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# Alcoholic Beverages and Human Health: An Overview

*Oladipo Iyabo Christianah*

## Abstract

Production of alcohol is by fermentation of yeast, sugar, and starches. The consumption of which may be associated with some underlining risk factor depending on the quantity consumed per time. Alcohol can be consumed raw or by mixing in beverages, and whenever an alcoholic beverage is consumed, it can take about an hour for the body to metabolize one-eighth of an imperial gallon. The level of the blood alcohol is increased when the quantity of alcohol consumed exceeds the normal dose which the body could metabolize, and then intoxication sets in. The higher the blood alcohol concentration, the higher the risk of diseases associated with the liver, kidney, and pancreas and the abundance of free radicals in the body system. Excessive use of alcohol can lead to alcoholism or alcohol dependence. Withdrawal from which can be life-threatening. Disulfiram, naltrexone, and acamprosate are the three approved oral medications for the treatment of alcoholism or alcohol dependence. On the other hand, moderate consumption of alcohol or red wines has been confirmed to be beneficial to human health particularly because of the antioxidant properties it confers.

**Keywords:** alcoholism, alcohol dependence, alcohol addiction, alcohol withdrawal, signs and symptoms

## 1. Introduction

Alcohol are organic compounds identified by one or more hydroxyl ( $\text{-OH}$ ) groups attached to a carbon atom of an alkyl group [1]. Alcohol is often considered as organic derivatives of water in which one of the hydrogen atoms has been replaced by an alkyl group, typically represented by R in organic structures. There are different types of alcohol: propyl, methyl, ethyl, and butyl alcohol, but for the production of alcoholic beverages, ethyl alcohol (ethanol) is the type used, while death or blindness could result if the other three are consumed at all [2]. Ethanol is normally produced from the fermentation of yeast, sugar, and starches [3]. It can also be consumed mixed in beverages or in its raw form, but the end product after digestion by the body is formaldehyde, which is deleterious to the body and also the cause of alcohol poisoning. Liver cirrhosis, gastric ulcers, gastritis, fatty liver, alcoholic hepatitis, and pancreatitis are examples of some disorders resulting from alcohol intoxication. Moderate consumption of alcohol may have some health benefits that could prolong life, but when taken in excess or as an escape route from problems, then abuse or alcoholism is inevitable.

Abuse of alcohol usually leads to alcohol use disorder also known as alcoholism or alcohol addiction which can lead to a violent behavior. Addiction to alcohol refers

to physical and psychological dependency on alcohol to the point that tolerance is built up to alcohol [4]. Furthermore, once the body becomes adapted to excessive consumption of alcohol, an abrupt discontinuation leads to withdrawal symptoms which can be a threat to life and the symptoms normally includes hallucination, tremors, convulsions, anxiety, etc. Alcohol addiction may also result in the following: restlessness, depression, erratic behavior, decreased involvement in extracurricular activities, loss of interest in work or school, lack of interest in relationships, preoccupation with drinking, inability to control drinking, and violent behavior. While, nonalcoholic beverage refers to any drink that contains no alcohol or which contains less than 0.5% alcohol by volume and examples are fruit juices, mineral water, hot drinks etc.

## **2. Alcohol and alcoholic beverages**

There are different types of alcohol based on their uses; some are used as solvents, antifreeze solutions, e.g., isopropyl and methyl alcohol, paint removers in chemistry laboratories and chemical factories, and as nail polish remover and cleansing solvent, for example, methylated spirit for domestic use [5]. There are different types of alcohol depending on the number of carbon atoms present and the position of the OH bond in the formula, but the most common alcohol is ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$  or  $\text{C}_2\text{H}_5\text{OH}$ ). During the process called fermentation, alcohol is produced. Fermentation of yeast usually results into sugar breaking down into carbon dioxide and alcohol. But carbon dioxide is taking off the process through gas bubbles leaving a mixture of water and ethanol. Sugar fermentation to alcohol can be used in different applications especially in the production of alcoholic beverages, for example, the extracts of grapes and barley are fermented in the wine and beer industry to produce alcoholic beverages. Any drink or beverage that contains ethanol is normally referred to as alcoholic beverage and are either produced by fermentation or distillation. There are different types of alcoholic and nonalcoholic beverages. Alcoholic drinks can be classified into five categories: (i) Wine, i.e., still, sparkling, fortified, or aromatized; (ii) beer, i.e., ales, lagers, and stouts; (iii) cider and perry; (iv) distilled spirits, i.e., vodka, gin, rum, whiskey, brandy, and others; and (v) liqueurs, i.e., flavored with fruit, citrus, herb, kernel, flower, cream, and berry. And nonalcoholic drinks can be classified into four categories: (i) Hot drinks, i.e., tea, coffee, and chocolate; (ii) fruit juices; (iii) mineral waters; and (iv) cordials/syrups.

## **3. Alcohol and human health**

Alcohol has a complex mode of action and is majorly a depressant on the central nervous system, and the brain is affected in the process. It activates the release of the chief inhibitory neurotransmitter in the central nervous system by binding to GABA (gamma-aminobutyric acid) receptors in the brain. Absorption of alcohol which takes place from the intestine is reduced by fatty foods, and alcohol is distributed into body water. Alcoholic beverages contain ethyl alcohol, and research has shown that utilization of alcohol has here and now mental and physiological impacts on the consumer [6, 7]. Diverse absorption of alcohol in the human body affects a man, and the impacts of alcohol rely upon the quantity an individual has consumed, the level of alcohol in the mixed drinks and the time length that the utilization occurred, the measure of sustenance eaten and whether an individual has taken other remedies, and over-the-counter or road drugs, among different

elements. Alcohol in carbonated drinks is absorbed faster than alcohol in noncarbonated drinks [6, 7].

Blood alcohol concentration (BAC) is dependent on amount and time range of alcohol utilization, muscle to fat ratio and weight, and nourishment impacts. Overabundance utilization of alcohol on an unfilled stomach over a brief timeframe range as a rule results to higher BAC. Drinking enough to cause a blood alcohol concentration (BAC) of 0.03–0.12% ordinarily causes a general perking up and conceivable happiness; expanded self-assurance and amiability; diminished nervousness; a flushed, red appearance in the face; impeded judgment; and fine muscle coordination. A BAC from 0.09 to 0.25% causes torpidity, sedation, adjust issues, and obscured vision. A BAC from 0.18 to 0.30% causes significant disarray, hindered discourse (e.g., slurred discourse), unsteadiness, and spewing [6, 7]. A BAC from 0.25 to 0.40% causes trance, obviousness, anterograde amnesia, retching (passing may happen because of inward breath of regurgitation (pneumonic goal) while oblivious), and respiratory melancholy (possibly dangerous). A BAC from 0.35 to 0.80% causes a state of unconsciousness (obliviousness), hazardous respiratory misery, and potentially deadly alcohol harming. Likewise with every mixed drink, drinking while at the same time driving, working an airship, or substantial hardware builds the danger of a mishap; numerous nations have punishments against driving while intoxicated [8].

Metabolization of 90% of consumed alcohol takes place in the liver; alcohol is converted to acetaldehyde by dehydrogenase (which is a sympathomimetic toxin responsible for “hangover”). Then, acetaldehyde is metabolized to acetic acid by aldehyde dehydrogenase and finally to carbon dioxide and water. Alcohol can then be excreted from the body through the sweat, lungs, and urine.

The regular consumption of alcohol, despite the bad effects it has on human’s life, is called addiction or alcoholism. The causes of alcoholism usually include one or more of the following: peer pressure, usage of alcohol as remedy for mental ill health, alcoholism gene, influence of an alcoholic parent, etc. The abuse of alcohol results in over a million deaths in teenagers and young adults due to accidents every year all over the world [9]. Alcohol abuse occurs when all or one of the following happens: (i) Excess alcohol consumption in a social gathering, (ii) drinking and driving, (iii) alcohol consumption throughout the day, (iv) alcohol consumption to feel high, and (v) the need to drink alcohol every day.

Cognitive ability is impaired due to alcohol consumption, for example, in occasional and moderate drinkers the following occurs: memory impairment, blackout, recklessness, and impaired decision-making. While the following results in heavy and/or chronic drinkers: diminished brain size, inability to think abstractly, loss of visuospatial abilities, Wernicke-Korsakoff syndrome, loss of memory, and poor attention span. There are five different types of alcoholics which are (i) young adult subtype which includes young adults whose family have no history of alcoholism or mental ill health; (ii) young antisocial subtype, also includes young adult with a family history of alcoholism, mental ill health, and other addictions; (iii) functional subtype, this includes gainfully employed and successful middle-aged with a supportive family; they have a family history of alcoholism while some of them may have a history of depression (iv) intermediate familial subtype, these are middle-aged people with prior episode of depression and a family history of alcoholism, (v) chronic severe subtype are the middle-aged people with family histories of alcoholism, mental ill health, and other addictions [10].

### **3.1 Toxicity of alcohol**

The toxic metabolic effects of alcohol are due both to its direct action when few percent of it enter the bloodstream from the stomach and that of its first metabolite

called acetaldehyde (belongs to the same chemical family with formaldehyde) which is highly toxic to man [11]. Alcohol increases the rate of generation of free radicals in the body system and also inhibits the antioxidant levels thus inducing oxidative stress [6]. The excessive consumption of alcohol can also result in immunodeficiency and immunosuppressant thus exposing such individual to different kinds of infections. Research has shown that the consumption of alcohol is one of the causes of acute illness and chronic diseases throughout the world today [7].

### **3.2 Alcohol and pregnancy**

Consumption of alcohol during pregnancy can have deleterious effects on the fetus not only in the first trimester but also throughout pregnancy as alcohol can move by the umbilical cord and placenta from the mother's bloodstream to the fetus. Alcohol consumption can cause havoc on the pregnancy before a woman is aware of the pregnancy. The havoc that can be caused on pregnancy includes miscarriage, birth deformities, retarded growth, and mental defects [2]. Excessive consumption of alcohol in pregnant women results in fetal alcohol syndrome (FAS) or fetal alcohol spectrum disorders (FASD) characterized with irreversible mental and physical changes to the baby. Fetal alcohol syndrome (FAS) may cause skeletal and facial abnormalities, growth retardation, mental disorders, and heart defects, while in fetal alcohol spectrum disorders (FASD), hyperactivity, life-long learning disabilities, poor attention span, speech or language delays, poor memory, and other disorders may result [12–14]. It is generally advised that drinking should be completely avoided by pregnant women.

### **3.3 Alcohol's effects on the body**

Frequent alcohol consumption can be deleterious to human's health by affecting the following: (i) Brain: the communicative pathways of the brain are disrupted which may result in mood swing, lack of coordination, and coherence. (ii) Heart: it may also affect the heart by causing cardiomyopathy, arrhythmias, stroke, and high blood pressure. (iii) Liver: different types of problems may occur in the liver including liver inflammations, cirrhosis, alcoholic hepatitis, fibrosis and steatosis, or fatty liver [15]. (iv) Pancreas: heavy consumption of alcohol may cause the blood vessels in the pancreas to be swollen and inflamed thereby preventing proper digestion [16]. (v) Skin: abuse and consumption of alcohol can cause a variety of skin disorders [17]. Thermoregulation of the body also results in skin vasodilation and sweating [18]. (vi) Cancer: heavy drinkers stand the chance of developing cancers like cancer of the mouth, esophagus, throat, liver, and breast [16, 19]. Alcohol meddles with folate assimilation and function in the body, which may be one way alcohol can build danger of causing specific cancers. (vii) Immune system: alcoholism results in immune system being compromised, and the body is easily prone to diseases like pneumonia and tuberculosis.

## **4. Signs and symptoms of alcohol abuse and addiction**

Some of the signs and symptoms of alcoholism includes the following in most adults: stomach pains, vomiting or nausea, redness of the face during or after periods of consumption, delayed reflexes, loss of consciousness or blacking out, slurred or incoherent speech, poor balance, and clumsiness. Alcoholics reach a level that the breathing is affected due to depression of the respiratory system which sometimes results into death. Some alcoholics become dependent on alcohol

up to a point that their health, work, and relationship are neglected [20]. Signs of alcohol abuse include the following: insomnia, anger, loss of control and attention, etc. Alcoholism if untreated results in addiction identified by dependency. Signs of alcohol dependence are tolerance to increase in alcohol consumption, hangover, unsuccessful attempt to reduce consumption, alcohol withdrawal symptoms when alcohol is not consumed, etc. Seizures, extreme agitation or anxiety, hallucinations, nausea or vomiting, tremors, convulsions, uncontrolled shaking of the hands, persistent insomnia, and profuse sweating are some of the symptoms of withdrawal from alcohol indicative of advanced stage of addiction and should not be handled lightly [11]. Medical detoxification is usually the treatment given to alcoholism.

## **5. Side effects of alcohol withdrawal**

Withdrawal from alcohol normally kicks off between 6 and 24 hours after the last drink, and withdrawal has been categorized into three stages according to their severity: (i) stage one which is the mild stage involves tremors, abdominal pain and/or vomiting, foggy thinking, anxiety, insomnia, nausea, loss of appetite, fatigue, depression, mood swings, and heart palpitations; (ii) stage two which is the moderate stage also involves mental confusion; irregular heart rate; profuse sweating; irritability; increased blood pressure, body temperature, and respiration; and heightened mood disturbances; and (iii) stage three which is the severe stage is often called the delirium tremens. It is characterized by fever, agitation, severe confusion, hallucination, and seizures. Delirium tremens often occur in about 3–5% alcohol withdrawal individuals. It normally kicks off without warning at 24 or 48 hours after alcohol leaves the bloodstream. Withdrawal from alcohol is influenced by factors such as stress level, family history of addiction, co-occurring mental ill health, childhood trauma, drinking duration, and quantity consumed. It can also be influenced by combined use of alcohol and other drugs thereby increasing the potential for dangers and other side effects. Withdrawal from alcohol can in some cases cause the death of an addict as the central nervous system and the brain are normally affected by continuous suppression by alcohol for a long period of time.

Withdrawal from alcohol has no definite timeline, but a general timeline has been detailed as follows: the first stage normally begins 8 hours after the first drink, while the second and third stages occur rapidly, and symptoms peak between 24 and 72 hours. Symptoms may then start to wear off 5–7 days later, but psychological symptoms may be prolonged for several weeks [21].

Physical symptoms are monitored and controlled up to a stable point during detoxification which is often achieved by medications. Restoration of the natural order to the overactivity of the central nervous system can be accomplished by using benzodiazepines during alcohol detoxification. Dangerous side effects of alcohol withdrawal can be avoided by gradual and controlled weaning of alcohol out of the body.

### **5.1 Managing withdrawal symptoms**

Thought of suicide, anxiety, and depression can be controlled with medications alongside therapy and counseling. Disulfiram, naltrexone, and acamprosate are the three approved medications used to control alcohol cravings in the treatment of alcohol withdrawal. Naltrexone operates by blocking the opioid receptors in the brain, thereby reducing cravings for drinking, while long-term withdrawal symptoms are taken care of by acamprosate. Disulfiram makes drinking undesirable by making people sick if they drink. Another promising medication in the treatment of alcohol use disorders is topiramate [2].

## **6. Beneficial effects of alcohol**

Red wines have been known to have antioxidant properties because they contain substances like resveratrol (polyphenol) and flavonoids which confer cardioprotective effects to the heart. Antioxidants also protect against artery damage by increasing levels of high density lipoprotein (HDL). So, moderate consumption of alcohol or red wines has been confirmed to be beneficial to human health. But it should not be used as an excuse to start drinking as it can be addictive or cause other health problems [2].

Also, it is generally known that red wine contains the most resveratrol, the antioxidant found in grape skin that may improve the health of the heart by counteracting blood vessel harm and also diminishing LDL cholesterol. Additionally, the flavonoids contained in red wine are another vital cancer prevention agent. It must then be noted that most research carried out have been on animals, and the measure of wine to be taken by an individual to level with a similar sum given to mice would neutralize any of the assumed advantages. Likewise, the 129 calories contained in a glass can accumulate, regardless of whether an individual is just drinking one daily [22]. Red wine also contains histamine that can cause headache assaults or different kinds of manifestations that happen from a histamine prejudice.

## **7. Treatment of alcohol abuse and alcoholism**

Alcoholism treatment involves serious medical, family, and social support, while interventions like group support, individual counseling, stepped therapy, and medications are usually advocated for alcohol dependence. Three approved medications for medical treatments of alcohol dependence are naltrexone (Depade, ReVia), disulfiram (Antabuse), and acamprosate (Campral) and an injectable long-acting form of naltrexone (Vivitrol). The medication may reduce relapses and drinking and may result to total recovery and abstinence from alcohol. Naltrexone and acamprosate have been recommended as treatment alternative for alcohol dependence together with behavioral therapy in a review, but disulfiram has not been recommended for routine use in primary care as proof of its ability to increase abstinence rates or decrease relapse rates or cravings compared with placebo as not been shown [4].

## **8. Alcohol detoxification**

Alcohol detoxification is the process by which the system of a heavy drinker is returned to normal after prolonged period of alcohol abuse. It normally involves medical treatment and counseling. The detoxification process involves three steps: (i) Step one (intake) involves a comprehensive review of drug, psychiatric, and medical histories of patients to fully understand the situation, (ii) step two (stabilization) which involves medical and psychological therapies to help a patient reach a balance of mind and body, and (iii) step three (medication) which involves medications that mimic the effects of alcohol to mitigate withdrawal symptoms. Some of the unpleasant side effects of detoxification may include nausea, insomnia, mood swing, muscle weakness, and nervousness, while kidney or liver dysfunction, seizures, extreme nausea, aspiration pneumonia, heart arrhythmias, fever, and hallucinations are examples of some of the severe side effects of alcohol detoxification. Medications are used to avoid physiological upsets and system imbalance during detoxification. Benzodiazepines are used to reduce alcohol withdrawal symptoms

and also prevent alcohol withdrawal seizures which are the most common causes of fatality in alcohol withdrawal [23].

## 9. Nonalcoholic drink

Beverage without an alcohol is usually referred to as a nonalcoholic drink. There are different varieties of nonalcoholic beverages; examples are soft drinks, nonalcoholic beers like root beer, mineral water, aerated/carbonated, hot and cold drinks, mocktails, etc. These nonalcoholic beverages perform one or more of the following functions: (i) supply vitamins and nutrient required by the body, (ii) provide energy, (iii) hydrate, (iv) supply of the necessary calories and sugar required by the body, and (iv) some can be used as aperitif or palate stimulant.

Some beverages like soft drink, juice, and apple cider naturally may contain little amounts of alcohol. Distillation of ethanol is often to separate alcoholic drinks into what are commercially called spirit and nonalcoholic drinks. Purification of alcoholic drinks to 0.00% alcohol by volume by distillation is impossible. Furthermore, most drinks with the label nonalcoholic contain 0.5% ABV as it brings more profit than distilling it to 0.05% ABV normally found in products sold by companies specialized in nonalcoholic drinks [24]. It is said by some people that the sign nonalcoholic on drinks is misleading and therefore a threat to recovering alcoholics due to the psychoactive nature of alcohol.

Nonalcoholic beer may be beneficial to other people, but it is not advised to be consumed by a recovering alcoholic. According to a study which was conducted on some Spanish nuns who drank nonalcoholic beer for 45 days and had an increased antioxidant levels in their bloodstream, nonalcoholic beer could have positive impacts on the cardiovascular system. Among the disadvantages are (i) the perception of most people is that nonalcoholic beer does not have the rich flavor of normal alcoholic beer; (ii) most nonalcoholic beer contains a small amount of alcohol, which could result into relapse for recovering alcoholics; (iii) research has made it clear that the smell of any kind of beer may trigger cravings in the alcoholic's mind, and the level of dopamine in the brain may be raised; and (iv) there is a fear of being stigmatized as the only one not drinking alcohol in a social gathering.

## 10. Conclusions

Conclusively, drinks that contain ethanol are regularly alluded to as mixed refreshment and are either produced by fermentation or distillation. The utilization of which might be related with some underlining hazard factor contingent upon the amount devoured per time. The consistent utilization of alcohol, regardless of the terrible impacts it has on human's life, dependence, alcohol addiction, and withdrawal from which can be dangerous. Alcohol expands the rate of production of free radicals in the body framework and furthermore represses the antioxidant levels along these lines instigating oxidative stress. The unnecessary utilization of alcohol can likewise result in immunodeficiency and immunosuppressant subsequently presenting such individual to various types of infections. The causes of alcoholism range from alcoholism gene, peer pressure, to influence of an alcoholic parent, among others. The three affirmed oral pharmaceuticals for the treatment of alcohol addiction or dependence are disulfiram, naltrexone, and acamprosate. While, nonalcoholic beverages alludes to any drink that contains no alcohol or which contains under 0.5% alcohol by volume. Moderate consumption of alcohol or red wines has been affirmed to be gainful to human well-being especially on

account of the cancer prevention agent properties it gives. Some other positive effects like reduction of diabetes, stroke, and coronary heart disease have been associated with moderate consumption of alcohol particularly among middle-aged and older men and women.

### **Conflict of interest**

The authors hereby declare that there is no conflict of interest.

### **Author details**

Oladipo Iyabo Christianah  
Department of Science Laboratory Technology, Ladoke Akintola University of  
Technology, Ogbomoso, Oyo State, Nigeria

\*Address all correspondence to: [xtiecoker@gmail.com](mailto:xtiecoker@gmail.com)

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