Alcohol Intake and Subjective Health

Kari Poikolainen, Erkki Vartiainen, and Heikki J. Korhonen

This cross-sectional analysis examined associations between alcohol intake and subjective health in a random sample (n = 6,040) drawn from the general population aged 25–64 years in Finland in 1992. Self-reported health was good for 3,375 persons and average or poor (suboptimal) for 2,665 persons. Crude odds ratios suggested a U-shaped pattern between alcohol intake and suboptimal health. The pattern took more of a J-shape after data were controlled for sex, age, education, marital status, lack of close friends, being on a disability pension, smoking, being an ex-drinker, and having decreased one’s alcohol intake during the past 12 months because of health problems. An interaction was found between alcohol and smoking. The pattern of alcohol odds ratios showed a J-shaped association among never smokers, and a similar pattern was suggested among ex-smokers and current smokers. Among never smokers, the lowest risk was found at the alcohol consumption level of 100–199 g/week (odds ratio (OR) = 0.58, 95% confidence interval (CI) 0.38–0.89). The highest risk was found among persons who regularly smoked ≥20 cigarettes per day and drank ≥300 g/week (OR = 4.44, 95% CI 2.36–8.36). The risk for ex-drinkers did not differ from that for lifelong abstainers (OR = 0.89, 95% CI 0.62–1.28), but persons who had decreased their alcohol intake during the past 12 months because of health problems had a higher risk (OR = 1.21, 95% CI 1.05–1.39). The authors conclude that moderate alcohol intake is related to a self-perception of good health. Am J Epidemiol 1996;144:346–50.

While alcohol drinking is known to have many adverse effects, some patterns of intake have also been observed to improve certain health-related outcomes. To obtain a balanced view of the effects of alcohol on health, global outcome measures should be studied. Total mortality is such a measure, and it has already been widely studied, as witnessed by a recent review (1) and new original work (2–5). Less is known about morbidity and health, partly because unequivocal global measures are difficult to find for these more proximate outcomes.

One simple but useful global measure is subjective evaluation of general health. Self-assessed health has been found to correlate strongly with other direct or indirect measures of health (6), such as the prevalence of health-related functional disability (7) and scores on extensive global health scales like the Sickness Impact Profile (8) and various subscales of the Short Form 36 Health Survey Questionnaire (9). Since the determinants of excellent health are largely the same as those for ill health (10) and the negative end of the health spectrum has traditionally been the focus of scientific investigation, we studied suboptimal (average or poor) subjective health in relation to alcohol intake in a cross-sectional sample that was representative of the general population.

In an earlier cross-sectional study, subjective health was found to be positively associated with alcohol intake (10), but as the authors noted, this might have been due to selective processes. Heavy drinkers might eventually become abstainers or light drinkers because of worsening health. Studies of total mortality (5, 11) and coronary heart disease hospitalizations (12) suggest that such selection partly explains the high death rate among abstainers. To avoid this bias, in our analysis we distinguished between lifelong abstainers, ex-drinkers, and persons who reported having decreased their alcohol intake during the previous 12 months because of health problems.

MATERIALS AND METHODS

In 1992, a self-administered questionnaire was mailed to a random sample of persons drawn from the general population aged 25–64 years in three areas in Finland. These areas were a region in southwestern Finland, the province of Kuopio, and the province of North Karelia. The participation rate was 76 percent. Sampling procedures and measurements have been described elsewhere in detail (13). Because of missing
data on several variables, 11 subjects were excluded from the analyses. We included four cases with missing data on smoking only, assuming that they were never smokers. The number of cases analyzed was 6,040.

Participants were asked, "How do you find your state of health at present?" Those who responded "rather good" or "very good" were considered to be in good health, and those who responded "average," "rather poor," or "very poor" were considered to be in suboptimal health.

Alcohol intake was assessed by asking about the usual frequency and amount of consumption of beer, wine, and spirits during the 12 months before the survey. Earlier studies have shown that in populations where alcohol intake varies over time, this approach provides more reliable estimates of long-term intake than relying on shorter recall periods (14, 15). Estimates of mean alcohol intake were based on the following amounts of alcohol: 4.8 percent for beer, 14.5 percent for wine, and 37.0 percent for spirits. These figures were based on the average amounts of alcohol in various types of beverages sold by the government alcohol agency in Finland. Lifelong abstainers were persons who reported consuming no alcohol during their lifetimes. Those who had abstained for the previous year or more were defined as ex-drinkers.

The subjects returned their questionnaires when they appeared for a medical examination. Blood was drawn from the antecubital vein for measurement of gamma-glutamyltransferase (GGT). Blood samples were not obtained for 41 subjects. To evaluate the accuracy of our alcohol intake data, we compared the former levels with the measured serum activity of GGT. We controlled for body mass index (weight (kg)/height\(^2\) (m\(^2\)), which is known to be associated with GGT levels (16), and used logarithmically transformed data because of the skewness of the distributions. The partial correlation coefficient between alcohol intake and GGT, controlling for body mass index, was 0.29 (95 percent confidence interval 0.26-0.30; \(n = 5,982\)).

**RESULTS**

Subjects were grouped into lifelong abstainers, ex-drinkers, and current drinkers, with five categories of average weekly alcohol intake. Prevalences of these factors and potential confounders are shown in table 1. Crude and adjusted estimated odds ratios for the categories of average weekly alcohol intake are shown in table 2. We controlled for the following factors as dichotomous variables (categorized as in table 1) in logistic regression analysis: age, sex, years of education, marital status, a lack of close friends, being on a disability pension, smoking, being an ex-drinker, and reporting a decrease in alcohol intake during the past 12 months because of health problems. After we controlled for these factors, the relation of alcohol intake to self-reported lack of good health was found to resemble the letter J. Compared with abstainers, moderate drinkers were, on average, more often in good health, and heavy drinkers were more often in poor or average health. The lowest risk of subjective suboptimal health was found at an alcohol consumption level of 40-99 g/week, and the highest risk was seen among those reporting an intake of 300 g/week or more.

<table>
<thead>
<tr>
<th>TABLE 1. Characteristics (%) of 6,040 persons with good or suboptimal subjective health, Finland, 1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
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<tr>
<td>----------------</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>25-34</td>
</tr>
<tr>
<td>35-44</td>
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<tr>
<td>45-64</td>
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<tr>
<td>55-64</td>
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<tr>
<td>Education (years)</td>
</tr>
<tr>
<td>0-8</td>
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<td>9-10</td>
</tr>
<tr>
<td>£11</td>
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<tr>
<td>Marital status</td>
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<tr>
<td>Single</td>
</tr>
<tr>
<td>Married</td>
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<tr>
<td>Divorced</td>
</tr>
<tr>
<td>Widowed</td>
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<tr>
<td>Lacking close friends</td>
</tr>
<tr>
<td>On disability pension</td>
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<tr>
<td>Alcohol intake (g/week)</td>
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<tr>
<td>0</td>
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<tr>
<td>£39</td>
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<tr>
<td>40-69</td>
</tr>
<tr>
<td>100-189</td>
</tr>
<tr>
<td>200-299</td>
</tr>
<tr>
<td>£300</td>
</tr>
<tr>
<td>Ex-drinker</td>
</tr>
<tr>
<td>Decreased alcohol intake in the previous 12 months due to health problems</td>
</tr>
<tr>
<td>Cigarette smoking*</td>
</tr>
<tr>
<td>Regular/heavy smoker†</td>
</tr>
<tr>
<td>Irregular/light smoker</td>
</tr>
<tr>
<td>Ex-smoker</td>
</tr>
<tr>
<td>Never smoker</td>
</tr>
<tr>
<td>No. of cases</td>
</tr>
</tbody>
</table>

* No. of cases with good health, 3,371.
† £20 cigarettes per day.
TABLE 2. Odds ratios for suboptimal subjective health in 6,040 persons, according to average weekly alcohol intake, Finland, 1992

<table>
<thead>
<tr>
<th>Alcohol Intake (g/week)</th>
<th>Crude OR*</th>
<th>95% CI*</th>
<th>Adjusted† OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0.6-0.8</td>
<td>0.9</td>
<td>0.7-1.1</td>
</tr>
<tr>
<td>≥39</td>
<td>0.6</td>
<td>0.4-0.7</td>
<td>0.7</td>
<td>0.6-1.0</td>
</tr>
<tr>
<td>40-99</td>
<td>0.5</td>
<td>0.4-0.7</td>
<td>0.8</td>
<td>0.6-1.1</td>
</tr>
<tr>
<td>100-199</td>
<td>0.7</td>
<td>0.5-0.8</td>
<td>1.0</td>
<td>0.7-1.5</td>
</tr>
<tr>
<td>200-299</td>
<td>0.7</td>
<td>0.6-1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥300</td>
<td>1.1</td>
<td>1.0</td>
<td>1.7</td>
<td>1.1-2.5</td>
</tr>
</tbody>
</table>

* OR, odds ratio; CI, confidence interval.
† Adjusted for age, sex, years of education, marital status, lack of friends, disability pension, smoking, being an ex-drinker, and reporting a decrease in alcohol intake during the past 12 months due to health problems.

Interactions

Interactions were studied by introducing alcohol intake, its square, number of cigarettes smoked daily, age, and years of education as continuous variables and the other aforementioned factors as categorical variables into logistic models. The interaction between alcohol and education was not significant. The same was true for alcohol and sex. However, the interaction between alcohol and smoking was significant ($p < 0.05$). Therefore, the model was reparameterized for analysis of the two interacting exposures, alcohol and smoking. The pattern of odds ratios showed a J-shaped association between alcohol and suboptimal health among never smokers, and a similar pattern was suggested among ex-smokers and current smokers (table 3). In the subgroup of never smokers, significantly lower odds ratios were found among persons who consumed less than 200 g/week than among lifelong abstainers. A significantly increased odds ratio was found among persons who regularly smoked 20 or more cigarettes daily and drank 300 g/week or more of alcohol.

At almost all drinking levels, the odds ratios increased according to the level of smoking.

In full models that included interactions, the risk for ex-drinkers did not differ from that for lifelong abstainers (odds ratio = 0.89, 95 percent confidence interval 0.62-1.28), but those who had decreased their alcohol intake during the past 12 months because of health problems had a higher risk (odds ratio = 1.21, 95 percent confidence interval 1.05-1.39). Similar but slightly diluted differences were found when poor health was used alone as the outcome variable instead of poor or average health.

DISCUSSION

In this cross-sectional study, we found that the pattern of odds ratios showed a J-shaped association between alcohol intake and subjective suboptimal health among never smokers, and a similar pattern was suggested for ex-smokers and current smokers. In the never smokers, significantly lower odds ratios were found among persons who consumed less than 200 g of alcohol per week in comparison with lifelong abstainers. A significantly increased odds ratio was found among persons who regularly smoked 20 or more cigarettes daily and drank 300 g/week or more of alcohol.

While self-reports of alcohol intake are not fully reliable and tend to underestimate actual intake (17-20), these reports are reasonably accurate for studying the relations between alcohol and general health. In our data, the correlation between self-reported alcohol intake and the serum activity of GGT, an enzyme

TABLE 3. Adjusted* odds ratios for suboptimal subjective health in 6,040 persons, according to cigarette smoking and average weekly alcohol intake, Finland, 1992

<table>
<thead>
<tr>
<th>Alcohol Intake (g/week)</th>
<th>Never smokers</th>
<th>Ex-smokers</th>
<th>Irregular and light smokers</th>
<th>Regular and heavy smokers (≥20 cigarettes per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR†</td>
<td>95% CI†</td>
<td>OR†</td>
<td>95% CI†</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0.9-1.1</td>
<td>1.0</td>
<td>0.8-1.2</td>
</tr>
<tr>
<td>≤39</td>
<td>0.6</td>
<td>0.4-0.7</td>
<td>0.8</td>
<td>0.6-1.0</td>
</tr>
<tr>
<td>40-99</td>
<td>0.6</td>
<td>0.4-0.7</td>
<td>0.8</td>
<td>0.6-1.0</td>
</tr>
<tr>
<td>100-199</td>
<td>0.5</td>
<td>0.3-0.7</td>
<td>1.0</td>
<td>0.8-1.3</td>
</tr>
<tr>
<td>200-299</td>
<td>0.4</td>
<td>0.3-0.7</td>
<td>1.1</td>
<td>0.9-1.5</td>
</tr>
<tr>
<td>≥300</td>
<td>1.2</td>
<td>1.0-1.6</td>
<td>1.6</td>
<td>1.3-2.0</td>
</tr>
</tbody>
</table>

* Adjusted for age, sex, years of education, marital status, lack of friends, disability pension, being an ex-drinker, and reporting a decrease in alcohol intake during the past 12 months due to health problems.
† OR, odds ratio; CI, confidence interval.
widely used as a biologic marker of alcohol consump-
tion, was similar to that previously found between 
alcohol intake, as measured by extensive prospective 
diary, and a marker index combining GGT, mean cell 
volume, high density lipoprotein cholesterol, and al-
kaline phosphatase in a group of motivated male vol-
unteers (21). The former correlation coefficient was 
0.29, and the latter was 0.30. The consistency of these 
coefficients suggests that the accuracy of self-reported 
alcohol intake in the present data was acceptable, even 
if the magnitude of the correlation between alcohol 
intake and its biologic marker depends on the variance 
of alcohol intake and the number of heavy drinkers in 
the data, as well as the extent to which other factors 
influencing the marker have been controlled for. A 
comparison of retrospectively versus prospectively ob-
tained information on alcohol and cigarette usage has 
shown that information bias is unlikely to have much 
impact on effect estimates based on retrospective 
information (22). Moreover, the presence of serious 
disease does not seem to bias the relation between 
disease and self-reported alcohol intake (23). We 
therefore believe that our findings on alcohol and 
subjective health closely approximate the actual rela-
tion.

Self-estimates of health are essentially subjective 
and are valid as such. Moreover, they have two useful 
features. First, their test-retest reliability is good (10). 
Second, several cohort studies have found that subjec-
tive health is a strong predictor of mortality (24–27).

However, there is no definitive measure of general 
health, and estimates of subjective health are likely to 
miss asymptomatic diseases. Thus, our results must be 
considered together with those of studies that have 
used other types of health outcome measures.

Our results are in line with those of most studies of 
hospital admissions and leaves of absence due to ill-
ness. First, the US National Health Interview Survey 
found that, compared with lifelong abstainers, moder-
ate drinkers had had fewer admissions to acute-care 
hospitals during the year before the survey, and their 
length of stay was shorter (28). Moreover, the propor-
tion of subjects who had been functionally disabled in 
various health-related ways 2 weeks prior to interview 
was higher among former drinkers than among life-
long abstainers (7). Second, in a California Kaiser 
Permanente cohort for which total number of days 
spent in the hospital during follow-up was the outcome 
measure and in which adjustments were made for age, 
smoking, and months of observation, moderate drink-
ers who consumed approximately 170 g/week or less 
had fewer hospital days than lifelong abstainers (29). 
Overall, the relation was either U-shaped or J-shaped 
in the four race/sex groups studied. Third, a study 
conducted by the UK Home Office found that Exec-
utive Officers who reported consuming 240–270 
g/week or more (≥30 British units) during a 1-week 
call period had significantly higher numbers of both 
leaves of absence and sick days than those who drank 
less (30). Fourth, the Whitehall Study, after adjust-
ment for age and employment grade, found the lowest 
rates of sick leave among males who had consumed 
approximately 90–130 g/week and among females 
who had consumed 90 g/week or less during the pre-
vious 12 months; both nondrinkers and heavier drink-
ers had higher rates (31). Fifth, a cross-sectional in-
terview of US adults aged 60 years or more found 
fewer physician visits among heavier drinkers than 
among light or moderate drinkers (32). These results 
are not as consistent as those of the other studies; 
however, the subjects were older, and the cutoff point 
for heavier drinking was as low as two or more drinks 
per day.

There is some evidence suggesting that weaker so-
cial networks among abstainers and heavy drinkers 
than among moderate drinkers might confound the 
J-shaped association between alcohol and mortality 
(33). However, in our study, controlling for a lack of 
close friends did not make any notable difference in 
the results.

If some health problems caused certain subjects to 
abstain from alcohol for a lifetime, the suboptimal 
subjective health among abstainers would be due to 
selection rather than to the positive effects of moderate 
drinking. Such selection should operate early in life. 
Some mental disorders might have this effect. Unfor-
unately, we did not have any information on partici-
pants’ reasons for abstaining from alcohol. The main 
reasons given for being a lifelong abstainer in the US 
National Health Interview Survey were: not caring for 
alcohol or disliking it (47 percent), having religious or 
moral objections (17 percent), feeling no need to drink 
or thinking that it was not necessary (16 percent), and 
having been brought up not to drink (7 percent) (28). 
Only 5 percent mentioned medical or health reasons. 
The main reasons given do not suggest any deviation 
from the general population that might bias compari-
sions. Another possible bias might result from moder-
ate drinkers’ distortedly perceiving their health to be 
better than that of abstainers and heavy drinkers. We 
did not have any information on this.

Cross-sectional studies do not permit any firm con-
clusions regarding causality. However, we were able 
to control for one major selection bias in these studies: 
the existence of former drinkers among current ab-
stainers. Distinction was made between lifelong ab-
stainers, ex-drinkers, and those who reported having 
decreased their alcohol intake during the past 12
months because of health problems. To our knowledge, only three earlier global morbidity studies have analyzed lifelong abstainers separately (7, 28, 29), and one considered reductions in alcohol intake over the past 5 years (31), but none of them controlled simultaneously for lifelong abstinence, ex-drinking, and decreases in alcohol intake due to health problems. In contrast to the aforementioned morbidity studies, we also analyzed interactions between alcohol and smoking. Our analysis strengthens the suggestion that moderate alcohol intake is beneficial and heavy intake is detrimental to health in general, while smoking is always harmful. Moderate alcohol intake is related to a self-perception of good health.

REFERENCES