

### **The latest trends in Swedish women's alcohol habits - what do they buy, what do they drink and how do they drink?**

**Ylva Arnhof**

Available data show a clear tendency to an increased consumption of alcohol among women during the post-war period. Both the consumption surveys and the sales statistics indicate a decrease in the early 1980's and an increase to a maximum in 1989, followed by a decreasing trend. Between 1994 and 1996, there has been no change in the alcohol consumption among girls.

It is mainly the young women who are responsible for the raise in consumption, but the tendency remains the same in all ages. The development has been different depending on types of beverages. The percentage of beer-consumers has increased very little while the percentage of wine-consumers increased relatively much. The share of women consuming spirits also increased. Illegal spirit is mostly consumed by young women.

Girls seem to have a more severe opinion on alcohol compared to boys.

Slightly more than one third of the girls consider alcohol as one of our most important public health problems.

In making an international comparison of drunkenness among students, the experiences of drunkenness was highest in the northern parts of Europe. In the southern and southeastern parts of Europe there were generally more boys than girls who got drunk, but there were very small differences between the sexes in the northern parts.

### **Is the Female Body More Sensitive to Alcohol than the Male Body?**

**A.W. Jones, PhD, DSc.**

After drinking beer, wine, or spirits, the alcohol (ethanol) present in these beverages mixes with the total body water without binding to plasma proteins and solubility of ethanol in fat and bone is negligible. How fast alcohol enters the bloodstream depends on many variables. Alcohol can be absorbed through the stomach and also from the small intestine where the rate of absorption is faster owing to the larger surface area in the duodenum. Alcohol in beer and wine tends to be absorbed more slowly than alcohol contained in whisky and vodka, not only because of the lower concentrations present but also the fact that malt beverages and wines contain sugars as well as other constituents. Eating a meal during or before drinking slows the absorption of alcohol because the food in the stomach delays gastric emptying and the resulting blood-alcohol concentration will be appreciably less compared with taking the same dose of alcohol on an empty stomach. Hyperglycaemia slows and hypoglycaemia accelerates gastric emptying, which means that the time of day when drinks are taken, and factors influencing blood-glucose level, e.g. eating low-carbohydrate diets, pregnancy, and diabetes, are important for the absorption kinetics of alcohol. The age, menstrual cycle, and menopause in women are associated with hormonal changes that tend to influence gastric emptying. Commonly used medication (Aspirin, Tagamet) and oral contraceptive steroids can alter gastrointestinal motility and the absorption rate of ethanol. Smoking cigarettes has been shown to delay the opening of the pylorus sphincter thereby slowing the absorption of alcohol into the portal blood. A host of environmental and gender-related factors are involved with gastric emptying, and these in turn impact on the peak blood-alcohol concentration (BAC) reached and the impairment effects caused by a given dose of alcohol.

A person's BAC depends not only on the absorption processes but also on body weight and particularly the ratio of muscle to fatty tissue. More fat per kg body weight results in a higher BAC for a given dose of alcohol because leaner individuals have more body water into which the alcohol can be distributed. Since women tend to be smaller than men and have proportionally more fatty tissue and less body water, a given amount of alcohol will result in a higher BAC and a correspondingly greater intoxicating effect.

Once absorbed from the gut, alcohol is transported to the liver by the portal blood where enzymes begin to oxidize the alcohol thereby clearing it from the bloodstream. The principal alcohol-metabolizing enzyme is alcohol dehydrogenase (ADH) which converts ethanol into a toxic metabolite acetaldehyde, which fortunately is swiftly transformed into acetate by another hepatic enzyme known as aldehyde dehydrogenase (ALDH). Both these enzymes display racial and genetic variations and a multitude of isoenzymes exist with characteristic substrate specificity,  $K_m$  and  $V_{max}$  values and different intrinsic activity. Animal studies have shown that ADH activity is higher in the liver when low concentrations of testosterone circulate in the blood, which suggests that women may burn-off alcohol faster than men to produce higher concentrations of the toxic acetaldehyde. The higher sensitivity of Asian populations to alcohol stems from a raised level of acetaldehyde owing to a defective form of the mitochondrial ALDH enzyme in these individuals. Furthermore, the aversion therapy in alcoholics treated with Antabuse depends on an over-production of acetaldehyde

if the patients take any alcohol. The flush-reaction seen in some women after they take a few drinks might also be mediated by an acetaldehyde reaction. Another alcohol-metabolizing enzyme called cytochrome P450 2E1 is located in the microsomal compartment of the liver and this protein assists in the oxidation of ethanol at high BACs when large amounts of alcohol have been consumed. Moreover, P450 2E1 is inducible after chronic drinking so ethanol is cleared faster from the blood and at the same time produces more toxic acetaldehyde. Cytochrome P450 2E1 is also involved in the metabolism of certain drugs and environmental chemicals converting them into toxic metabolites.

Recent research indicates that a small part of the ethanol ingested can be broken down already in the stomach where a Class IV isoenzyme of ADH is located in the gastric mucosa. This form of the enzyme is apparently less active in women than in men which suggests the existence of gender-related difference in systemic availability of ethanol. Gastric ADH was rendered less effective when subjects took various medication such as Aspirin, Tagamet, and Zantac, all widely used by both men and women. An increased bioavailability of ethanol associated with decreased gastric oxidation of ethanol may be one reason that women more prone to some organ and tissue damage associated with overconsumption of alcohol. However, the significance of gastric ADH as a protective barrier and its role in the overall clearance of ethanol from the body is still a matter of conjecture and debate.

In conclusion, a smaller volume of distribution of ethanol in women, a faster and more variable rate of absorption from the gut, a lower activity of gastric ADH, a swifter rate of hepatic clearance, and a higher concentration of acetaldehyde produced are key physiological factors making the female organism more sensitive to alcohol than the male organism. Although a person's drinking habits depend on complex social, cultural, and genetic factors a host of nutritional, biochemical, and hormonal influences related to the metabolism of ethanol interact to make the female body more vulnerable than the male body to the untoward effects of acute and chronic alcohol consumption.

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### The Relation of Alcohol to Coronary Heart Disease, Stroke, and Total Mortality in Women

#### R. Curtis Ellison, MD

Women who consume small to moderate amounts of alcohol are protected from CHD as much or more than men, with relative risks versus non-drinkers of 0.3 - 0.8. In the Framingham Study, CHD mortality over 24 years for non-smoking women consuming up to one drink per day was 1.9% versus 5.5% for non-drinkers; it was 3.0% versus 6.3%, respectively, for smokers. In the Nurses' Health Study, the risk of severe CHD for women consuming 1.5 to 24.9 g of alcohol per day was 0.6 that of non-drinkers.

Data on stroke are more limited, but for women consuming moderate amounts of alcohol, there seems to be protection against thromboembolic stroke (the large majority of strokes in the US and most Western countries) but an increased risk for hemorrhagic stroke. In the Nurses' Study, women consuming 5-14 g of alcohol per day had a relative risk for ischemic stroke of 0.3 (95% CI 0.1-0.7), but an increased risk of subarachnoid hemorrhage.

For total mortality, risk of death in the Nurses' Study was 12-17% lower for drinkers of up to 30 g/day of alcohol, while in the Kaiser Permanente studies up to 1 drink/day was associated with a 30% reduction. In a current project using a risk appraisal approach to estimate the risk of death over a 10-year period, we are finding that from age 55 to 75, women who begin to average one drink per day live longer than non-drinkers, even women at low risk of CHD and high risk of breast cancer.

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### Does alcohol protect women from dementia?

#### Luc Letenneur, BSc, PhD.

**Objectives:** To examine the association between wine consumption and dementia according to gender in a cohort of elderly community residents aged 65 years and older.

**Methods:** A community-based cohort of elderly was studied longitudinally for 8 years for the development of dementia. Dementia diagnoses were made according to the DSM III R criteria, and Alzheimer's disease (AD) was assessed using the NINCDS-ADRDA criteria. Among the 3,675 initially non-demented subjects, 2,913 participated in the follow-up. Subjects were classified into 3 groups according to alcohol consumption: non-drinkers (reference group), mild drinkers (1-2 drinks of wine a day), moderate drinkers (3-4 drinks of wine a day) and heavy drinkers (more than 4 drinks of wine a day).

**Results:** During the 8 year follow-up, 278 incident cases of dementia including 198 cases of AD were

identified. Moderate consumption of wine is associated with a significant lower risk of dementia (RR=0.58, p=0.02). The risk associated with a mild consumption of wine is not significantly different from the risk in non-drinkers (RR=0.89, p=0.13). Very few women were exposed to moderate (n=53) or heavy (n=2) consumption of wine. However, the same trends are found since no demented women were identified in these groups.

Conclusion: An inverse association between dementia and moderate consumption of wine was found in the general population. In women the results are inconclusive due to lack of exposure to a moderate amount of wine.

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### Does alcohol protect women from diabetes?

**Calle Bengtsson, M.D.**

There are several reports indicating that alcohol may have some protective effect against myocardial infarction and a favourable effect on the metabolic profile. In accordance with this, some beneficial effect could be expected with respect to glucose tolerance and risk of developing diabetes.

In the prospective population study of women in Gothenburg, Sweden, which started in 1968-69, it has been possible to relate alcohol habits to variables dealing with glucose tolerance and incidence of diabetes. Altogether 1462 women aged 38-60 years were studied at baseline. The participation rate was 90.1%. The women have then been subjected to follow-up studies after 6, 12 and 24 years. Consumers of alcohol as reported at baseline had, compared with non-consumers, a lower overall mortality and a lower incidence of myocardial infarction. It seemed that the incidence of diabetes was lowest in women with an intake of alcohol at least weekly, somewhat higher in consumers of alcohol less often than weekly, and highest in abstainers. A statistically lower incidence was observed in consumers of spirits compared to non-consumers of spirits, and in those with an intake of beer at least once per week compared with those with an intake of beer less often. Fasting serum insulin concentration at baseline was statistically lower in women with a weekly intake of alcohol than in abstainers.

This means that it seems fair to conclude that alcohol in moderate amounts may have a favourable effect on insulin metabolism in women and may have a protective effect with respect to diabetes.

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### What happens to women's weight when they drink alcohol?

**Klaus Jung, M.D.**

During the last years a scientific agreement was reached concerning the relation between alcohol consumption and decrease in heart diseases, blood circulation diseases and cancer, on the other hand the expert opinions about the relation alcohol/body weight are still considerably different. Two extreme opinions are existing at the same time. One is that also little alcohol consumption results in weight increase, the other that additional alcohol calories result in an effective weight reduction, concerning also women, even if a well balanced nutrition is not changed.

Obviously the social economic situation, the kind, the quantity and the time of alcohol consumption, as well as the quantity and quality of nutrition, have certain influence. But also some other habits in every day life, especially an increase in activities (sports), are a debateable paradox: constant weight in spite of additional alcohol calories.

For a possible weight change of moderate consumers, above all the induction of MEOS (microsomal ethanol oxidizing system), the increased sympathetic tonicity and the associated thermal genesis, as well as an increased ATP-breakdown should be mentioned first, effects which can be additionally be varied by changing fat- and calory-consumption.

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### Which level of alcohol Consumption endangers the female liver?

**Ulrik Becker, M.D.**

Earlier retrospective studies have suggested that women are more vulnerable to the hepatotoxic effects than men. In a cohort study of 13,285 men and women participating in The Copenhagen City Heart Study in 1976-78 we observed a dose-dependent increase in the relative risk of developing alcoholic liver disease. Women had a significantly higher relative risk than men at any given level of alcohol intake, although the underlying risk was lower for women compared with men.

In order to estimate the effect of the different types of alcohol risk of developing alcoholic liver disease we used data from several cohort studies from the Copenhagen area. Self-reported alcohol intake was available in 27,570 individuals with a total observation time of 318,800 person years. During the observation period 461 cases of alcoholic liver disease (including 223 cases of cirrhosis) was observed. Using Poisson regression models, taking sex, age, BMI, level of education and total alcohol intake into account, we found that the risk of developing cirrhosis decreased with increasing wine percentage of total alcohol consumption. At a wine intake of 31-50% the risk of cirrhosis was 0.38 (95% confidence limits 0.23-0.65) with no wine intake as reference. Neither percentage of beer nor percentage of spirits had any influence on the risk function.

This potentially protective effect of wine was seen in both men and women and the effect of wine seems to be more universal.

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### Facts, myths and problems concerning alcohol use during pregnancy

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**Jørn Olsen, M.D.**

It has been known for 30 years that heavy alcohol intake during pregnancy is related with growth retardation, poor mental development and a characteristic facial pattern in off-spring. The Fetal Alcohol Syndrome (FAS) is now a diagnostic entity in official coding systems.

While a high intake of alcohol (>4 drinks/day) is rare a moderate to low intake is common in most European countries. If an intake at a low level causes harm to the unborn child it has considerable public health implications. Alcohol has a number of biological effects which may interfere with fecundity and other reproductive systems. Most of the research in this topic has, however, shown reassuring results and these results will be reviewed.

Two recent publications raises, on the other hand, some concern. One study showed more behavioural problems in children exposed to low levels of alcohol in prenatal life (1 drink/week). Another study showed more subfecund women among social drinkers.

At present the research we have do not indicate any documented threshold effect, nor do we know much about the effect of occasional peek exposures. Ongoing studies may provide more answers to these pertinent questions.

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### The female problem drinker

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**Dr. Moira Plant**

A brief review of the historical perspective on attitudes and treatment for women problem drinkers will be presented. The links for women with alcohol for example as the carers of family health and the producers of alcohol will de highlighted. Myths about treatment for female problem drinkers will be discussed.

The variety of treatments now available will be considered. These include the traditional in-patient intensive psychotherapy programmes, brief intervention techniques such as motivational interviewing and the more woman identified programmes of Women for Sobriety. The evaluations, (or lack of them) of these treatment programmes will be noted, in particular, the large scale and important study, Project Match. Some of the major aspect of barriers to treatment, both "internal", such as shame and guilt and "external" for example the misperceptions of professionals, will be described. Finally, the issues of "Special Populations" will be briefly considered. These groups include the pregnant problem drinker, the older women with a drinking problem and the growing concern for people with a "dual diagnosis" of alcohol problem and psychotic illness such as bi-polar illness and schizophrenia.

### Alcohol and oestrogen - is there an interaction?

**Judith S. Gavaler, B. S., Ph. & Professor and Head, Women's Health Research.**

It has been reported in postmenopausal women that moderate consumption of alcoholic beverages increases oestradiol (E2) levels; this increase is accompanied by a concomitant decrease in follicle stimulating hormone (FSH) levels. We wondered whether or not moderate alcoholic beverage consumption might interact with oestrogen replacement therapy (ERT) to alter the levels of E2 achieved and thus the response to therapy. In clinical practice, ERT is used to alleviate menopausal symptoms as well as to protect against osteoporosis and coronary heart disease. The dose of ERT is frequently titrated on the basis of symptom relief, however, levels of E2 and FSH are rarely monitored.

We have evaluated hormone levels and response rates in a racially diverse sample of 170 postmenopausal women being treated with conjugated equine oestrogens (CEE). Based on the Ansbacher criterion, an adequate response was defined as an E2 level of  $\geq 45$  pg/ml (165 pmol/L). In the total sample, 93 (54.7%) women were responders, while a surprising 77 (45.3%) were found to be non-responders. Among responders as compared to non-responders, both the prevalence of moderate drinking (49.5% vs. 28.6%,  $p=0.008$ ) and the proportion of women consuming  $\geq 1$  drink/week (33.4% vs. 16.9%,  $p=0.042$ ) were higher in responders. In the total group, both E2 and estrone were significantly correlated with FSH levels, CEE dose and total weekly drinks. Among moderate drinkers, the Odds Ratio (OR) for responding when CEE dose was  $\geq 0.9$  mg/day was 1.06 (95% CI: 0.65, 2.87); however, the OR was 4.20 (1.75, 6.74;  $p=.001$ ) in women whose CEE dose was  $\leq 0.625$  mg/day.

It can be concluded that moderate alcoholic beverage consumption does in fact significantly interact in a complex manner with ERT use to modulate response to therapy.

### Does the consumption of alcohol raise the risk of breast cancer?

**Klim McPherson, M.D., Professor of Public Health Epidemiology.**

Many epidemiological studies from all over the world indicate that the consumption of alcohol among women increases the risk of breast cancer. The arguments for this being a causal association are not completely convincing, although quite strong. Partly the problem is a lack of a strong dose response relationship or a coherent time relationship in the epidemiology. If however the estimated risks are true reflections of a causative relationship the proportional attributable risk can appear quite high. However if only large amounts of alcohol can be deemed to be causative then the attributable risks are very much smaller.

It will be argued that the time has come to sort out the causal relationship rather than repeat studies all of which could incorporate the same (unknown possibly) confounding variables. This will have to be done by an assiduous analysis of the possibility of confounding - particularly the aspects of diet - in existing data sets.

Women deserve to know rather than be frightened into giving up a pleasurable habit - possibly unnecessarily.

### Bone and alcohol

**Olof Johnell, MD., Dr. Med. Sci., Professor of Orthopaedics.**

Osteoporosis and its clinical consequence - fracture - are a major health care problem in the Western World. Several risk factors have been identified for osteoporosis and fragility fractures. These are important both for the selection of individuals for intervention and selection of individuals for evaluation of osteoporosis. One of these risk factors is alcohol. There are somewhat conflicting data. Most epidemiological studies have shown that minor to moderate alcohol intake has no negative effect on bone mass (some studies show an even better effect on bone mass than no alcohol at all - could be confounding bias). However, alcoholics have been shown to have reduced bone mass.

Regarding fractures, most studies are on alcoholics and they have a huge increase in number of fractures compared with the general population. This is partly due to reduced bone mass but probably also due to increased falling tendency. Conflicting data exist whether individuals with a moderate alcohol intake have a lower or normal fracture rate compared with the general population. Some studies suggest that those with moderate alcohol intake have a lower fracture risk compared with those without any alcohol intake - similar to what is discussed in the cardiovascular field. However, there are several confounders that have to be taken into account.

Summary: Alcoholism and heavy intake of alcohol are negative for bone mass and increase the fracture risk. The question is whether moderate alcohol intake has any positive effect on bone mass and fracture risk.