Alcohol Causes Liver Damage But May Be Beneficial To The Cardiovascular System: A Short Discussion On The Relative Risk And Benefits Of Alcohol Consumption

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Abstract

Alcohol is a widely used drug, tolerated physiologically and socially, with a place in religion and in everyday social transactions, but also a drug that contributes extensively to illness and to mortality. However, an abundance of recent literature has suggested that alcohol may have a protective effect in man, especially with hepatic regeneration and cardioprotection.

EFFECTS OF ALCOHOL ON THE LIVER

Hepatic changes resulting from the regular alcohol ingestion are many and include benign fat infiltration, alcoholic hepatitis, an increased prevalence of concomitant infection with hepatitis C virus, cirrhosis and hepatocellular carcinoma. Only approximately 10% of chronic alcoholics develop liver disease ([1,2,3,4,5,6,7,8]).

Progression to cirrhosis is correlated with severity of fatty liver and particularly with the presence of alcoholic hepatitis. Mortality from cirrhosis is strongly correlated with alcohol consumption. Becker et al ([5]) observed a steep dose dependent increase in relative risk for developing both alcohol-induced liver disease and cirrhosis with an alcohol intake from 7-13 beverages per week for women and from 14-27 beverages per week for men. The relative risk increased more steeply for women than men in agreement with the fact that women have a greater susceptibility to alcoholic liver disease than men ([1, 3, 5, 6]).

Bellentani et al ([6]), also found that Italians, who regularly drank with or without food at mealtimes, displayed an accumulative risk of developing liver damage. Additionally they discovered, that those who drank outside of mealtimes and those drinking multiple different beverages, had an increased risk, when compared to those who only drank one type of beverage with meals. They felt that this was due to the effect of food on alcohol absorption leading to a slower rise and lower peak blood alcohol concentration. They believed that alcohol had a permissive effect, which allowed other aetiological factors to operate and thus cause further hepatic damage ([3,7]).

Becker et al ([5]), on the other hand found males, drinking 1-6 beverages per week had a reduced risk of alcoholic cirrhosis and liver disease, than those who abstained from alcohol. Their findings show up graphically as a “J-shaped curve”, which suggests a protective effect of low alcohol ingestion against hepatic damage. Nonetheless, the authors felt this effect was due to some of the abstaining men being past alcoholics with previous liver disease and underreporting of weekly alcohol intake by this group.

However, the graphical display of this study has been repeated by a number of other studies, so is widely accepted by many. The interpretation of the “J-shaped curve” ([16,24]), which some say is “U-shaped” ([17, 18,20]), relating alcohol intake to mortality, is that the lowest point on the curve (light/moderate drinking) represents optimum exposure to alcohol and the increased risk in non-drinkers reflects the consequence of sub-optimal exposure. Reduction in alcohol intake or giving up drinking is associated with higher rates of cardiovascular and non-cardiovascular disease ([16]).

Current hypothesis on mechanisms of alcoholic liver disease relate largely to the effects of ethanol metabolism generating acetaldehyde and free radicals, which bind to proteins thus altering function and also initiating an immune response ([7,8]). Oxygen derived free radicals can also damage hepatocytes directly, by initiating peroxidation of membrane lipids, and

indirectly by stimulating transcription of pro-inflammatory cytokines. One might expect that these postulated mechanisms would increase in intensity with increasing alcohol doses. Day ([8]) feels the threshold effect reflects that, below a certain level of intake, the body's intrinsic defences can cope with the insult. Above this threshold, the balance between disease mechanisms and these defence systems favour the development of tissue damage.

A number of studies conducted on rats have revealed a positive role for alcohol with respects to hepatic regeneration. Zhang et al ([9]), found that light ethanol consumption enhanced regenerative activity after partial-hepatectomy. Heavy drinking decreased regeneration, and moderate drinking did not have any effect, when compared to controls.

In agreement, Gong et al ([10]), found that an acute, not chronic, alcohol intake inhibited gamma-aminobutyric (GABA) activity, which when high contributes to the impairment of hepatic regeneration.

On the other hand, Minuk et al ([11]), found that the administration of alcohol to rats within the ranges reported by humans, revealed no significant differences in the rate of hepatic regeneration, between low and high alcohol grace groups and controls. Nonetheless one must note that inferences made to humans should be considered carefully when using results from animal studies.

EFFECTS OF ALCOHOL ON THE CARDIOVASCULAR SYSTEM

Pathological textbooks agree, as do many studies including Kajander et al ([30]), that alcohol causes cardiomyopathy, which can eventually lead to cardiac failure. However, there has been controversy whether alcohol in moderation can have beneficial effects on health.

Moderate alcohol regularly with food (not in binges) may be the key to the “French paradox”. The French have a lipid profile similar to their neighbours, and eat more dietary fat, but their death rate from coronary heart disease is a third that of their neighbours. Alcohol inhibits platelet aggregation: one of the reasons why it's one of the best cardioprotective agents known, nevertheless this benefit accrues only to patients with low-density lipoprotein levels >5.25mmol/l, which is deemed cardiogenic.

Thun et al ([12],[15]), found that at least 1 drink daily reduced mortality from all cardiovascular disease by 30-40% in men and women when compared to non-drinkers, but mortality was increased considerably with heavy drinking. Researchers in Boston ([13]) showed the same effects of alcohol with respects to mortality. But in both studies, the non-drinking groups were not refraining from alcohol consumption as part of a pattern of health-orientated behaviour.

Another important consideration is that the non-drinker group included more people with a lower vegetable intake and a larger percentage were obese due to being educated less about healthy lifestyles. Clearly, drinking or not drinking alcohol was not the only way these groups differed from each other, so alcohol may not be the sole agent for the difference in mortality between groups. Researchers have also noted that participants in studies that are heavy drinkers are often older, smoke more, and are more likely to suffer from hypertension ([13]).

In agreement with Thun et al ([12],[15]), McElduff et al ([19]), found that frequency and quantity of alcohol consumption were important in assessing the risk of a major coronary event. They found the risk to be lowest among men drinking 1-4 drinks daily (and 1-2 drinks for women) on 5-6 days a week. This study concluded that broad categories of average weekly alcohol consumption did not take into account the importance of frequency of consumption.

They also found women had a reduced risk of a major coronary event in the 24 hours after consuming 1-2 alcoholic drinks compared with regular drinkers who consumed no alcohol in the period, in agreement with Garg et al ([27]).

McElduff et al ([19]), believed that moderate consumption of alcohol caused temporary changes in the fibrinolytic system (by reducing blood clots), which returns to normal within 24 hours. Van De Wiel et al ([21]) have found similar effects with the acute inhibition of fibrinolysis, in the following morning after a binge drinking session, thus causing increased thrombotic coronary events in this group. This would explain why those who consumed large amounts of alcohol on 1-2 days a week did not gain the same benefit as those who consumed the same amount over 5-6 days in McElduff et al's study.

On the other hand Friedman and Klatsky ([14]), noted that regular consumption of alcohol at high levels is undesirable and they argued that low-moderate drinking might reduce or increase the risk of disease depending on individual

characteristics. This belief was based on the fact that drinkers and non-drinkers may not arise from the same population, and that a great deal of alcohol consumption remains underreported by participants during experimental studies.

Most research focuses on how much alcohol is considered protective, and how much is harmful. However, another important question is whether some types of alcohol provide more benefit than others.

Recently there has been an abundance of literature on the subject of antioxidants present in red wine, which might be more protective than alcohol itself in preventing heart disease.

Flavanoids (including phenolic acids and polyphenols), present in red wine (and in fruit and vegetables), act as antioxidants to prevent the oxidation of low-density lipoprotein, which normally facilitates fatty plaque formation in arteries ([13], [22]).

This effect has been demonstrated by a Brazilian team ([13]), who conducted a study in which rabbits were given red wine, red wine without alcohol, or no wine at all. After three months the rabbit's aorta was examined for fatty plaques. Rabbits given no wine at all displayed 60% stenosis; this declined to 50% in rabbits fed non-alcoholic red wine and was 40% in the rabbits given red wine.

Gronbaek et al ([24]), carried out studies involving humans, and they revealed that heavy wine drinkers had significantly lower mortalities from heart disease when compared to heavy drinkers who abstained from wine. Another study by Gronbaek et al ([25]) showed that a low to moderate intake of wine was associated with lower mortality from cardiovascular disease, but that similar intakes of spirits implied an increase risk, while beer drinking did not affect mortality. Gronbaek et al ([26]) has recently repeated these findings again, that wine drinking is related to good health, whereas this is not the case for beer and spirit drinking.

Not all researchers share this view, including Rimm et al ([23]), who believes the benefits of drinking are derived from alcohol alone rather than the other components of each type of drink. Alcohol itself has been shown to help reduce serum levels of low-density lipoprotein (cardiogenic cholesterol), and thus reduce the risk of heart disease, so this mechanism may occur independently of flavanoids.

Furthermore, Suh et al ([20]), found alcohol also raises high-density lipoprotein (cardioprotective cholesterol), which is known to protect against heart disease and so subsequently enhance the cardioprotective effects of alcohol.

Bearing in mind that alcohol consumption is inversely related to heart disease, Hemstrom ([29]) conducted a large-scale study in 14 EU countries and Norway. He discovered that the alleged cardioprotective effect of alcohol is absent at the population level, so great caution should be taken concerning alcohol policies for cardioprotective purposes.

CONCLUSIONS

Outside the alcohol industry, there are no voices calling for an increase in consumption. Nonetheless, embedded in the advice that we can derive from the limited reduction in risk of some diseases (but not all) and in overall mortality in some groups is the concept of drinking alcohol is good for us, rather than drinking more than one or two drinks a day is bad. If you are not a drinker, don't start to prevent or treat heart disease, as alcohol is not a medication. However, one must note from the well-known Framingham study ([31]), that even moderate drinking, which seems to be cardioprotective, causes a number of deaths from cirrhosis, cancers of the mouth, throat and liver and especially due to trauma.

For those at high risk of cardiovascular disease, is alcohol the preventative therapy of choice, or would an appropriate regime of exercise and diet be at least as efficacious in lowering mortality? On balance, alcohol consumption exceeding this modest allowance is probably responsible for more harm than good. The adverse physical and social effects of alcohol should prevent consumption being recommended as a health measure.

Plato, quoting from the inscription in the temple at Delphi, suggested “nothing in excess is good for you”, this is obviously a good starting point for health advice with respects to alcohol consumption, even 2400 years later.

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