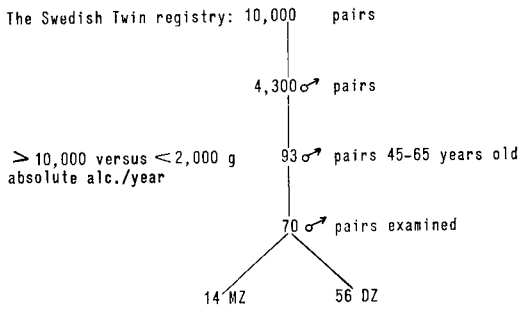
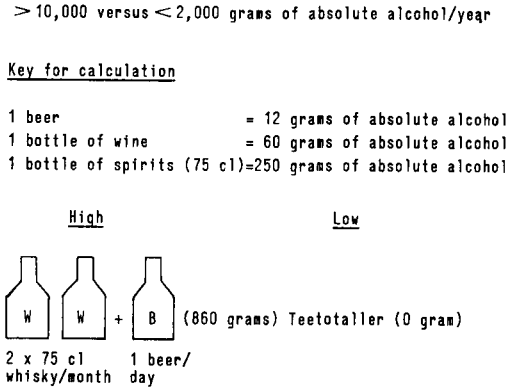


Fig. 1. Selection of alcohol-discordant twins.



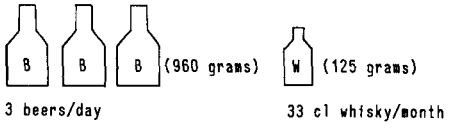


Fig. 2. Criteria for alcohol discordance.

Fig. 3 depicts the blood pressure variables. The statistical calculation is based upon an intrapair analysis and the statistical method used is the paired t test. To depict the results, a blood pressure limit of $\geq$ 140 mm Hg (casual systolic blood pressure) has been chosen; 89% of the high consumers have values over this boundary. The corresponding figure for the low consumers is 66% ($p < 0.01$). If the same procedure is used for casual diastolic blood pressure $\geq$ 95 mm Hg, 54% of the high consumers have values above the boundary while the corresponding value for the low consumers is 34%. The differences are statistically significant when intrapair analysis is made ($p < 0.001$). Smoking in relation to alcohol consumption is shown in Fig. 4. No differences can be found regarding present smokers; 66% of the high consumers compared with 58% of the low consumers were present smokers. When smoking habits were evaluated quantitatively, it came forth that 56% of the high consumers smoked $\geq$ 5 cigarettes daily as opposed to 30% of the low consumers ($p < 0.01$). Moreover, it is interesting to note that 3 times as many of the low consumers smoke only a pipe and/or cigars compared with high consumers ($p < 0.025$).

The next variables to be presented are the fasting blood glucose and the intravenous glucose tolerance test (k-value). The 70 pairs of twins have been analyzed with regard to fasting blood glucose upon which significant differences were found, the high consumers having a higher glucose level than the respective low-consuming twins. To illustrate the differences, the number of twins within the respective groups who showed over 100 mg % is indicated in Fig. 5; 11 of the high consumers (16%) vs. 1 of the low consumers (1%) fulfilled this criterium ($p < 0.025$). Pathologic or borderline k-values (< 1.11) were found for 53% of the high consumers vs. 27% of the low consumers ($p < 0.025$).

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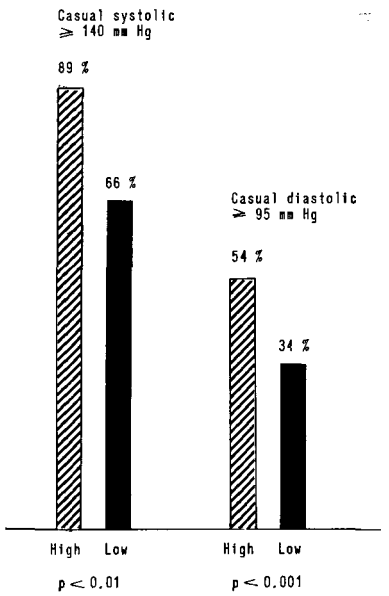

Fig. 3. Blood pressure in relation to alcohol comsumpion (MZ + DZ = 70 pairs).

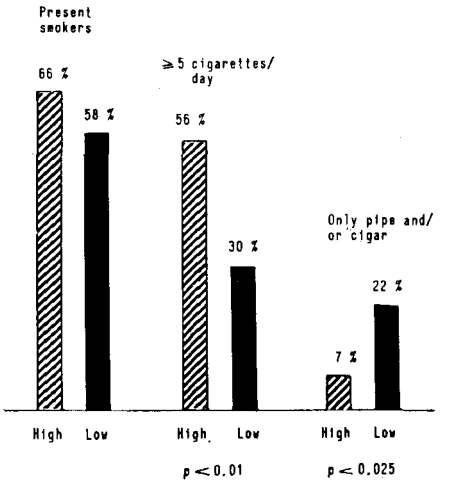

Fig. 4. Smoking in relation to alcohol consumption (MZ + DZ = 70 pairs).

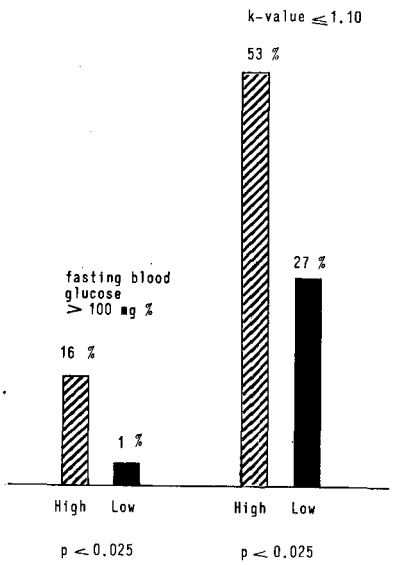

Fig. 5. Fasting blood glucose > 100% and k—value < 1.10 in relation to alcohol consumption (MZ + DZ = 70 pairs).

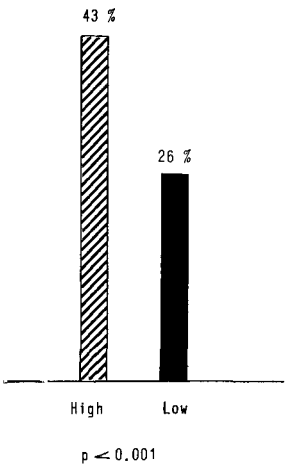

Fig. 6. Uric acid ≥ 6 mg % in relation to alcohol consumption (MZ + DZ = 70 pairs).

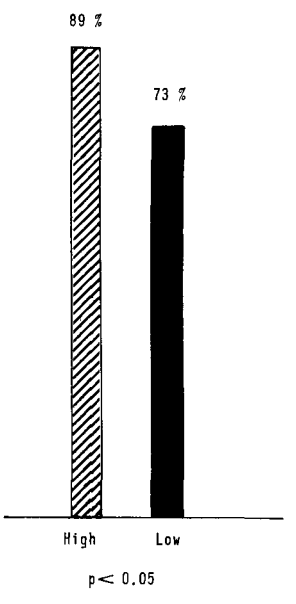

Fig. 7. Serum cholesterol > 200 mg % in relation to alcohol consumption (MZ + DZ = 70 pairs).

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Uric acid, which according to many epidemiological researchers is a part of the coronary profile, has also been studied. Here too, the statistical calculation is based on intrapair analysis and significant differences can be shown between the groups. If the limit for hyperuricemia is set at 6 mg % (Fig. 6), 43% of the high consumers show a value over this limit in contrast to 26% of the low consumers ($p < 0.001$).

No differences were found with regard to cholesterol, triglycerides, or lipid electrophoresis, when intrapair analyses were performed. However, a significantly higher number of the high consumers did have a cholesterol value exceeding 200 mg % (Fig. 7). The percentage figures for high vs. low consumers in this case were 89% and 73%, respectively ($p < 0.05$).

No differences could be found with regard to occurrence of myocardial infarction, angina pectoris or ST-segment, in which cases the ECG was evaluated blindly, according to the Minnesota Code (Blackburn et al. 1960), at rest and at maximum work. Thus, no differences could be demonstrated between the high- and low-alcohol consumers with regard to manifest or subclinical IHD. This may be explained by the small size of the sample, by genetic factors, and by the methods available for the detection of IHD being comparatively crude for intrapair comparison. Another possible explanation is the low mean age of the sample; the twins examined might still be too young to have developed IHD. Therefore a follow-up of the present subject group will be performed.

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M. Myrhed, M.D., Department of Clinical Alcohol and Drug Research, Karolinska Hospital, S-104 01 Stockholm 60, Sweden.