



# **A Review on Alcohol Temperance in Health and Disease**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

There is hardly a disagreement about the dangers of alcoholism ranging from addiction through cardiovascular disorders and cancers to death. But there seem to be conflicting science and sense on the effect of low to moderate intake of alcohol and abstinence in health and disease. Some earlier scientific reports maintain that moderate intake of alcoholic beverages is beneficial to health; seemingly more beneficial than total abstinence from imbibing in the habit. A number of researchers went further to classify the different forms of alcoholic beverages and their effect on health at moderate intake. There exists a near general agreement on the health benefit of taking red wine in moderation; which was attributed to bioflavonoids and antioxidants used in the preparation of red wine and not the alcoholic medium of delivery. This logically suggests that these antioxidants can elicit the same benefit as supplements without alcohol. Individual variations are seen to exist in alcohol intake and handling; and genes can also act differently in people of different races and genders, further influencing whether someone is

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predisposed to addiction. This review appraises some scientific reports on the intake of alcoholic beverages, with emphasis on low to moderate levels, from limitless resource in all accessible internet databases.

*Keywords: Alcohol handling; reward; addiction; dopamine.*

## 1. INTRODUCTION

Drinking alcohol has been associated with a myriad of health challenges but these are often attributed to overindulgence [1]. Claims have been made that a life devoid of alcohol does not have optimal health. Many chemicals are classified as “alcohol” but ethyl alcohol (also known as ethanol) is the only “safely” consumable form of alcohol [2]. Ethanol is the type of alcohol found in alcoholic beverages and is also used in scents, flavourings, colourings and drug formulations. Features of drinking alcoholic beverages include euphoria, impaired thought processes and decreased mechanical efficiency. Alcohol has over the years been an accepted part of the human diet and is the intoxicating component of beverages such as palm wine, whiskey and beer. It occurs naturally from the palm tree as palm wine but is mostly derived as a product of the fermentation of various types of sugars found in food and drinks. Ethyl alcohol is one of the most widely used and most commonly abused drugs in the world. It is used orally and is absorbed by the mucosa of the stomach and the small intestine. 90% of consumed alcohol is metabolized in the liver, while the remaining 10% is excreted unchanged by the kidneys and lungs [3].

### 1.1 Starting to Drink Alcohol

Starting to drink alcohol is influenced by environment, culture, tradition and upbringing. Peer influence and belief in people of value enhance our inclination to copy their habits, including drinking alcohol; as perceptions are easily influenced by status. Preconceptions around the elderly or people of status and prestige are important because we're likely to overvalue things related to them and assign too low a value to things not related to them. When people that we idolize are in the habit of drinking alcohol, we are drawn to do same in desperate hopes of impressing them; thus, decisions are made to try out alcoholic drinks even when they are not offered. In such environment people that do not drink alcohol are considered unconventional and social misfits. The tasting and starting off with alcohol imply a person's first

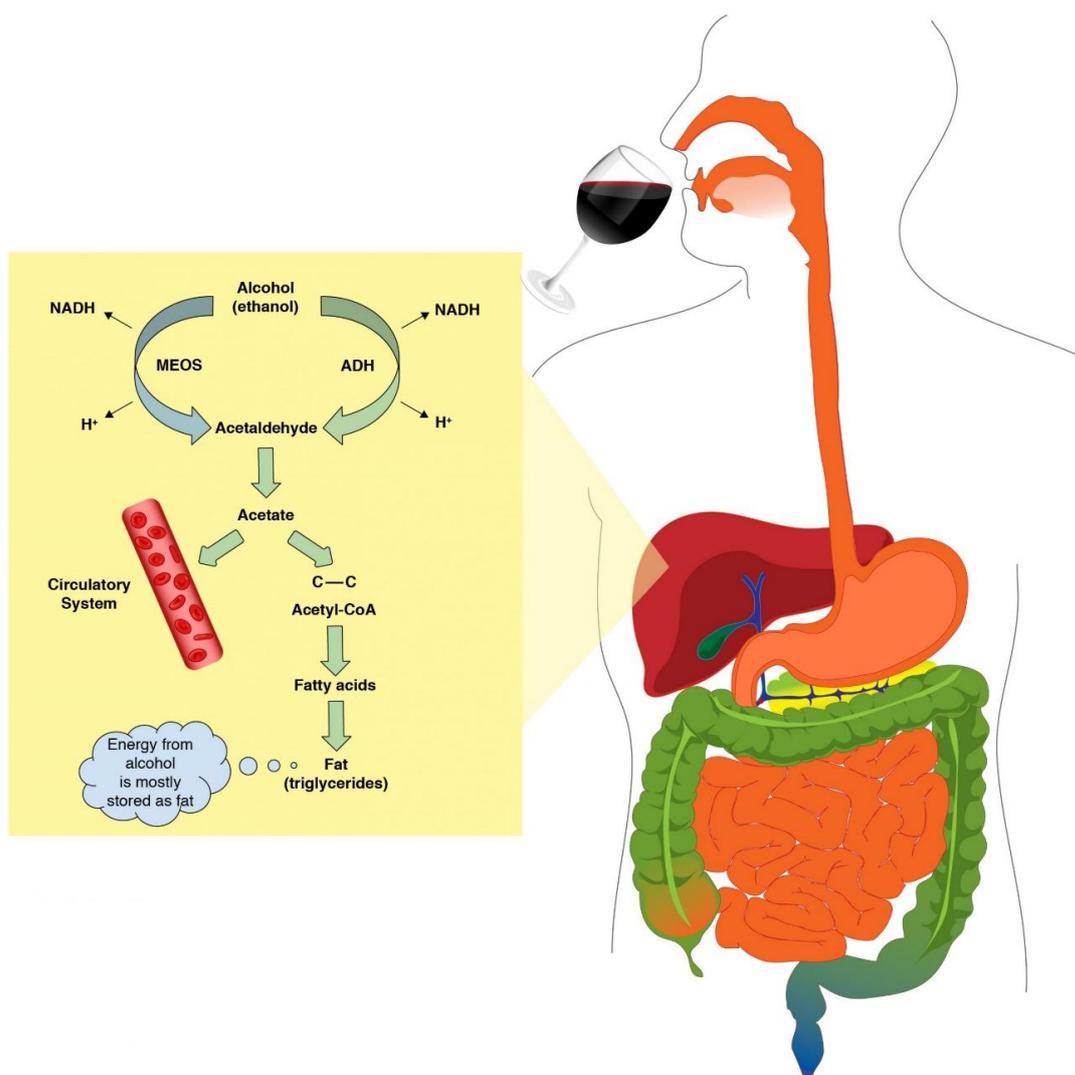
few experiences with alcoholic beverages, no matter at what age this happens. Research has shown that if a person starts to drink alcohol in the early teenage years, they will be more likely to run into alcohol problems later in life and this can also impair both physical and emotional development [4]. Teenagers have “spurts of physical growth in their body, while adolescence is also a time for huge development mentally, emotionally and psychologically” [5]. If alcohol becomes something that serves as an expedient during adolescence, it can impair that development and make them more susceptible to addiction and chronic effects [6]. This suggests that postponing the onset of association with alcoholic beverages might minimise the attendant dependence and addiction with consequent social and physiological ills associated with it.

### 1.2 Alcohol Handling

After oral absorption, alcohol is absorbed almost completely from the duodenum, primarily by diffusion at an extremely variable rate which depends on several factors that include; the rate of drinking, food, gastric metabolism, volume, type and alcohol concentration of the beverage [3]. The amount, timing and type of food all have an effect. The effect of food on alcohol is primarily due to the delay in gastric emptying seen after meal consumption [7]. Less concentrated alcoholic solutions are absorbed more slowly, and the faster the rate of drinking, the faster the absorption. Also, gastric metabolism, as well as hepatic first-pass metabolism can significantly decrease the bioavailability of alcohol and thus the amount of alcohol getting into the systemic circulation [7].

### 1.3 Variability in Alcohol Handling

There is ethnic, age, genetic and gender variations to the effect of alcohol on the body. The role of region and race/ethnicity in alcohol consumption among older adults has been reported [8]. Differences in the metabolizing enzymes ensure that alcohol is handled differently by persons of different races [9]. Most of the time, women are more prone to the toxic



**Fig. 1. Ethanol metabolism**

effects of alcohol than men, because they have smaller body size and the distribution of alcohol is into total body water. Women are known to have lower proportion of total body water compared to men, even if they have the same weight [10]. Older adults are also more sensitive to the intoxicating effects of alcohol because they metabolize alcohol more slowly [11]. Males and females differ in their ability to metabolize alcohol. The main biological differences between men and women concerning alcohol consumption are attributed to several contributing factors involved including heredity and genetics [12]. This difference is partly due to variations in the amount and activity of alcohol dehydrogenase (ADH), the enzyme responsible for metabolizing alcohol. In general, males metabolize alcohol more efficiently than females because they have ADH in the stomach and very

active ADH in the liver. Females do not express ADH proteins in their stomachs and the ADH in their livers is not as efficient [13]. Gender differences in alcohol metabolism result in increased blood alcohol concentration for females compared to males if they both consume the same amount of alcohol. For the same number of drinks, it is easier for females to become intoxicated [13]. It is also “suggested that females are more susceptible than males to alcohol-induced liver inflammation, cardiovascular disease, memory blackouts, hangovers, and certain cancers” [14].

Variations in alcohol handling can also be partially caused by heredity when the disease runs in the family. “However, this does not necessarily mean that an alcoholic parent will pass the disease onto a child. It simply means

that there could be specific risk factors involved” [12]. Genes might play a direct role in the development of alcoholism, as in affecting the body's metabolism of alcohol; or they might play a less direct role, influencing a person's temperament or personality in such a way that the person becomes vulnerable to alcoholism. Those with a history of alcoholism in their family have the highest risk of becoming alcoholics [15]. With multiple relatives with alcohol addictions or other substance use disorders, one may have inherited the genes that exposes to alcoholism. The more family members one has with an alcohol problem, the higher the risk of becoming alcoholic. Many independent lines of evidence point to genetic contributions to its etiology. Adoption studies show that alcoholism in adoptees correlates more strongly with their biological parents than their adoptive parents [16-18]. Twin studies in the US and Europe suggest that approximately 45-65% of the liability is due to genetic factors [19,20]. Animal studies also demonstrate genetic liability; mice and rats have been selectively bred for many traits associated with alcohol dependence, including alcohol preference, alcohol sensitivity, and withdrawal sensitivity [21]. Genetic factors affect the risk not only for alcohol dependence, but also the level of alcohol consumption and the risk for alcohol-associated diseases, including cirrhosis and upper gastrointestinal cancers [22]. It should be emphasized that while genetic differences affect risk, there is no “gene for alcoholism,” and both environmental and social factors weigh heavily on the outcome.

#### 1.4 Habit forming Potential of Alcohol

Through evolutionary trends living beings are compelled to repeat habits that are desirable as this promotes survival. Such habits as eating food and sexual intercourse bring bursts of pleasure to ensure nourishment and procreation which are vital elements of survival [23]. “The brain strengthens the connections that allow this rewarding behavior to occur” and it is then easier to do next time [24]. But the body makes adjustments for consumption habits and includes having to need more quantity to reach the same level of satiety [25]. Subsequently the organism finds it increasingly difficult to function “normally without topping up with the habit”. If this source of joy is suddenly withdrawn it leads to often violent emotional, psychological and physiological reactions [26]. Thus, the journey from consumption through tolerance and dependence to addiction ends with withdrawal

reactions on the path of recovery. Alcohol consumption initially leads to euphoria because it releases dopamine (DA) into the “reward center” of the brain. But after drinking a lot for a long time, the dopamine is no longer released leading to dysphoria [27]. The dopamine system originates in the ventral tegmental area (VTA) and connects to the nucleus accumbens, prefrontal cortex as well as hippocampus. This is the mesocorticolimbic system. “Natural activities such as eating, drinking, and sex activate the nucleus accumbens, inducing considerable communication among this structure's neurons”. The resultant effect of this essential connection is the release of dopamine [27]. An optimally functional nucleus accumbens cause normal, consistent and predictable communication among its neurons. When an electrical signal within a stimulated neuron reaches the synapse with the target neuron it triggers the release of dopamine into the synapse [27]. The dopamine travels across the synaptic gap until it reaches the target neuron at which time it binds to the postsynaptic neuron's dopamine-specific receptors, which in turn has an excitatory effect that generates an internal electrical signal within this neuron [27]. “However, not all of the released dopamine binds to the target neuron's receptors. Extra dopamine may be chemically deactivated, or it may be quickly reabsorbed by the releasing neuron through a system called the dopamine reuptake transporter”. As soon as the extra dopamine has been deactivated or reabsorbed, the two cells are “reset,” with the releasing neuron prepared to send another chemical signal and the target neuron prepared to receive it. The released dopamine brings about feelings of pleasure and elation. As dopamine levels lessen, so do the feelings of pleasure. A repetition of the activity will lead to further release of dopamine and consequent feelings of pleasure and euphoria. Thus, the pleasurable feelings obtained from dopamine release positively reinforce such activities and motivate the repeating of these actions [27]. Alcohol mostly affect the brain by increasing release of the neurotransmitter GABA, which causes an overall “depressive” effect on brain activity, including retarded and impaired thought processes, movement, and reaction time [28].

Because alcohol is a depressant, this can negatively affect the brain in the long run, causing more stress, anxiety, and sadness than before. An area of the brain called the neostriatum is involved in the brain's reward system [29]. When alcohol activates the reward

pathway, causing the cells to increase the amount of dopamine in the area the brain compensates for these sudden changes by reducing the number of cells that can respond to dopamine, so that the next time a drug is used, the effect is not as strong [29]. Unfortunately, this also causes the user to increase drug use in order to get that same "high," a term called "tolerance"; the phenomenon of decreased effect with prolonged exposure to a drug [27]. When the tolerance occurs with a single exposure to the drug it is called acute tolerance. Chronic tolerance occurs over repeated uses of the drug. Tolerance to alcohol can be metabolic (pharmacokinetic) - due to induction of enzymes, or pharmacodynamic - due to physiological adaptation of the body to its presence. As the brain continues to adapt to alcohol, the regions of the brain responsible for judgment and memory are also changed. This makes alcohol-seeking behaviour a habit, and the user becomes dependent on it and ultimately addicted to the drug.

### **1.5 Regulatory Attempts on the Use of Alcohol**

The health challenges from the social use of alcoholic beverages are noticeably huge both for the individual and society and thus attempts have been made to curtail it [30]. In the U.S.A., the National Prohibition of Alcohol (1920-33) was undertaken to reduce crime and corruption, solve social problems, reduce the tax burden created by prisons and poorhouses, and improve health and hygiene in America by eliminating alcohol intake [31]. The lure of alcohol and the deep root it has taken on society ensured that it turned out a miserable failure on all counts [32]. High taxation is imposed on alcoholic substances but this has not discouraged the consumption noticeably. Many countries and religions also placed bans on the dealing and intake of alcohol without been able to eradicate it [33]. These are a reflection of the force of addiction to alcohol and its acceptance by different rational societies that find it impossible to reduce the burden of indulgence on alcoholic beverages.

### **2. HOW MUCH ALCOHOL IS TOO MUCH?**

To reduce the risk of alcohol-related harms, the recommended low risk weekly guidelines for adults are: less than 11 standard drinks (approx. 110g of alcohol) in a week for women, and less than 17 standard drinks (approx. 170g of alcohol) in a week for men [34,35]. Binge drinking - the

consumption of high quantities of alcohol ( $\geq 4/5$  drinks for women/men) within a time period of 2 h [36] or heavy episodic drinking, comes with acute and chronic consequences [37] and is not covered by this guideline. This *Guideline* does not recommend that individuals who do not drink alcohol start drinking for any reason and that if adults of legal drinking age choose to drink alcoholic beverages, drinking less is better for health than drinking more. It also notes that some persons; that are pregnant or might be pregnant, under the legal age for drinking, recovering from an alcohol use disorder or have certain medical conditions or are taking certain medications that can interact with alcohol should not drink alcohol at all. Not drinking alcohol also is the safest option for women who are lactating. "Alcohol intake inhibits the milk ejection reflex, causing a temporary decrease in milk yield" [38]. "The alcohol concentrations in breast milk closely resemble those in maternal blood. The amount of alcohol presented to nursing infants through breast milk is approximately 5-6% of the weight-adjusted maternal dose, and even in a theoretical case of binge drinking, the children would not be subjected to clinically relevant amounts of alcohol. Newborns metabolize alcohol at approximately half the rate of adults" [38].

### **3. MODERATE ALCOHOL CONSUMPTION**

Drinking alcohol even within the recommended limits has been found to increase risk for cancer, and for some types of cancer, the risk increases even at low levels of alcohol consumption. Consumption of alcoholic beverages within reasonable or average limits; not excessive or extreme, has also been attributed to positive outcomes [39,40]. Some research found that people who drank heavily had a lower mortality rate than those who did not drink any alcohol at all [39-41]. But although past studies have indicated that moderate alcohol consumption has protective health benefits (e.g., reducing risk of heart disease), more recent studies show this may not be true [42,43]. While some studies have found improved health outcomes among moderate drinkers, it's impossible to conclude whether these improved outcomes are due to moderate alcohol consumption or other differences in behaviours or genetics between people who drink moderately and people who do not [44-47]. Low levels of alcohol consumption can increase high density lipoprotein cholesterol [48], while facilitating blood circulation and decreasing inflammation [48]. Inflammation

is strongly implicated in the severity and progression of diseases like Alzheimer's , and experiments on isolated neurons "suggest that small amounts of alcohol can precondition brain cells to deal with stressful conditions". This helps to suppress inflammation and prevent cognitive deterioration [49,50]. Although several studies pointed out that drinking low-to-moderate amounts of any form of alcohol may reduce the risk of developing Alzheimer's disease, others suggest that red wine has the highest potential to prevent or delay cognitive decline [51]. For example, one study regularly tested over 5000 older adults on learning, memory and attention tasks for seven years [51]. Those who drank red wine did better in each tested class and presented slower age-related cognitive decline as likened to those who drank other forms of alcohol [52]. "Red wine contains other compounds besides alcohol, including the antioxidant resveratrol, which may have potential benefits for human health" [53]. But the amount of resveratrol in red wine is so low that it is probably not relevant to human health [53]. However, it is necessary to separate the effects of red wine from other factors. For example, people who drink wine have a tendency or disposition to buy healthier foods [54], are generally better-educated [54], exercise more and maintain a healthier body mass [55]. All these are factors that are also associated with a lower risk of developing Alzheimer's disease. Drinking red wine may then be associated with persons who are more likely to also choose healthier lifestyles. Drinking at levels above the moderate drinking guidelines significantly increases the risk of short-term harms, such as injuries, as well as the risk of long-term chronic health problems, such as some types of cancer [56-58]. Some investigators have proposed that cognitive performance worsens in direct proportion to the severity and duration of alcoholism [59]. Studies suggest that social drinkers who consume more than 21 drinks per week also fit into this category [60]. Other investigators have suggested that cognitive deficits may be detectable only in those alcoholics who have been drinking regularly for 10 years or more [59]. Long-term, light-to-moderate social drinkers have been found to fall into this category as well, showing cognitive deficits equivalent to those found in detoxified alcoholics [61].

According to one centenarian, the key to longevity is regular drinking [62]. "During her milestone 100th birthday celebration,

Pennsylvania-based Pauline Spagnola said that her secret for living a long life is alcohol. Strangely enough, Spagnola isn't the first to credit booze for her long life. Back in 2013, a 101-year-old Staten Island woman insisted the same, claiming she drank two glasses of wine, a glass of Southern Comfort and one beer each day" [62]. It can be reasoned that the alcohol is not the total enabler but that the people who use moderate to low alcohol levels share other characteristics that make them less likely to experience both cognitive decline and other degenerative diseases. For example, perhaps these people are more likely to have an active social life and maintain time-tested practices that are essential for living a long, healthy life like exercising and eating right.

#### **4. COMPULSIVE DRINKING AND ALCOHOL USE DISORDER**

Alcohol consumption is associated with a variety of short- and long-term health risks, including motor vehicle crashes, violence, sexual risk behaviours, high blood pressure, and various cancers [63]. The risk of these harms increases with the amount of alcohol consumed [63]. For some conditions, like some cancers, the risk increases even at very low levels of alcohol consumption [64]. The popular byword "First the man takes a drink, and the drink takes another drink, then the drink takes the man" or paraphrased as "First you take a drink, then the drink takes another drink, then the drink takes you" summarized the acceptance that voluntariness in taking alcohol ends with the first drink; at least for many persons. The addictive potential and lure of alcohol is such that many a person has been programmed by genetic and other disposition to remain in its hook once exposed. For some persons who feel that they can control their alcoholic intake end up being controlled by the alcohol. In this master-servant relationship, the roles are programmed to change. Compulsive drinking usually ends up with alcohol use disorder and may be due to dysfunction in a specific brain pathway that normally regulate drinking. The results as reported in the journal Biological Psychiatry point to that direction [65]. Alcoholism also called alcohol use disorders can be beguiling but harmful, and often there is no clear line between alcohol abuse and alcohol dependence. Eventually alcohol dominates thinking, emotions, and actions and becomes the primary means through which a person can deal with people, work, and life. The Impact of Alcoholism affects

the individual, the family and the society at large. For the individual alcohol is responsible for a myriad of physical health challenges involving almost all the organs of the body.

#### 4.1 Brain Function

Alcohol acts as a general central nervous system depressant, but it also affects specific areas of the brain to a greater extent than others. It can damage memory and brain function and after only a few drinks memory can be impaired and brain processes slow down. Larger quantities of alcohol can lead to short-term memory failure or 'blackouts' [66]. Drinking heavily over a long period of time can also have long-term effects on memory. Alcohol affects many parts of the brain and the most prevalent alcohol-associated brain impairments affect visuospatial abilities and higher cognitive functioning [67]. Visuospatial abilities include perceiving and remembering the relative locations of objects in 2- and 3-dimensional space. Examples include driving a car or assembling a piece of furniture based on instructions contained in a line drawing. Higher cognitive functioning includes the abstract-thinking capabilities needed to organize a plan, set it in motion, and change it as needed [68]. With long-term heavy drinking, recalling old memories and laying down new ones can become more difficult. Alcohol-related dementia (ARD) is a form of dementia caused by long-term, excessive drinking, resulting in neurological damage and impaired mental processing. Epidemiological studies show an association between long-term alcohol intoxication and dementia [69]. This study did not support the hypothesis that low-to-moderate alcohol consumption prevents cognitive decline. "Alcohol can damage the brain directly as a neurotoxin, or it can damage it indirectly by causing malnutrition, primarily a loss of thiamine" (vitamin B1).

The human brain is still in the process of development until the age of 18 or 19, and it may be more susceptible to damage than the adult brain. In adolescents who regularly drink alcohol, parts of the brain important in planning and emotional control have been found to be smaller than expected. Alcohol use by students is a major public health problem, leading to decrease in academic performance, injuries, blackouts, alcohol dependence and other maladies [70]. This study shows that alcohol use even in moderate doses leads to decrease in academic

performance. Negative effect of alcohol use on intellectual activities of students using academic performance as a criterion increases with increase in time and dose of alcoholic drinks [70].

#### 4.2 Carcinogenicity

In 1931, Otto Heinrich Warburg (1883-1970) was awarded the Nobel Prize for his thesis: "The Primary Cause and Prevention of Cancer." He stated that cancer is the result of an anti-physiological diet and lifestyle [71]. "The lack of oxygen and acidosis are two sides of the same coin: if you have one, you have the other" [71]. Basic chemistry explains that alkali solutions (pH greater than 7.0) tend to absorb oxygen while acids (pH below 7.0) tend to expel oxygen. A weak alkali can absorb much more oxygen (O<sub>2</sub>) than a weak acid. Therefore, when the body becomes acidic by dropping below pH7.0, oxygen is driven out of the body, thereby inducing cancer. According to Warburg: "All normal cells must have oxygen, but cancer cells can live without oxygen—a rule without exception. "In summary, cancer occurs in the absence of free oxygen in the body, and therefore whatever can deprive the body of oxygen can cause cancer to manifest" [72]. All body fluids, except for stomach and urine are supposed to be mildly alkaline at pH7.4. Stomach fluids must remain acidic to digest food and urine must remain acidic to remove wastes from the body. Blood is the exception. Blood must remain at an alkaline pH7.4 to retain its oxygen. Alcohol causes a depletion of some minerals in the body. When insufficient mineral is in the diet, the body is forced to remove minerals from other body fluids (saliva, spinal fluid, kidney, liver etc) in order to maintain the blood pH at 7.4. This causes the demineralized fluids and organs to become acidic and therefore anaerobic, thus inducing not only cancer, but a host of other degenerative diseases including cardiovascular disorders, diabetes and arthritis. Drinking alcohol can also increase the risk of multiple types of cancer due partly because the body breaks down alcohol into acetaldehyde, a chemical that damages DNA [73]. Damaged DNA can lead to cancer cells and tumours [74].

#### 4.3 Cardiovascular and other Disorders

Alcohol has been implicated in several cardiovascular disorders like hypertension,

arteriosclerosis and stroke. Alcohol can cause a long-term increase in blood pressure and people with high blood pressure face a variety of health risks, including heart disease, heart attack, and stroke [44-47]. Constant intake of alcohol can lead to mineral deficiency in the blood which will subsequently result in acidosis. The artery which conveys blood from the heart to other parts of the body is essentially the same as the vein, which returns blood to the heart. The major difference is that the artery surface is made up of muscle tissue that can squeeze and compress the artery, resulting in an increased blood pressure, thereby ensuring the blood gets to the distant parts of the body. This is muscle tissue that is most amenable to disintegration by lactic acid. Intake of alcohol leads to increased acidity of the blood. Once the body's fluids become acidic, the muscle tissue surface of the arteries become a susceptible target. With the muscle tissue disintegrated, the remainder of the artery wall is weakened. As the wall is thin, it is exposed to the very positively charged external acids (acids are positively charged and alkali are negatively charged). This causes various negatively charged components in the blood such as phospholipids to be attracted and stick to the positive acid weakened wall. A host of other components like collagen, fibrin, triglycerides, heavy metals, proteins, mucopolysaccharides, muscle tissue and debris plus Low-density lipoprotein cholesterol attach themselves to the phospholipids anchored on the weakened artery wall. All of this form a plaque bound together by calcium. This results in a stronger, thickened and hardened artery wall which diminishes the size of the opening in the artery-arteriosclerosis. Thus, the arteriosclerosis, heart attack and stroke were caused by inflammation of the blood vessel walls due to acidosis which was a result of mineral deficiency caused by constant intake of alcohol [45]. Alcoholics usually have inadequate content of significant nutrients. Deficiencies in vitamin B pose health risks in people with alcoholism. Other vitamin and mineral deficiencies, however, can also cause numerous health problems. Alcohol interference in folate metabolism can cause severe anemia. Wernicke-Korsakoff syndrome often manifest from severe thiamine (vitamin B1) deficiency in alcoholism. Symptoms of this syndrome include severe loss of balance, confusion, and memory loss. Eventually, it can result in permanent brain damage and death. Also, Vitamin B12 deficiencies can also lead to pain, tingling, and other abnormal sensations in the arms and legs; a condition peripheral neuropathy.

## **5. SOCIOECONOMIC EFFECT OF ALCOHOL ABUSE**

The general impact of alcohol abuse extends far beyond the financial costs to family life and the society [75]. Alcohol use results in Fatigue, impaired mental alertness, attention deficit, decreased work and academic performance. The alcoholic problem of a family member would have impact on both the nuclear and extended family. This rubs off on the community, schools, the workplace, the healthcare system and the entire society. The social impact of alcohol abuse is a separate issue from the financial costs involved, and that impact begins in the home, extends into the community, and consequently affects society as a whole, much like the financial impact does. Research on the effects of alcohol abuse on families shows that alcohol abuse and addiction play a role in intimate partner violence, causes families' financial problems, impairs decision-making skills, and plays a role in child neglect and abuse [76]. As with the financial costs of alcohol abuse, studies have found occasional binge drinking can affect families also. Research suggests that the risk of intimate partner violence rises not only in the context of frequent drinking, but also when a partner has consumed a large volume of drinks in one sitting [77].

### **5.1 Alcohol Abuse and Children**

Fetal alcohol syndrome (FAS) is one of the most common direct consequences of parental alcohol use in the United States, caused by alcohol consumption by the mother during pregnancy [75]. Children with FAS display a variety of symptoms, many of which are lifelong and permanent. Children who grow up in a home with a loved one dealing with alcohol addiction may be affected as well; they are at significant risk to develop alcohol use disorders themselves. "Growing up in a home where at least one parent has an alcohol use disorder can increase a child's chances of developing psychological and emotional problems" [76].

### **5.2 Alcoholic Abuse and Prostitution**

Alcohol use decreases inhibition and increases the inclination to risky sexual behaviour [78]. "The existence of a relationship between substance abuse and prostitution in and of itself does not imply causality" [82]. It is not clear whether substance abuse is one of the factors that pushed these women into prostitution or

whether it was prostitution that caused their drug involvement. Most likely, both prostitution and substance abuse are the behavioural translations of these women's endless cycles of victimization and severely disturbed backgrounds, as well as an expression of the self-destructive pull, the sense of hopelessness, helplessness, negative self-concept and psychological paralysis reported by almost every subject in the study [79].

## **6. ABSTINENCE IN HEALTH AND DISEASE**

Abstaining from alcoholism or teetotalism is the practice and promotion of complete abstinence from alcoholic beverages. The word abstinence refers to voluntary prevention of oneself from indulging in bodily activities that provide pleasure and are potentially addictive; like sexual intercourse, alcohol or food [80]. Abstinence can be due to personal preferences, religious practices of practical considerations. In medicine abstinence also refers to discontinuation of an addictive substance. This may lead to intense craving for the drug or withdrawal syndromes [80]. Abstinence may be a temporary or short-term goal meant for short durations of time. This includes refraining from compulsive drinking [80]. The time and the measure are voluntary and thus meant to enhance life. This is different from psychological mechanism of repression where the abstinence is not willingly adopted. Abstaining from alcohol can lead to several health benefits and this is more noticeable for former addicts to alcohol [81]. This has made it trendy for many persons who are seeking to make healthy life changes to desire to quit drinking alcoholic beverages completely. The brain, cardiovascular and other systems show considerable improved functioning in the absence of alcohol [81]. No advantages have been convincingly proven to the contrary.

### **6.1 Benefits for the Brain**

Addiction to alcohol leads to decreased mental alertness, slower reaction time and serious depression among a wide array of ills. The consequence of this can be seen in slurred speech and stumbling movements. This can lead to difficulty in handling previously ordinary tasks like driving or operating machinery. Structural imaging studies reveal that compared with non-alcoholics', most alcoholics' brains are smaller and less dense [82,83]. Loss of brain volume is most noticeable in two areas: the outer layer (i.e., the cortex) of the frontal lobe, which is

considered a major centre of higher mental functions [83] and the cerebellum, which is responsible largely for gait and balance as well as certain aspects of learning [84]. Support for these results is provided by functional imaging studies, which reveal altered brain activity throughout the cortex and cerebellum of heavy drinkers [85]. In addition, functional imaging often is sufficiently sensitive to detect these irregularities before they can be observed by structural imaging techniques, and even before major cognitive problems themselves become manifest [86].

### **6.2 Benefits for the Liver**

Drinking alcoholic beverages over task the liver as it is not processed by the body the same way that other things are processed in the liver. The rate of oxidation of alcohol is constant and does not change with concentration. For an average man this is approximately 12.5ml/hour and is proportional to body weight [10]. Alcohol can take several days to get through the liver, depending on rate and quantity consumed [10]. This gradually leads the alcoholic to a fatty liver, liver scarring and other liver disease which are life threatening. The liver is an extremely important organ in maintaining health and adequate body function. Total abstinence from alcohol is the only protection from alcohol-related liver disease (ARLD). Alcohol abstinence can prevent liver damage from progressing and reverse the damage that has been caused by years of excessive drinking. On alcohol abstinence the liver begins to repair itself. Alcoholic fatty liver, liver scarring and other life-threatening liver disease can gradually go back to a healthier state. This depends on factors which include length of time spent drinking, age and lifestyle.

### **6.3 Other Health Benefits of Alcohol Abstinence**

Not only will alcohol abstinence significantly benefit the brain and liver, but it will also decrease risk of cancers, cardiovascular and other diseases. Drinking alcohol can increase the risk of multiple types of cancer [57], thus, abstainers from alcohol face a much lower risk of cancer than people who drink. Complete abstinence from alcohol helps maintain a healthy blood pressure. Alcohol decreases immunity which increases susceptibility to disease. People who drink tends to experience more colds, flus, and other illnesses than people who don't drink. That's because alcohol intake weakens the

immune system. Even a moderate amount of alcohol can suppress the immune system and increase susceptibility to illness. Abstinence from alcohol thus leads to a stronger immune system and this aids protection from many ailments.

A good night's sleep is extremely important to anyone's health. Alcohol disrupts the circadian rhythm, an internal process that helps control sleep-wake cycle. More specifically, the drug prevents one from getting enough deep sleep leading to frequent wakefulness throughout the night and exhaustion the next day [87]. Quitting drinking leads to improved sleeping habits. Alcohol dehydrates the body which will affect skin tone and complexion [88]. Abstinence leads to better hydration of the skin making it to look healthier. Each drink of Alcohol increases intake of empty calorie that fills the body with excess fat, thus with abstinence, there is likely to be loss of weight and increased energy [88]. Moderate alcohol consumption is claimed to help protect the hearts of adults with type 2 diabetes. Heavy drinking, however, is associated with obesity, which is a risk factor for this form of diabetes. In addition, alcohol can cause hypoglycaemia, a drop in blood sugar, which is especially dangerous for people with diabetes who are taking insulin.

## 7. ALCOHOL RECOVERY

Because changes associated with the use of alcohol can be damaging to the body system, efforts are made to put the alcoholic on a path to recovery. Recovery from the effect of alcohol abuse can only commence with an understanding of the harmful effect and willingness to choose healthier life style. Quitting drinking will pave the way for the body to heal itself from the chemical assault due to alcohol use. Recovery time may depend on how long one has been drinking as well as the individual specific body's ability to restore itself. There are many options for treatment for alcohol use disorders. They depend in part on the severity of the patient's drinking, but treatment options include behavioural therapy and medications [89]. The goal of long-term treatment for alcohol dependence is total abstinence. Evidence strongly suggests that seeking total abstinence and avoiding high-risk situations are the optimal goals for people with alcoholism. A strong social network and family support is also important. Families and friends need to be educated on how to assist, and not enable, the drinker. Support

groups can be very helpful in providing advice and guidance.

### 7.1 Alcohol Withdrawal

Changes in bodily function that is experienced by a patient and is associated with when a person who often drinks too much alcohol suddenly gives up the habit is called withdrawal symptoms. Withdrawal symptoms begin within 6 - 48 hours and peak about 24 - 35 hours after the last drink. At this time, the inhibition of brain activity caused by alcohol is abruptly reversed, stress hormones are oversecreted, and the central nervous system becomes overexcited [85]. The NMDA system is also important in alcohol withdrawal [90]. Every alcoholic goes through withdrawal syndromes on quitting and these can range from unpleasant to life-threatening events [91]. Application of a harm reduction approach allows people to decrease step by step the number of drinks they consume each day, without requiring the withdrawal syndrome. But the will to cease imbibing in alcoholic drinks may often be there but difficult to attain without assistance. Thus, treatment options become the mainstay for this menace.

### 7.2 Alcohol Abuse Withdrawal Symptoms Treatment

Treatment for alcohol abuse aims to calm the patient as quickly as possible while being observed for at least 2 hours to determine the severity of withdrawal symptoms. Often people have mild-to-moderate withdrawal symptoms like agitation, trembling, disturbed sleep, and lack of appetite, brief seizures and hallucinations. Some have been shown to progress to full-blown delirium tremens [26]. Anti-anxiety drugs (benzodiazepines) inhibit nerve-cell excitability in the brain and are considered to be the treatment of choice because they relieve withdrawal symptoms and reduce the risk for seizures. Long-acting benzodiazepines (chlordiazepoxide, oxazepam, and halazepam) are preferred because they pose less risk for abuse than the shorter-acting drugs, which include diazepam, alprazolam and lorazepam [92,93]. Antiseizure drugs, such as carbamazepine or divalproex sodium are often recommended for reducing the requirements of a benzodiazepine [93]. These do not appear to reduce seizures or delirium associated with withdrawal when used by themselves. Beta blockers, such as propranolol and atenolol, are sometimes used in combination with benzodiazepines. They slow heart rate,

reduce tremors and may also reduce cravings [93].

### 7.3 Specific Treatment for Severe Symptoms

Seizures are usually self-limited and treated with a benzodiazepine [94]. Benzodiazepines are used primarily in the treatment of the hyper excitability, including convulsions and hallucinations, during withdrawal [94]. Co administration of intravenous phenytoin with a benzodiazepine may be used in patients who have a history of seizures, who have epilepsy, or in those with ongoing seizures but the patient's heart should be monitored during treatment because of the hypotensive effect of phenytoin. For hallucinations or extremely aggressive behavior, antipsychotic drugs, particularly haloperidol, may be administered [95]. Rapid and immediate injection of the B vitamin thiamine is necessary to treat Wernicke-Korsakoff syndrome caused by severe vitamin B1 (thiamine) deficiencies, which cannot be replaced orally [95].

### 7.4 Anti-craving Medications

The main anti-craving drug is naltrexone which is an opioid antagonist originally developed for treatment of opioid addictions [96]. It has been shown to be useful in decreasing craving for alcohol, which is associated by its ability to block opioid function. This drug reduces the intoxicating effects of alcohol and the urge to drink. Naltrexone is approved for the treatment of alcoholism and helps reduce alcohol dependence in the short term for people with moderate-to-severe alcohol dependency. There is an oral form which is taken daily and a once-a-month injectable form of naltrexone. Side effects include nausea, vomiting, stomach pain, headache and fatigue. High doses can cause liver damage. Acamprosate is another drug approved for treatment of alcoholism. Acamprosate is a drug that acts by stimulating the GABA inhibitory system and antagonizing the glutamate excitatory system, thus calming the brain and reducing craving for drinks [97]. This drug reduces the frequency of drinking and, in combination with psychotherapy, improves quality of life even in patients with severe alcohol dependence. It may cause occasional diarrhea and headache and can also impair certain memory functions which does not alter short-term working memory or mood. People with kidney problems should use acamprosate cautiously [97].

### 7.5 Aversion Medications

Disulfiram is an inhibitor of aldehyde dehydrogenase, and when taken with alcohol results in the build-up of acetaldehyde levels leading to nausea, dizziness, headache and flushing; making the entire drinking experience very aversive, and thus decreasing the desire to drink. This can happen within an hour or two of drinking half a glass of wine or half a shot of liquor and may last from half an hour to 2 hours, depending on dosage of the drug and the amount of alcohol consumed. Effectiveness of a dose of disulfiram is usually 1 - 2 weeks and overdose can be dangerous, causing low blood pressure, chest pain, shortness of breath, and even death [98].

### 7.6 Other Drugs Used for Alcohol Recovery

Topiramate is an anti-seizure drug used to treat epilepsy. Topiramate is thought to have an effect on alcohol cravings and alcohol use by interacting with GABA [99]. It also potentially decreases the release of dopamine, which is involved in the pleasure caused by alcohol consumption. Studies indicate it may help treat alcohol dependence [100]. In one study, patients who took Topiramate had fewer heavy drinking days, fewer drinks per day, and more continuous days of abstinence than patients who received placebo [101]. Side effects include burning and itching skin sensations, change in taste sensation, loss of appetite and difficulty concentrating. Baclofen is a muscle relaxant and antispasmodic drug [102]. Among pharmacological agents that have been used in experimental studies for reduction in craving, baclofen appears to have a significant advantage over other agents [103, 104]. It reduces craving and alcohol consumption and causes few side effects.

## 8. CONCLUSION

Alcohol can limit life and career but in reasonable amounts was accepted as beneficial. People who never took alcohol and had engaged in other healthy life habits seem to fare better than those that had imbibed for some time and quit. This often depends on the length of time spent as drinkers. Genetic variation in alcohol metabolizing enzymes is a main source of inter-individual variability in alcohol metabolism. Gender variation in alcohol handling makes women more susceptible to the effect of alcohol

consumption than men. People who are able to moderate their alcohol intake are also more likely to have been able to choose other healthier life style. Drinking alcohol is addictive and even when alcohol use may seem beneficial in moderation the brunt of disease lies with the alcoholic.

## CONSENT AND ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. World Health Organization. Global Health Risk: Mortality and Burden of Disease Attributable to Certain Major Risk. Geneva: World Health Organization Press; 2009.
2. American Academy of Pediatrics. Alcohol: The Most Popular Choice; 2015. Available: <https://www.healthychildren.org/English/ages-stages/teen/substance-abuse/Pages/Alcohol-The-Most-Popular-Choice.aspx>
3. Dubowski KM. Absorption, distribution and elimination of alcohol: Highway safety aspects. *J Stud Alcohol Suppl.* 1985;10:98-108.
4. National Research Council (US) and Institute of Medicine (US) Committee on Developing a Strategy to Reduce and Prevent Underage Drinking; Bonnie RJ, O'Connell ME, editors. Reducing Underage Drinking: A Collective Responsibility. Washington (DC): National Academies Press (US); 2004.
5. Health Consequences of Adolescent Alcohol Involvement. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK37610/>
6. Moss HB, Kirisci L, Gordon HW, Tarter RE. A neuropsychologic profile of adolescent alcoholics. *Alcoholism: Clinical and Experimental Research.* 1994;18:159-163.
7. Rall T. Ethanol. In Gilman A, Rall T, Nies A, Taylor P (eds); *The pharmacological basis of Therapeutics* (8th ed.). New York: Pergamon Press Inc. 1990;370-82.
8. Wilson JR, McClearn GE, Johnson RC. Ethnic variation in use and effects of alcohol. *Drug Alcohol Depend.* 1978;3(2): 147-51. DOI: 10.1016/0376-8716(78)90029-7. PMID: 631014
9. Jorgenson E, Thai KK, Hoffmann TJ, Sakoda LC, Kvale MN, Banda Y, Schaefer C, Risch N, Mertens J, Weisner C, Choquet H. Genetic contributors to variation in alcohol consumption vary by race/ethnicity in a large multi-ethnic genome-wide association study. *Molecular Psychiatry.* 2017;22(9):1359-1367. Available: <https://doi.org/10.1038/mp.2017.101>
10. Holford NHG. Clinical pharmacokinetics of ethanol. *Clin Pharmacokinet.* 1987;13: 273-292.
11. Rigler SK. *Am Fam Physician.* 2000; 61(6):1710-1716. Available: <https://sites.duke.edu/apec/module-1-gender-matters/content/content-gender-differences-in-alcohol-metabolism/>
12. National Institute on Alcohol Abuse and Alcoholism. *Genetics of Alcohol Use Disorder*; 2008. Available: <https://www.niaaa.nih.gov/alcohol-effects-health/alcohol-use-disorder/genetics-alcohol-use-disorder>
13. Heath AC. Genetic influences on alcoholism risk: a review of adoption and twin studies. *Alc Health Res World.* 1995;19:166-171.
14. Cloninger CR, Bohman M, Sigvardsson S. Inheritance of alcohol abuse: Cross-fostering analysis of adopted men. *Arch Gen Psychiatry.* 1981;38:861-868.
15. Bohman M, Sigvardsson S, Cloninger CR. Maternal inheritance of alcohol abuse. Cross-fostering analysis of adopted women. *Arch Gen Psychiatry.* 1981;38: 965-9.
16. Heath AC, et al. Genetic and environmental contributions to alcohol dependence risk in a national twin sample: consistency of findings in women and men. *Psychol Med.* 1997;27:1381-96.
17. Prescott CA, Kendler KS. Genetic and environmental contributions to alcohol abuse and dependence in a population-based sample of male twins. *Am J Psychiatry.* 1999;156:34-40.
18. Kendler KS, Neale MC, Heath AC, Kessler RC, Eaves LJ. A twin-family study of alcoholism in women. *Am J Psychiatry.* 1994;151:707-715.
19. Pickens RW, et al. Heterogeneity in the inheritance of alcoholism: a study of male and female twins. *Arch Gen Psychiatry.* 1991;48:19-28.

21. McBride WJ, Li TK. Animal models of alcoholism: neurobiology of high alcohol-drinking behavior in rodents. *Crit Rev Neurobiol.* 1998;12:339–69.
22. Foroud T, Edenberg HJ, Crabbe JC. Genetic Research: Who Is At Risk for Alcoholism? *Alcohol Research and Health.* 2010;33:64–75.
23. Kalivas PW, Volkow ND. The neural basis of addiction: a pathology of motivation and choice. *The American Journal of Psychiatry.* 2005;162 (8):1403–13. DOI:10.1176/appi.ajp.162.8.1403. PMID 16055761.
24. Nutt D. Alcohol and the brain: Pharmacological insights for psychiatrists. *Br J Psychiatry.* 1999;175:114-119.
25. Kalant H. Research on tolerance: What can we learn from history. *Alcohol Clin Exp Res.* 1998;22:67-76.
26. Schuckit MA (1995). *Drug and Alcohol Abuse: A clinical guide to diagnosis and treatment.* New York: Plenum.
27. Koob GF, Nestler EJ. The neurobiology of drug addiction. *J Neuropsychiatry Clin Neurosci.* 1997;9:482-497.
28. Mihic SJ, Harris RA. GABA and the GABA A receptor. *Alcohol Health Res World;* 1997;21:127–31.
29. Visovsky C, Zambroski C, Hosler S, Workman L. *Introduction to Clinical Pharmacology (9<sup>th</sup> Edition).* USA: Elsevier Inc; 2019.
30. Cox E, Wells C, Campbell C. *Lawmakers Target Grain Alcohol;* 2014. Available: <http://www.baltimoresun.com/news/maryland/politics/bs-md-grain-alcohol-ban-20140205-story.html>
31. Oliver Richardson. *Wine marketing: modelling the ethics of the wine industry using qualitative data, Qualitative Market Research: An International Journal;* 2005.
32. Mark Thornton. *Alcohol Prohibition Was a Failure. Policy Analysis No. 157.* Available: <http://www.cato.org/pa-157.html#1>
33. King D. *Laws including high-proof grain alcohol ban take effect Tuesday;* 2014. Available: [http://articles.baltimoresun.com/2014-06-30/news/bs-md-grain-alcohol-illegal-tuesday-20140630\\_1\\_grain-alcohol-estate-tax-income-tax-credit](http://articles.baltimoresun.com/2014-06-30/news/bs-md-grain-alcohol-illegal-tuesday-20140630_1_grain-alcohol-estate-tax-income-tax-credit)
34. Rose ME, Grant JE. Alcohol dosing and total mortality in men and women: an updated meta-analysis of 34 prospective studies. *Arch. Intern. Med.* 2010;166:2437-2445.
35. US. Department of Agriculture and U.S. Department of Health and Human Services. *2020 – 2025 Dietary Guidelines for Americans. 9th Edition,* Washington, DC; 2020.
36. National Institute on Alcohol Abuse and Alcoholism. *NIAAA Council Approves Definition of Binge Drinking. NIAAA Newsletter.* 2004; N° 3. Winter.
37. Esser MB, Hedden SL, Kanny D, Brewer RD, Gfroerer JC, Naimi TS. Prevalence of alcohol dependence among US adult drinkers, 2009–2011. *Prev Chronic Dis.* 2014;11:140329.
38. Maija Bruun Haastруп, Anton Pottegård, Per Damkier. "Alcohol and Breastfeeding", *Basic & Clinical Pharmacology & Toxicology;* 2014.
39. Holahan CJ, Schutte KK, Brennan PL, Holahan CK, Moos BS, Moos RH. Late-life alcohol consumption and 20-year mortality. *Alcohol Clin. Exp. Res.* 2010;34: 1961-1971.
40. Heather Saul; 2013. Available: <http://www.independent.co.uk/life-style/health-and-families/health-news/Tuesday 10 December 2013>
41. Chikritzhs T, Fillmore K, Stockwell T. A healthy dose of skepticism: four good reasons to think again about protective effects of alcohol on coronary heart disease. *Drug Alcohol Rev.* 2009;28: 441–4.
42. Andréasson S, Chikritzhs T, Dangardt F, Holder H, Naimi T, Stockwell T. Evidence about health effects of “moderate” alcohol consumption: reasons for skepticism and public health implications. In: *Alcohol and Society.* Stockholm: IOGT-NTO & Swedish Society of Medicine; 2014.
43. Knott CS, Coombs N, Stamatakis E, Biddulph JP. All-cause mortality and the case for age specific alcohol consumption guidelines: pooled analyses of up to 10 population-based cohorts. *BMJ.* 2015;350:h384.
44. Holmes MV, Dale CE, Zuccolo L, et al. Association between alcohol and cardiovascular disease: Mendelian randomisation analysis based on individual participant data. *BMJ;* 2014;349:g4164.
45. Naimi TS, Brown DW, Brewer RD, et al. Cardiovascular risk factors and confounders among nondrinking and

- moderate-drinking US adults. *Am J Prev Med.* 2005;28(4):369–73.
46. Rosoff DB, Davey Smith G, Mehta N, Clarke TK, Lohoff FW. Evaluating the relationship between alcohol consumption, tobacco use, and cardiovascular disease: A multivariable Mendelian randomization study. *PLoS Med.* 2020;17:e1003410
  47. Mukamal KJ, Jensen MK, Gronbaek M, Stampfer MJ, Manson JE, Pischon T, Rimm EB. Drinking frequency, mediating biomarkers, and risk of myocardial infarction in women and men. *Circulation.* 2005;112:1406-1413
  48. Collins MA, Neafsey EJ, Mukamal KJ, Gray MO, Parks DA, Das DK, Korthuis RJ. Alcohol in moderation, cardioprotection, and neuroprotection: epidemiological considerations and mechanistic studies. *Alcohol Clin. Exp. Res.* 2009;33:206-219.
  49. Lindsay J, Laurin D, Verreault R, Hebert R, Helliwell B, Hill GB, McDowell I. Risk factors for Alzheimer's disease: a prospective analysis from the Canadian Study of Health and Aging. *Am. J. Epidemiol.* 2002;156: 445-453.
  50. Larrieu S, Letenneur L, Helmer C, Dartigues JF, Barberger-Gateau P. Nutritional factors and risk of incident dementia in the PAQUID longitudinal cohort. *J. Nutr. Health Aging.* 2004;8:150-154.
  51. Arntzen KA, Schirmer H, Wilsgaard T, Mathiesen EB. Moderate wine consumption is associated with better cognitive test results: a 7 year follow up of 5033 subjects in the Tromso Study. *Acta Neurol. Scand. Suppl* 2010;23-29.
  52. Johansen D, Friis K, Skovenborg E, Gronbaek M. Food buying habits of people who buy wine or beer: cross sectional study. *BMJ.* 2006;332: 519-522.
  53. Klatsky AL, Armstrong MA, Kipp H. Correlates of alcoholic beverage preference: traits of persons who choose wine, liquor or beer. *Br. J. Addict.* 1990;85:1279-1289.
  54. Barefoot JC, Gronbaek M, Feaganes JR, McPherson RS, Williams RB, Siegler IC. Alcoholic beverage preference, diet, and health habits in the UNC Alumni Heart Study. *Am. J. Clin. Nutr.* 2002;76:466-472.
  55. Paschall M, Lipton RI. Wine preference and related health determinants in a U.S. national sample of young adults. *Drug Alcohol Depend.* 2005;78:339-344.
  56. Vinson DC, Maclure M, Reidinger C, Smith GS. A population-based case-crossover and case-control study of alcohol and the risk of injury. *J Stud Alcohol Drugs.* 2003; 64:358-66.
  57. Nelson DE, Jarman DW, Rehm J, et al. Alcohol-attributable cancer deaths and years of potential life lost in the United States. *Am J Public Health.* 2013;103(4): 641-8.
  58. Parsons OA. Neurocognitive deficits in alcoholics and social drinkers: A continuum? *Alcohol Clin Exp Res.* 1998;22(4):954-961.
  59. Beatty WW, Tivis R, Stott HD, Nixon SJ, Parsons OA. Neuropsychological deficits in sober alcoholics: Influences of chronicity and recent alcohol consumption. *Alcohol Clin Exp Res* 2000;24(2):149-154.
  60. Parsons OA, Nixon SJ. Cognitive functioning in sober social drinkers: A review of the research since 1986. *J Stud Alcohol.* 1998;59(2):180-190.
  61. Eckardt MJ, File SE, Gessa GL. et al. Effects of moderate alcohol consumption on the central nervous system. *Alcohol Clin Exp Res.* 1998;22(5):998-1040.
  62. Gillian Fuller. Palm Beach Post. 100 Year Old Woman Says Booze Key To Longevity; 2015. Available:[http://www.palmbeachpost.com/news/lifestyles/100-year-old-woman-says-booze-key-longevity/nmZgL/?ecmp=pbp\\_social\\_twitter\\_2015\\_sfp#\\_\\_federated=1](http://www.palmbeachpost.com/news/lifestyles/100-year-old-woman-says-booze-key-longevity/nmZgL/?ecmp=pbp_social_twitter_2015_sfp#__federated=1)
  63. Di Castelnuovo A, Costanzo S, Bagnardi V, Donati M, Iacoviello L, de Gaetano G. Alcohol Dosing and Total Mortality in Men and Women. *Arch Intern Med.* 2006;166(22):2437-45.
  64. Rehm J, Shield K. Alcohol consumption. In: Stewart BW, Wild CB, eds. *World Cancer Report 2014*. Lyon, France: International Agency for Research on Cancer; 2014.
  65. Lindsay R, Halladay, Adrina Kocharian, Patrick T. Piantadosi, Michael E. Authement, Abby G. Lieberman, Nathen A. Spitz, Kendall Coden, Lucas R. Glover, Vincent D. Costa, Veronica A. Alvarez, Andrew Holmes. Prefrontal regulation of punished ethanol self-administration. *Biological Psychiatry*; 2019. DOI: 10.1016/j.biopsych.2019.10.030
  66. White A. What Happened? Alcohol, Memory Blackouts and the Brain. *Alcohol Research & Health.* 2003;27(2):186-196.

67. Oscar-Berman M, Shagrin B, Evert DL, Epstein C. Impairments of brain and behaviour: The neurological effects of alcohol. *Alcohol Health Res World*. 1997;21(1):65-75.
68. Giancola PR, Moss HB. Executive cognitive functioning in alcohol use disorders. In: Galanter, M., ed. *Recent Developments in Alcoholism: The Consequences of Alcoholism*. New York: Plenum Press. 1998;14:227-251.
69. Elena Lobo; Carole Dufouil; Guillermo Marcos; Bernardo Quetglas; Pedro Saz; Eliseo Guallar; Antonio Lobo. Is there an Association between Low-to-moderate Alcohol Consumption and Risk of Cognitive Decline? *American Journal of Epidemiology*. 2010;172(6):708-716.
70. Menizibeya Osain, Vladimir Pereverzev Alekseevic. The effect of alcohol use on academic performance of university students. *Ann Gen Psychiatry*. 2010; 9(Suppl 1): S215.
71. Otto Warburg, Franz Wind, and Erwin Negelein. The metabolism of tumors. *Journal of General Physiology*. 1927;8(6):519-530.
72. Koppenol W, Bounds P, Dang C. Otto Warburg's contribution to current concepts of cancer metabolism. *Nat. Rev. Cancer*. 2011;11:325-337.
73. Cunningham FH, Fiebelkorn S, Johnson M, Meredith C. A novel application of the Margin of Exposure approach: segregation of tobacco smoke toxicants. *Food and Chemical Toxicology*. 2011;49 (11): 2921–33. DOI:10.1016/j.fct.2011.07.019
74. Kastan MB. DNA damage responses: mechanisms and roles in human disease: 2007 G.H.A. Clowes Memorial Award Lecture. *Molecular Cancer Research*. 2008 ;6 (4):517–24. DOI:10.1158/1541-7786.MCR-08-0020
75. Sacks JJ, Gonzales KR, Bouchery EE, Tomedi LE, Brewer RD. 2010 National and State Costs of Excessive Alcohol Consumption. *Am J Prev Med*. 2015;49(5): e73-e79. DOI: 10.1016/j.amepre.2015.05.031
76. Lander L, Howsare J, Byrne M. The Impact of Substance Use Disorders on Families and Children: From Theory to Practice. *Soc Work Public Health*. 2013;28(3-4):194-205. DOI:10.1080/19371918.2013.759005
77. Wilson IM, Graham K, Taft A. Alcohol interventions, alcohol policy and intimate partner violence: a systematic review. *BMC Public Health*: 2014;14:881. DOI:10.1186/1471-2458-14-881
78. Silbert MH, Pines AM, Lynch T. Substance abuse and prostitution. *J Psychoactive Drugs*. 1982;14(3):193-7.
79. Ugeskr Laeger. Street prostitution and drug addiction. *Am. J. Epidemiol*. 2004;160 (3):240-247. DOI: 10.1093/aje/kwh206
80. Available: <https://www.news-medical.net/health/What-is-Abstinence.aspx>
81. Fernandez DP, Kuss DJ, Griffiths MD. Short-term abstinence effects across potential behavioral addictions: A systematic review. *Clin Psychol Rev*. 2020;76:101828. DOI: 10.1016/j.cpr.2020.101828
82. Pfefferbaum A, Rosenbloom M, Crusan K, Jernigan TL. Brain CT changes in alcoholics: Effects of age and alcohol consumption. *Alcohol Clin Exp Res*. 1988;12(1):81-87.
83. Pfefferbaum A, Lim KO, Zipursky RB et al. Brain gray and white matter volume loss accelerates with aging in chronic alcoholics: A quantitative MRI study. *Alcohol Clin Exp Res*. 1992;16(6):1078-1089.
84. Lyvers M. Loss of control in alcoholism and drug addiction: A neuroscientific interpretation. *Exp Clin Psychopharmacol*. 2000;8(2):225-249.
85. Sullivan EV, Rosenbloom MJ. Alcohol and the cerebellum: Effects on balance, motor coordination, and cognition. *Alcohol Health Res World*. 1995;19(2):138-141.
86. Eberling JL, Jagust WJ. Imaging studies of aging, neurodegenerative disease, and alcoholism. *Alcohol Health Res World*. 1995;19(4):279-286.
87. Chakravorty S, Chaudhary NS, Brower KJ. Alcohol dependence and its relationship with insomnia and other sleep disorders. *Alcohol Clin Exp Res*. 2016;40(11):2271-2282. Available:<https://doi.org/10.1111/acer.13217>
88. Available:<https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/alcohol-facts-and-statistics>
89. Szigethy E, Frieman E. In: *Combined psychotherapy and pharmacology*. Kaplan & Sadock's *Comprehensive Textbook of*

- Psychiatry. 9th ed. Sadock BJ, Sadock VA, Ruiz P, editors. Philadelphia: Wolters Kluwer, Lippincott Williams & Wilkins. 2009;2923–31.
90. Petrakis IL, Limoncelli D, Gueorguieva R, Jatlow P, Boutros NN, Trevisan L, et al. Altered NMDA glutamate receptor antagonist response in individuals with a family vulnerability to alcoholism. *Am J Psychiatry*. 2004;161:1776–82.
91. Miller WR, Tonigan JS, Longabaugh R. National Institute on Alcohol Abuse and Alcoholism (U.S.): The Drinker Inventory of Consequences (DriC): an instrument for assessing adverse consequences of alcohol abuse: Test manual, Rockville, MD: U.S. Dept. of Health and Human Services, Public Health Service, National Institutes of Health, National Institute on Alcohol Abuse and Alcoholism; 1995.
92. Miller NS. Pharmacotherapy in alcoholism. *J Addict Dis*. 1995;14:23–46.
93. Sachdeva A, Choudhary M, Chandra M. Alcohol Withdrawal Syndrome: Benzodiazepines and Beyond; 2015.
94. Williams SH. Medications for treating alcohol dependence. *American Family Physician*. 2005;72(9):1775–80.
95. Pettinati HM, Rabinowitz AR. Choosing the right medication for the treatment of alcoholism. *Current Psychiatry Reports*. 2006;8(5):383–88. DOI:10.1007/s11920-006-0040-0
96. Rösner S, Hackl-Herrwerth A, Leucht S, Vecchi S, Srisurapanont M, Soyka M, Srisurapanont M (ed.). Opioid antagonists for alcohol dependence. *The Cochrane Database of Systematic Reviews*. 2010; (12):CD001867. DOI:10.1002/14651858.CD001867
97. Bouza C, Angeles M, Magro A, Muñoz A, Amate JM. Efficacy and safety of naltrexone and acamprosate in the treatment of alcohol dependence: a systematic review. *Addiction*. 2004;99(7): 811–28. DOI:10.1111/j.1360-0443.2004.00763.x
98. Lingford-Hughes AR, Welch S, Peters L, Nutt DJ. British Association for Psychopharmacology, Expert Reviewers Group. "BAP updated guidelines: evidence-based guidelines for the pharmacological management of substance abuse, harmful use, addiction and comorbidity: recommendations from BAP". *Journal of Psychopharmacology*. 2012;26(7):899–952.
99. Miranda R Jr., MacKillop J, Monti PM, Rohsenow DJ, Tidey J, Gwaltney C, et al. Effects of topiramate on urge to drink and the subjective effects of alcohol: a preliminary laboratory study. *Alcohol Clin Exp Res*. 2008;32: 489–97.
100. Paparrigopoulos T, Tzavellas E, Karaiskos D, Kourlaba G, Liappas I. Treatment of alcohol dependence with low-dose topiramate: an open-label controlled study. *BMC Psychiatry*. 2011;11:41. DOI:10.1186/1471-244X-11-41
101. Wetherill, R.R., Spilka, N., Jagannathan, K. et al. Effects of topiramate on neural responses to alcohol cues in treatment-seeking individuals with alcohol use disorder: preliminary findings from a randomized, placebo-controlled trial. *Neuropsychopharmacol*. 2021;46:1414–1420. Available: <https://doi.org/10.1038/s41386-021-00968-w>
102. Leggio L, Garbutt JC, Addolorato G. Effectiveness and safety of baclofen in the treatment of alcohol dependent patients. *CNS Neurol Disord Drug Targets*. 2010;9:33–44.
103. Addolorato G, Leggio L, Abenavoli L, Agabio R, Caputo F, Capristo E, et al. Baclofen in the treatment of alcohol withdrawal syndrome: A comparative study vs diazepam. *Am J Med*. 2006;119:276–e13-8.
104. Rozatkar AR, Kapoor A, Sidana A, Chavan BS. Clinical experience of baclofen in alcohol dependence: A chart review. *Ind Psychiatry J*. 2016; 25(1): 11-16. DOI: 10.4103/0972-6748.196043. PMID: 28163402; PMCID: PMC5248409

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