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Effect of Alcohol Metabolism on Digestive System

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ABSTRACT: Digestive system includes more than just your stomach and intestines. It also includes your mouth, throat, esophagus, liver, pancreas, and anus. Each of these organs serves a purpose in the process of ingesting, digesting, and absorbing the nutrients in the foods you eat and removing waste from your body. Frequent or excess consumption of alcohol can damage these organs. That's because your digestive system doesn't treat alcohol like it does the good nutrients found in food. Your body prioritizes the elimination of alcohol ahead of other nutrients. It absorbs alcohol throughout the digestive system for speedy elimination.

Not only does alcohol metabolism occur in your liver, but also in other cells in your body where it is converted into a toxic chemical called acetaldehyde which can damage DNA and prevent cells from repairing the damage. In fact, alcohol and acetaldehyde are classified as Group 1 carcinogens – cancer-causing agents – equal in their toxicity to tobacco smoke and asbestos. Here's how alcohol affects each portion of your digestive system:

- Your mouth and throat – Alcohol quickly penetrates your mouth's saliva and, when converted to acetaldehyde, can damage the tissues in your mouth. A British study found that approximately one-third of mouth and throat cancers were caused by drinking alcohol. Not only that, but when combined with smoking, alcohol may increase the risk of mouth cancer.
- Your esophagus – Once you swallow alcohol, it can damage the cells of your esophagus (the long tube running from your mouth to your stomach) and can increase your risk of cancer of the esophagus. Also, it can cause acid reflux, which also can damage cells and increase your cancer risk.
- Your stomach – Here is where alcohol lingers for a while, being absorbed into both your bloodstream and small intestine. Whether you drink occasionally or regularly, alcohol can interfere with stomach function. For one thing, it can affect acid production, diminishing your stomach's ability to destroy harmful bacteria that enters the stomach, allowing it to enter your upper small intestine. This can also damage the mucous cells meant to protect your stomach wall from being damaged by acid and digestive enzymes, thus inducing inflammation and lesions. In addition, beverages with more than 15 percent alcohol volume can delay stomach emptying, which can cause bacterial degradation of food and abdominal discomfort.
- Your liver – The main role of this vital organ is to remove toxins from the body. However, the liver breaks down alcohol in several different ways, all of which lead to the conversion of alcohol into acetaldehyde, which poisons cells and causes inflammatory changes in the liver. This can lead to fatty liver disease, which is an increase in fat production in the liver. It can also lead to cell and tissue damage from the toxic by-products produced when alcohol is metabolized.
- Your intestines – Whatever food that is undigested passes from the small intestine to the large intestine and is then expelled from the body through the anus. Alcohol reaches the large intestine by way of your bloodstream, where it can increase the risk of bowel cancer. Research suggests that people who drink moderately (as many as four drinks a day) and heavily (more than four drinks per day) are at a higher risk of colorectal cancer – an increase of 21 percent and 52 percent, respectively, compared to people who don't drink alcohol.

KEYWORDS: alcohol, metabolism, digestive, liver, toxicity, diseases

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I. INTRODUCTION

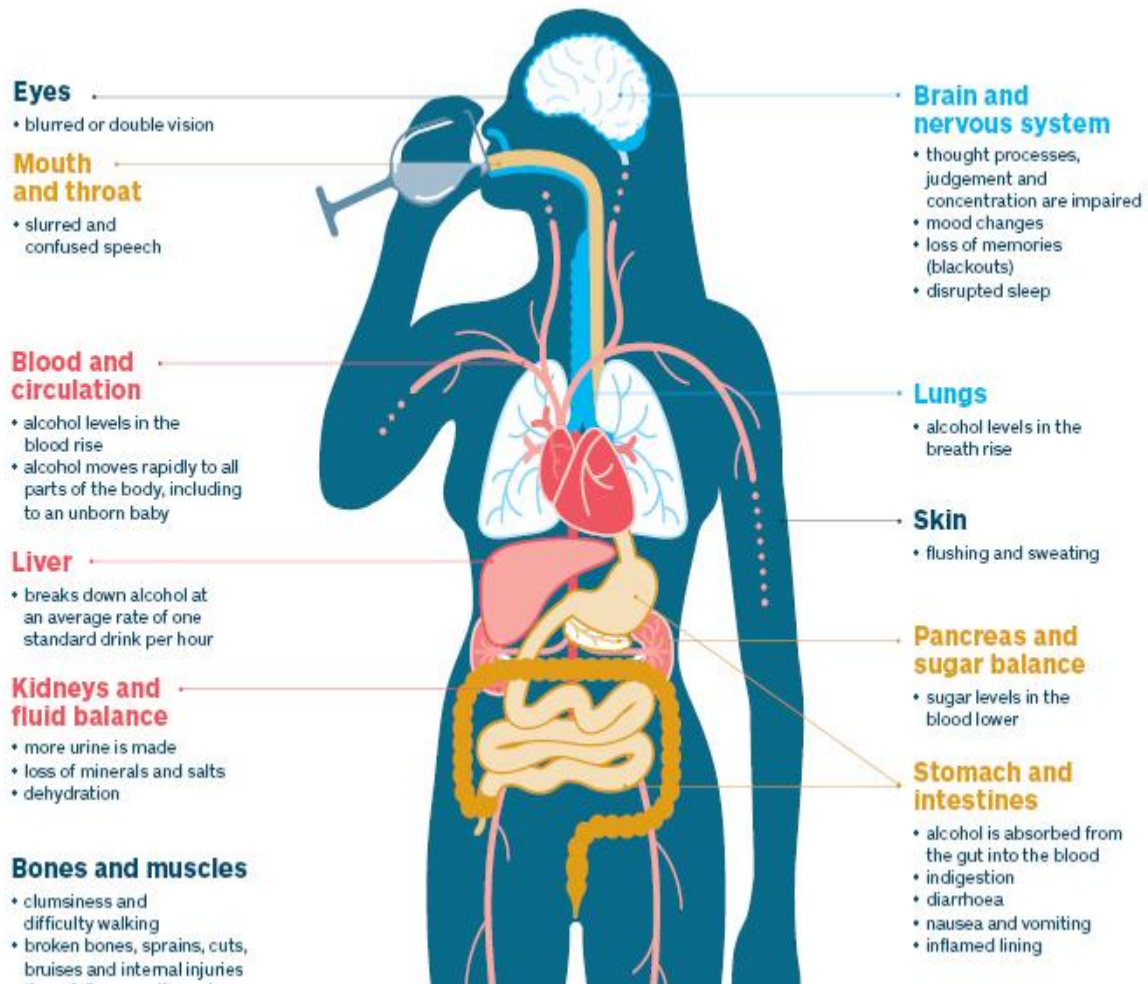
In large amounts, alcohol and its metabolites can overwhelm the gastrointestinal tract (GI) and liver and lead to damage both within the GI and in other organs. Specifically, alcohol and its metabolites promote intestinal inflammation through multiple pathways. That inflammatory response, in turn, exacerbates alcohol-induced organ damage, creating a vicious cycle and leading to additional deleterious effects of alcohol both locally and systemically. This review summarizes the mechanisms by which chronic alcohol intake leads to intestinal inflammation, including altering intestinal microbiota composition and function, increasing the permeability of the intestinal lining, and affecting the intestinal immune homeostasis. Understanding the mechanisms of alcohol-induced intestinal inflammation can aid in the discovery of therapeutic approaches to mitigate alcohol-induced organ dysfunctions. The intestinal barrier regulates the passage of materials between the GI tract and the bloodstream, allowing for the absorption by the blood of key nutrients and preventing the absorption of noxious substances. It is made up of a layer of water, mucous gel, and epithelial and connective tissue. The epithelial layer can become leaky or “permeable,” allowing pathogens and other deleterious substances into the bloodstream.[1]



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Circadian rhythm, also known as the biological clock, refers to an internal cycling of various biological processes. Chronic alcohol use can lead to a disrupted biological clock, which in turn can have a wide range of health-related consequences. In terms of gut-related inflammation, studies in cell cultures, mice, and humans suggest that a disrupted circadian rhythm exacerbates alcohol-related gut leakiness. Alcohol-induced gut inflammation is believed to promote several disease states both within the GI tract, in the form of gastrointestinal cancers and inflammatory bowel disease, and outside the GI tract, in the form of, for example, liver disease and neuroinflammation.[2]

Through multiple pathways, alcohol induces gut inflammation, which in turn promotes broad-spectrum pathologies both inside and outside the GI tract. In fact, many alcohol-related disorders, including cancers, liver disease, and neurological pathologies, may be exacerbated or directly affected by this alcohol-induced gut inflammation. The inflammation itself results from oxidative and nonoxidative pathways of alcohol metabolism that lead to a leaky gut, bacterial overgrowth, dysbiosis, and alterations in the mucosal immune system. As research uncovers the mechanisms by which alcohol affects gut inflammation and how that inflammation influences disease, researchers may be able to develop better strategies to prevent, or treat, conditions associated with chronic alcoholism. Already, studies are suggesting ways to modify diet and intestinal flora that may help alleviate some of the risks associated with chronic heavy drinking. Controlled trials are needed to assess the use of dietary supplementation with micronutrients in preventing or reversing alcohol effects.[3]

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II. OBSERVATION

When you drink an alcoholic drink, it initially passes down into your stomach, which contains alcohol dehydrogenase (ADH), your body's main line of defense against alcohol molecules. How effectively you metabolize alcohol is dependent on age, gender, and ethnicity. Most of your ADH resides in your liver, ready to filter and breakdown the alcohol that makes it to your bloodstream. Alcohol molecules are very small, so, when they hit your small intestine, they can easily pass through your gut wall and into your bloodstream, quickly creating that relaxed effect enjoyed after a glass of wine – the alcohol does indeed go straight to your head! Drinks containing carbonated bubbles are metabolized much quicker. On an empty stomach, the alcohol meets even less resistance from the gut. So it's true: drinking after a meal can slow down the rate of absorption.[4]

Gout- uric acid crystals have been deposited in
the bones of the foot and caused gouty arthritis
(48)



While your stomach can breakdown some alcohol molecules, a small amount of alcohol is excreted directly through your urine, breath, and sweat. But the ADH in your liver is responsible for neutralizing the majority of the alcohol you consume. On average, it takes 1 hour for your body to break down one alcoholic drink. But this is not a hard and fast rule – often it can take hours for your liver to metabolize one drink. The size of one standard drink corresponds to:

- 12-ounce bottle of 5% beer
- 5-ounce of 12% wine
- 1.5-ounce of 80% liquor[5]

Alcohol can cause heartburn, by provoking your stomach into attacking its own lining and surrounding muscles. Drinking large quantities can also cause nausea, vomiting, and ulcers, and go on to trigger further damage in your gut. Let's dive into the details, so you can make an educated decision about your alcohol consumption, even if you're not currently experiencing any gastrointestinal effects. Drinking alcohol harms your gut microbiome – this stands to reason because alcohol or ethanol is used as a disinfectant, and your microbiome is made up of important bacteria! The only alcoholic drink that can improve your gut microbiome is red wine (consumed in moderation) because it contains polyphenols, which increase your 'good' bacteria.[6]

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Just as heartburn is an inflammatory reaction to alcoholic drinks in the stomach, alcohol can also worsen symptoms of IBS. In fact, binge drinking can create a similar reaction in non-IBS patients causing symptoms such as:

- Diarrhea
- Abdominal pain
- Bloating feeling
- Flatulence

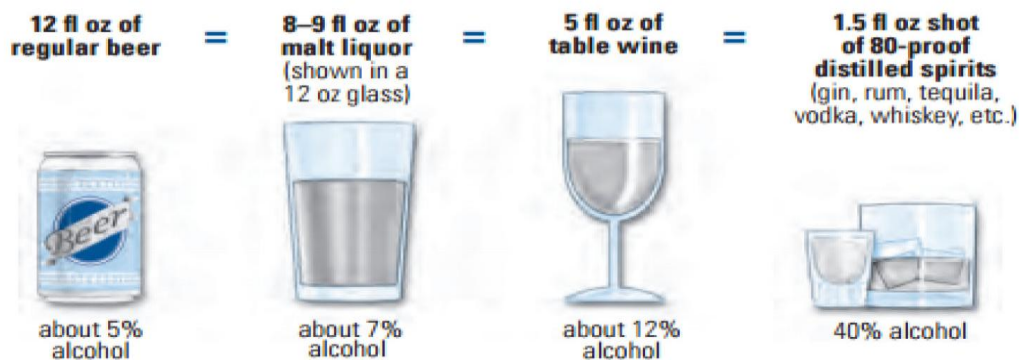
You may be surprised to learn that alcohol inhibits your gut's ability to absorb crucial nutrients and proteins. Drinking large quantities of alcohol regularly reduces the number of digestive enzymes your pancreas can release into your digestive tract. These enzymes are needed to oxidize the alcohol, to break it down into energy and components that eventually pass from your body. But the enzymes are also crucial to the proper digestion of food. Without them, you lack the ability to take up the vitamins and minerals needed for different functions in your body. Because alcohol causes an inflammatory response in your gut, it can lead to intestinal inflammation. And, in alcoholics, it can affect the intestinal permeability, potentially letting toxins and other debris through the gut wall and into the bloodstream. These conditions can create serious discomfort and pain for the sufferer. In 2012, the International Agency for Research on Cancer evaluated ethanol in alcoholic beverages as a group 1 carcinogen. While drinking alcohol is well known as a cause of cancer of the liver and breast, in terms of your digestive system, heavy alcohol consumption can raise the risk for cancer of the mouth, throat, and bowel - both colon and rectum.[7]

When you drink, the alcohol makes direct contact with the epithelial surface of your mouth and throat. More than four drinks a day seriously raises your chances of getting a gastrointestinal cancer. Many of my patients ask me about colon cancer at their appointment. You may know someone who had or has colon cancer, as it is the third most common type of cancer in the United States.[8]

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- Bleeding from the rectum
- Blood in your stool
- Abdominal cramps
- Pain from gas

- A change in your bowel habits
- A change in consistency of your stool
- However, in the early stages colon cancer can be asymptomatic.

In the moderate drinker demographic, men are at slightly higher risk than women. Men and women break down alcohol differently, due to hormonal differences. With this information in mind, I believe that if you enjoy the occasional alcoholic drink – preferably after a hearty meal – then you are not putting yourself at a huge risk. However, there is certainly an increased danger to your digestive system and gut if you choose to regularly drink heavily. Binge drinking or drinking every day can put an added strain on your body, but the occasional celebratory drink is not a cause for concern.[9]

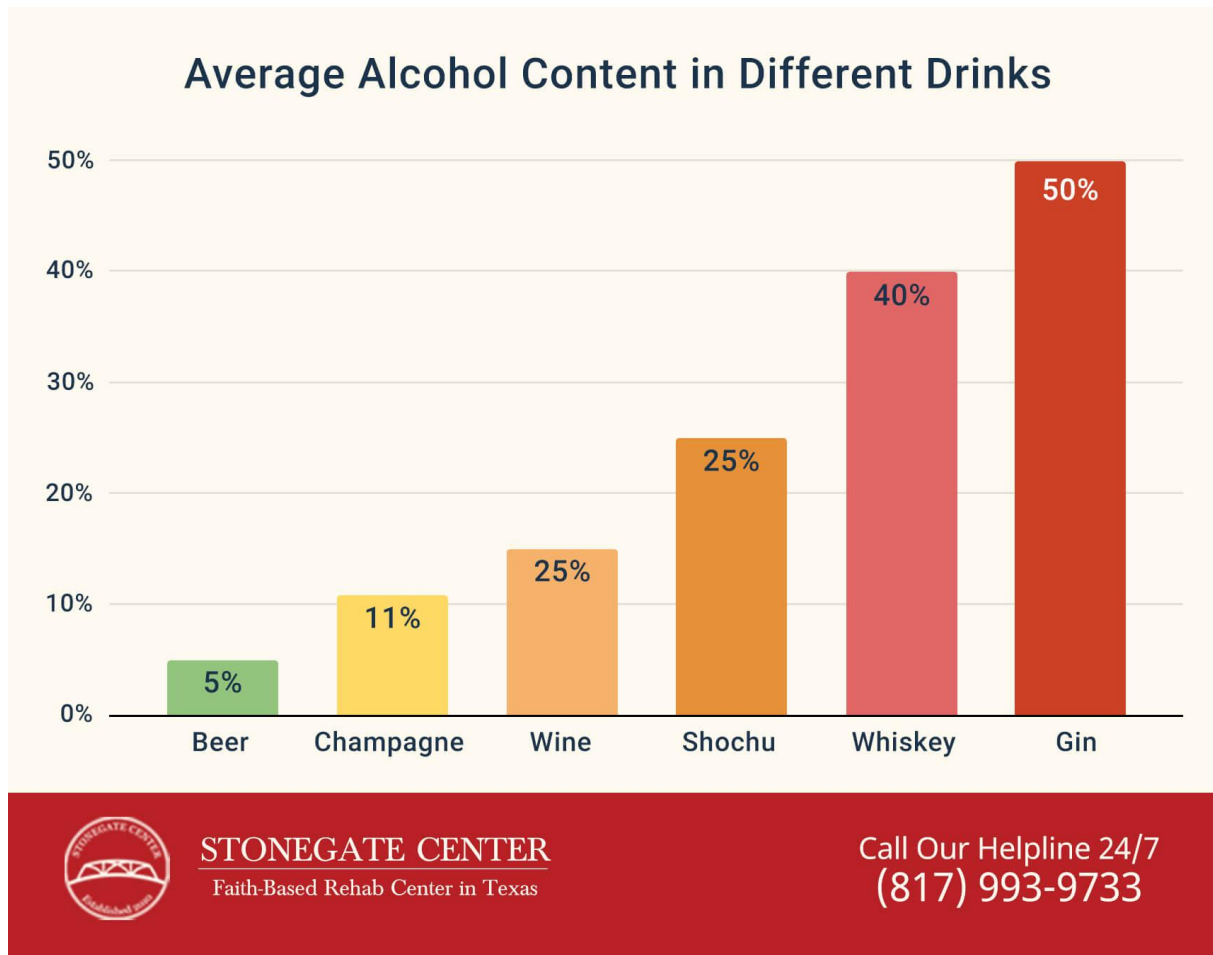
III. DISCUSSIONS

This system is where food is broken down, or digested. Its organs include the mouth, esophagus, stomach, small intestine, large intestine, rectum, and anus. The mouth, stomach, and the lining of the small intestine contain tiny glands that produce juices to help digest food. The liver and the pancreas also produce digestive juices that reach the intestine and help the process of digestion.[10]

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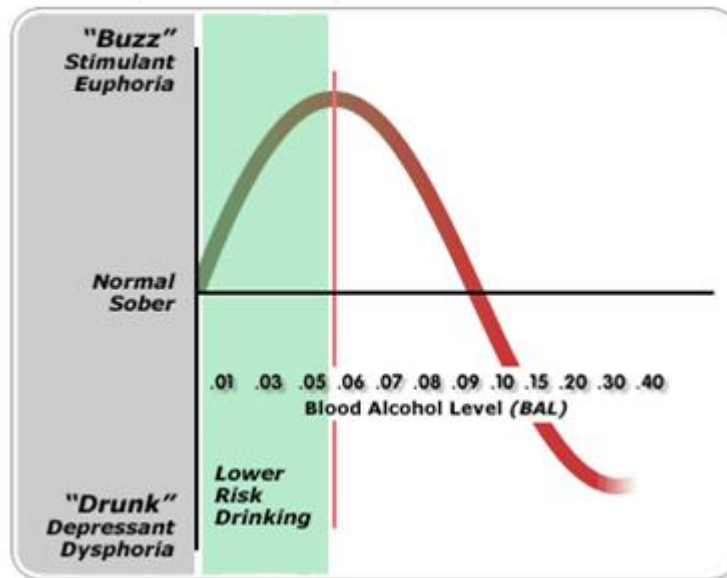
Alcohol is not digested like other foods. Once alcohol is swallowed, it travels down the esophagus into the stomach and the small intestine. It avoids the normal digestive process and goes right into the bloodstream. About 20 percent of the alcohol consumed is absorbed in the stomach, and about 80 percent is absorbed in the small intestine. One organ that is particularly affected by alcohol is the liver because it is the main organ that processes alcohol. The liver weighs more than three pounds and is the largest organ in the body. One of the liver's main jobs is to get rid of poisons—like alcohol—that enter the body. Without the liver, you could not live.[11]

Heavy drinking over a period of years can damage the liver. Some of this damage comes from free radicals, a group of molecules that are highly reactive. These molecules can attack the nearest stable molecule, leading to a dangerous chain reaction that can result in a disease called cirrhosis of the liver. Cirrhosis occurs when scar tissue replaces normal, healthy tissue and the liver, which needs unrestricted blood flow, doesn't work as it should. Alcohol increases acid in the stomach, which in alcohol abusers can lead to severe stomach pain or sores in the intestines. One way to help prevent the increase of acid is by eating while drinking. Food slows down the rate at which alcohol is absorbed by the body.[12]

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The CNS includes the brain and the spinal cord. The most important parts of the CNS are protected by bones. The skull protects the brain and the spine protects the spinal cord. The nervous system is made up of the CNS and the peripheral nervous system (PNS). The PNS includes the neurons, or nerves, that form a network that carries information to and from the neck and arms, trunk, legs, skeletal muscles, and internal organs. Neurons can send nerve signals to and from the brain at up to 200 miles per hour. When the nervous system is working smoothly, it is amazingly efficient. The CNS is responsible for taking in information through the senses, controlling motor function, as well as thinking, understanding, and reasoning. It also controls emotion. [13]

But alcohol is a depressant of the CNS, meaning it slows activity down. Does this surprise you? Many people think that alcohol is a "pick-me-up" experience because, initially, when people begin to drink, it causes them to become more animated and less reserved. But the opposite occurs as they continue to drink and more alcohol enters the brain. The degree to which brain activity slows down depends on how much, and how fast, a person drinks. Some effects people experience include:

- Altered speech
- Hazy thinking
- Slowed reaction time
- Dulled hearing
- Impaired vision
- Weakened muscles
- Foggy memory

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HOW MANY CALORIES ARE IN YOUR DRINK?

				
BEER 12 ounces 153 calories (103 calories for light beer)	RED WINE 5 ounces 125 calories	WHITE WINE 5 ounces 121 calories	80-PROOF SPIRITS (gin, rum, vodka, whiskey, tequila) 1.5 ounces 97 calories	CHAMPAGNE 4 ounces 84 calories
				
MARTINI 2.25 ounces 124 calories	COSMO 2.75 ounces 146 calories	MARGARITA 4 ounces 168 calories	MANHATTAN 3.5 ounces 164 calories	PIÑA COLADA 9 ounces 490 calories

SOURCES: NATIONAL INSTITUTES OF HEALTH, SHUTTERSTOCK

KARL TATE / © LiveScience.com



Many factors determine the impact that alcohol has on the CNS. These factors vary, depending upon:

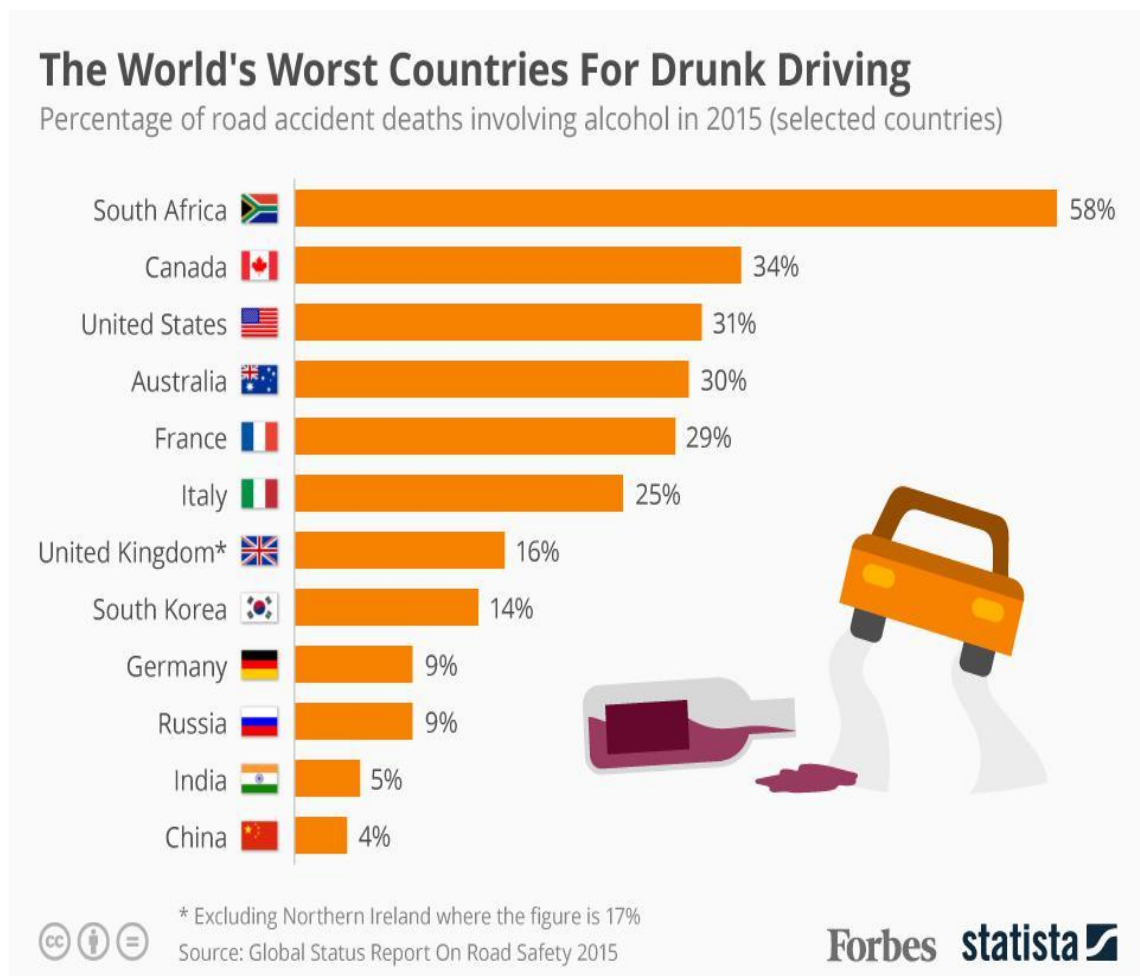
- The amount of alcohol drunk
- Time period over which the alcohol is drunk
- Whether it is consumed with food
- Whether it is mixed with other drugs, such as marijuana
- How often you drink. Alcoholics, or those individuals with an addiction to alcohol, can drink more alcohol and feel the effects less than someone who does not drink often or at all.
- Genetic background, such as ethnic background and gender
- Mood and psychological makeup
- Where alcohol is consumed
- Size, weight, and sex of the person. Alcohol has a stronger effect on girls than on boys because even if a girl weighs the same amount, she has less water in her body. This is because, for the most part, girls have less muscle tissue than boys, and muscle tissue contains more water than fat tissue.

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As a result, boys may have about 10 percent more water in their bodies than girls. That means for girls, alcohol is not diluted as much and they will have higher concentrations of alcohol in their blood. In addition, girls produce less of a particular gastric enzyme that is responsible for breaking down ethanol in the stomach. Because of this, women absorb up to nearly 30% more alcohol into their bloodstream than men of the same height and weight who drink the same amount of alcohol. Women are also usually shorter and lighter than men, further concentrating alcohol in their blood. When women of average size consume one drink, it will have almost the same effect as two drinks do for the average size man. If women eat little or skip food entirely, that compounds the effects of drinking alcohol.[14]



The brain is made up of more than 100 billion neurons. Each makes tens of thousands of connections throughout our bodies. Researchers used to think that most brain development took place during the first few years of life, but new findings have shown that during the teen years and into a person's twenties, important changes are taking place. For example, parts of the brain that help teens make decisions and control their impulses are still forming. In fact, many characteristics of adolescence, such as mood swings, may be, in part, a result of brain development. Too much alcohol can damage or even kill neurons, perhaps changing the development of those parts of the teenage brain that are still forming.

The brain is protected by the blood-brain barrier, which prevents or slows the passage of some drugs and other harmful substances from the blood into the central nervous system. Alcohol, however, is able to penetrate the brain because it can cross the blood-brain barrier.

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Because of the way different parts of the brain respond to alcohol, teens may engage in behaviors that are not good for them. For example, drinking alcohol can lead to making bad decisions. Because the prefrontal cortex is not mature, too much alcohol can harm a teen's ability to reason and weigh choices. Instead, teens may do something simply because they think it may be fun or feel good regardless of later consequences. Because connections between the prefrontal cortex and the ventral striatum are still maturing, alcohol can affect those connections. As a result, teens may take risks that they would not usually take, such as drinking and driving or having unprotected sex.[15]

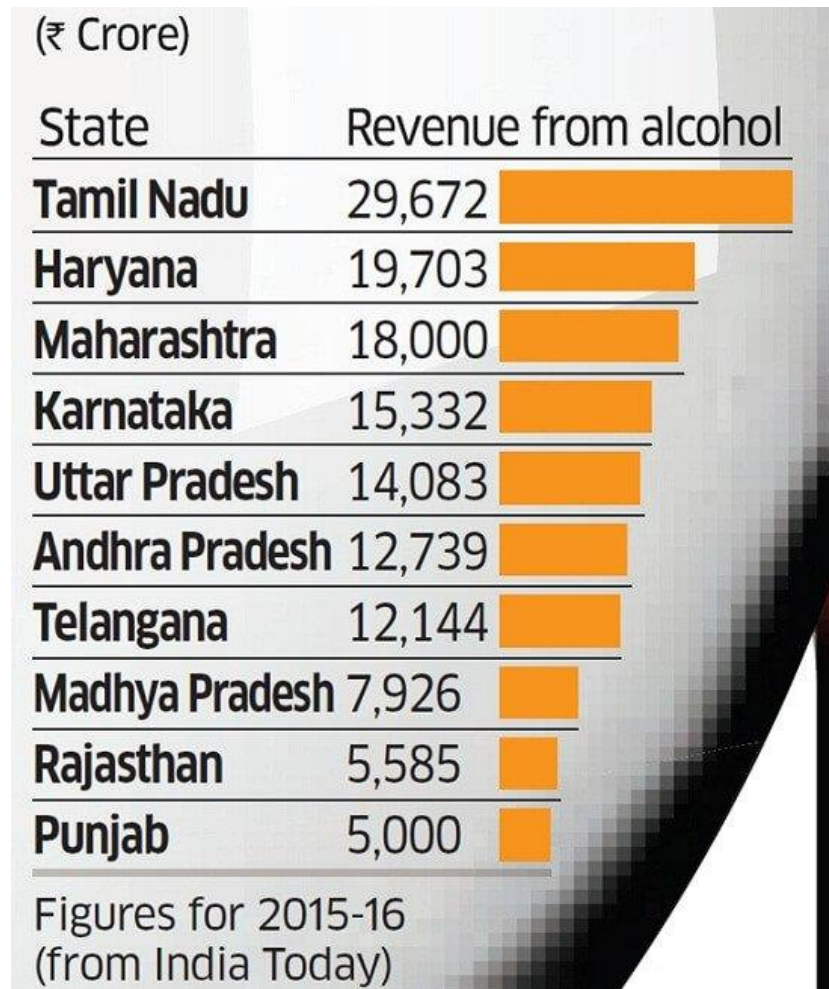


The circulatory system includes the heart; a system of vessels called arteries, veins, and capillaries; and blood. Blood is pumped by the heart through these vessels, causing "circulation" throughout the body. You may have read about some positive effects that alcohol can have on this system. Studies in adults have shown that a glass of alcohol (beer, wine, or distilled spirits) each day can help heart function. Drinking alcohol in moderation can help keep the balance of fat in the blood in the right proportions. This can help lower the chances of developing blocked arteries or blood clots. But the science is clear that drinking more than two drinks each day may cause harm. Large amounts of alcohol can affect how the heart works. If the heart isn't pumping blood throughout the body effectively, other organs may suffer from lack of oxygen or nutrients. If the person drinking has clogged blood vessels, the heart has to work even harder. Have you ever noticed a person with red eyes and red, blotchy skin? These can be signs of cell damage, caused when small blood vessels plug up, starving the tissues of oxygen. Blood vessels also can break in the stomach and esophagus, leading to bleeding and even death.[16]

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The endocrine system produces hormones, which are chemical signals produced by glands. The endocrine system helps regulate growth, signals the beginning of puberty, and is involved with metabolism, tissue function, and moods. How does it work? Each hormone is secreted from a specific gland and distributed throughout the body. The hormones act on tissues at different parts of the body. Two areas of the brain, the hypothalamus and the pituitary, release hormones, as do other glands, such as the thyroid and the pancreas. [17]

Hormones control four major areas of function in the body:

- 1) Production, utilization, and storage of energy
- 2) Reproduction, or the creation of new life
- 3) Maintenance of body systems responsible for regulating blood pressure and bone mass
- 4) Growth and development, or how we mature as we age

The timing of hormone release is complex. They must be released at the right time, to the right tissues in the body. Alcohol can impair both the functions of the glands that release hormones and the tissues to which they are being sent. [18]

For example, take the pancreas. This gland produces insulin, which is a hormone that is needed to regulate the amount of sugar (or glucose) in the blood. During digestion, glucose moves into the bloodstream. In response, the pancreas releases insulin, which triggers the opening of body cells so that glucose may enter and be used for energy. As glucose moves into body cells, the amount that remains in the bloodstream falls. When it falls below a certain point, the pancreas releases another hormone called glucagon. This hormone triggers the release of

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stored glucose from the liver. Through the work of the two hormones, insulin and glucagons, the body maintains a stable level of glucose in the blood.

Drinking heavily can cause a steep rise in blood sugar. When blood sugar rises, the pancreas responds by producing insulin to lower the blood sugar. But if the blood sugar rises too steeply, overproduction of insulin can actually lead to low blood sugar, a condition called hypoglycemia. This is especially dangerous for diabetics, especially those taking certain drugs to lower their blood sugar.[19]

Another way that alcohol affects the endocrine system is by interfering with how the body absorbs calcium, a chemical needed for strong bones. As a result, people who drink heavily may be at a higher risk for osteoporosis, a disease in which bone density declines. If bones aren't strong, there is a greater possibility of fractures. These fractures often occur in places where people usually don't break bones, such as the ribs, hip, or wrist. Osteoporosis is most common in women over fifty who have gone through menopause.

Men or boys who drink large amounts of alcohol are at risk for side effects related to the endocrine system. They can experience loss of testosterone, the hormone that regulates male sexual function and semen. As a result, they could experience erectile dysfunction and emotional changes. Heavy drinking also may be responsible for easy bruising or acne.[20]

As you can see, alcohol use doesn't just affect one part of the body. Because all the systems are connected, each drink has an impact on multiple systems. So alcohol can cause considerable damage. In the United States, underage drinking occurs when anyone under age 21 drinks alcohol in any amount or form. It's against the law, except in special cases, such as when it is part of a religious ceremony. Besides being against the law, there are a number of good reasons why young people should not drink.

BOLD AND DIFFERENT

People of Punjab start saying no to alcohol abuse

ONCE AN ADDICT TO ALCOHOL, SIKANDER SINGH OF MALUKA VILLAGE HAS NOW WRITTEN A 'PROHIBITION ORDER' AT THE ENTRANCE OF HIS HOUSE, READ AS 'SHARAB PEEKE ANDAR AANA MANA HAI'

RAJAY DEEP
Maluka (Bathinda)

For many Punjabis alcohol abuse is an open secret. Consumption of liquor is glorified across different aspects of Punjabi culture and stunts many seeking the help that they need. The problem is not only confined to the boundaries of Punjab as the same instances have made Punjabis face major embarrassment overseas too, especially in Canada, UK and Australia. However, here is good news. Meet Sikander Singh of village Maluka as his bold and different gesture gives a feeling that having realised the fall out of the menace, people of Punjab are now making up minds to get rid of the alcohol consumption that has virtually ruined them. As everything comes with a price, Sikander Singh also paid a heavy amount while standing as a torch-

bearer for the society. Once an addict to alcohol, Sikander Singh has now written a 'prohibition order' at the entrance of his house, read as 'Sharab Peeke Andar Aana Mana Hai' (Entry is restricted if liquor is consumed). This gesture made him face the annoyance of his relatives on different occasions as they found this derogatory to specify a precondition of welcoming the guests. Speaking to Daily Post, Sikander Singh flanked by his wife Manjit Kaur, tells "We were the victim of this menace as I was a drunkard. Apart from physical issues, the financial burden was increasing with each passing day. Finally, adopting the suggestion of a spiritual leader I shun the consumption of alcohol in 1994." "That was the turning point of my life," he said, adding that he was now happy with one



Sikander Singh and his wife Manjit Kaur show the prohibition order written at the entrance of their house at Maluka village.

Sikander Singh said, "It has become a notion that all Jatts and Zimindars (landholders) not only consume the alcohol but also serve their

While society is expected to join the torch bearers, the government would have to look for some positive alternative to earn money, which otherwise expects a whopping Rs 6,000 crore annual revenue just from the sale of liquor in Punjab.

feel discomfort while visiting us, we have clarified our decision by writing it on the wall outside. Initially, some relatives found it derogatory but gradually they all have accepted it as part of lifestyle," said Sikander Singh. Adding to his point,

Manjit Kaur said, "Till the time he used to drink, we used to waste a major chunk of our hard earned money in that misence but the day he resolved to shun the menace, our economic condition started improving and now we have various vehicles and gadgets, which we couldn't even think of otherwise."

It is the ill-fate of Punjab that one of most respectable singers of Punjab music industry Gurdas Mann also couldn't resist promoting this liquor culture. His song 'Aapna Punjab Hove', in which he promoted the country-made liquor, distilled by people at home, got huge fan following.

Another renowned Punjabi singer Sherry Mann is also in the long list of those promoting liquor through their songs. Ironically, when people of Punjab were shaking legs on such anti-social beats, a Karnataka man, Prof Pandit Rao Dharennavar initiated a movement in support of preservation and promotion of the Punjabi language and against persistent vulgarity in Punjabi pop songs. He has even filed a PIL against vulgarity in Punjabi. With Sikander Singh and Pandit Rao Dharennavar like people having come out with a torch of awareness in hands, it is now the duty of the society to join them in the mission. At the same time, the government would have to look for some positive alternative to earn money, which otherwise expects a whopping Rs 6,000 crore annual revenue just from the sale of liquor in Punjab.

Drinking too much is a major cause of death from injuries among young people. Each year, drinking alcohol contributes to the death of approximately 5,000 people under the age of 21; this includes about 1,900 deaths from motor vehicle crashes, 1,600 as a result of homicides, 300 from suicide, and hundreds from other injuries such as falls, burns, and drownings.[21]

Drinking too much can harm the growing brain. Today we know that the brain continues to develop from birth through the adolescent years and into the mid-20s. The prefrontal cortex, which is involved in planning and decision-making, does not completely mature until after the teen years. Using alcohol can harm a teen's ability to reason and weigh options instead of just doing something because it is fun or feels good.

Drinking too much can affect the body in many ways. The effects of alcohol range from hangovers to death from alcohol poisoning.

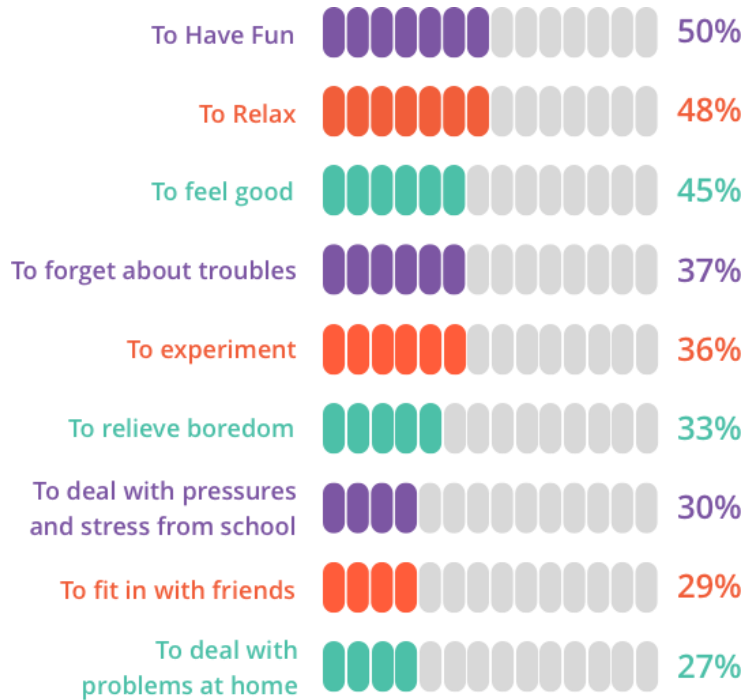
Drinking too much can lead to other problems. These may include bad grades in school, run-ins with the law, and drug use.

Drinking too much affects how well a young person judges risk and makes sound decisions. For example, after heavy drinking, a teen may see nothing wrong with driving a car or riding with a driver who has been drinking, whereas, before drinking, the teen might realize the risk involved.[22]

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Drinking too much plays a role in risky sexual activity. People do things when they are under the influence of alcohol—even a small amount—that they would not do when they are sober, including having sex even when they didn't want to and had not planned to do so. This behavior can increase the chance of teen pregnancy and sexually transmitted diseases, including HIV/AIDS. Before we look at some of these issues in more depth, let's first look at some background information about how we measure alcohol strength and the amount of alcohol in a person's blood.[23]

IV. RESULTS

Proof is the commonly used measure of how much alcohol is in an alcoholic drink. You take the percentage of alcohol in a drink and double it to get the proof measurement. The amount of alcohol in a bottle is regulated by law and affects how it is taxed. Proof is a hold-over term from earlier times. In the 18th century and up until about 30 years ago, Britain defined alcohol content in terms of "proof spirit." The British term started when payments to British sailors included rations of rum. To save money, sometimes the rum would be watered down, which made the alcohol content very low. So the sailors would toss gunpowder into the rum to see if it would light on fire. If there wasn't enough alcohol, it didn't burn and was considered to be "under-proof." [24]

Different types of alcohol have different proof levels in part because of what they're made from. Remember that proof is determined by roughly doubling the percentage of alcohol content in a beverage.

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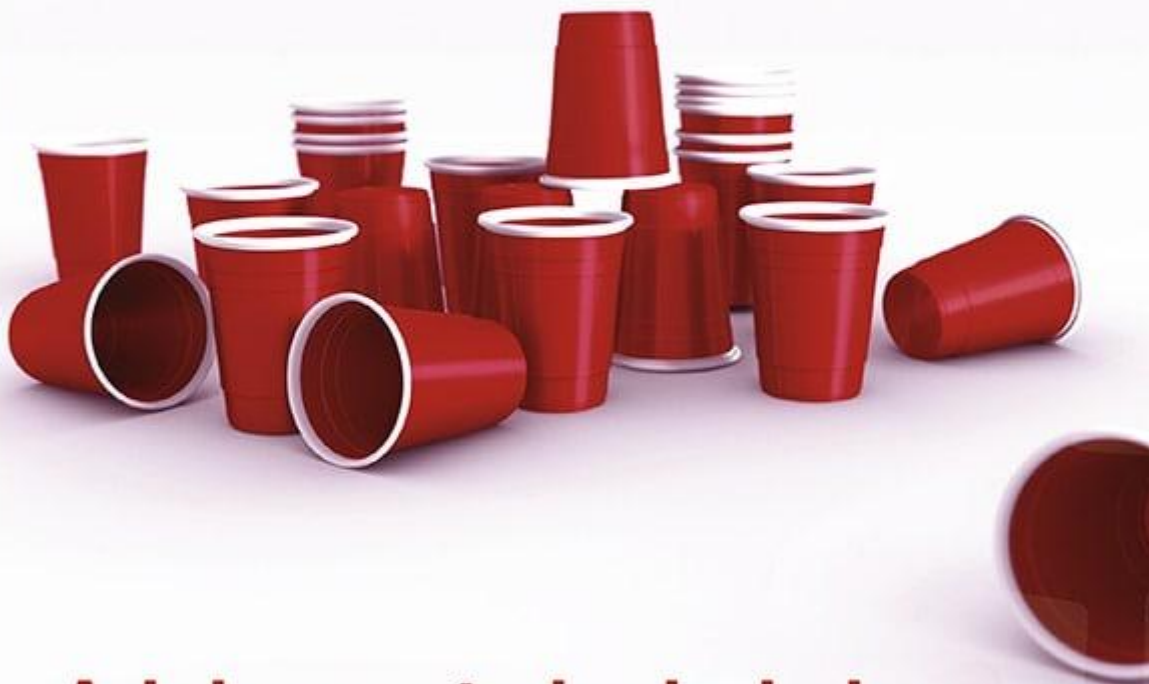
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JOURNAL OF HEPATOLOGY

The Home of Liver Research



Adolescent alcohol abuse predicts future cirrhosis

New treatment strategies in hepatitis B

Unravelling mechanisms of NK cell activation

A new score to allow usage of livers from deceased donors

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Here's some more information on how much alcohol is in a single drink:

- Beer – The alcohol content of beer in the U.S. is usually between 3 and 6%. Grains, malts, and lager beers can have higher alcohol content.
- Wine – American wine is between 9 and 14% alcohol. Fortified wines have an alcohol content higher than 14%. These wines contain added alcohol or brandy to increase the alcohol content to approximately 20%.
- Hard Liquor – The alcohol content can range from 14 to 40% in distilled spirits. Some of the products used to make hard liquor are corn (bourbon), potatoes (vodka), sugar cane (rum), and malts/grains (scotch).
- Blood alcohol content or blood alcohol concentration (BAC) is the amount of alcohol in a person's blood. BAC is primarily used as a measurement of intoxication for legal or medical purposes.[25]
- The concentration of alcohol in the blood continues to rise even after drinking has stopped because alcohol in the stomach continues to enter the blood stream.
- A standard drink is:

The number of drinks an adolescent or an adult has is a poor measure of BAC because of variations in weight and sex of the person who is drinking. One standard drink (on average 14 grams) of alcohol will increase the average person's BAC roughly 0.02% to 0.05%, so two drinks may cause driving impairment. Each state has individual laws for punishing drivers who operate motor vehicles with an elevated BAC reading. Laws in 50 states and the District of Columbia consider a person legally intoxicated if their BAC is 0.08% or higher. Mixing alcohol with carbonated drinks will speed up the absorption of alcohol into the blood stream. For teens, this is particularly significant, since they often prefer sweeter, mixed drinks. If a person is not an experienced drinker, a lower BAC will affect them more than someone who has built up a tolerance. A blood alcohol content of 0.40% will typically kill about half of all adults.[26]

Because blood alcohol concentration continues to rise even after drinking has stopped, there is only one thing that lowers BAC, and that is time. Coffee and cold showers may make a driver more alert but will not lower BAC or make it safe to drive. Impairments usually occur once an individual's BAC level reaches 0.05%. Potential problems at this BAC level include:

- Slowed eye movements
- Changes in what you see and in reaction time
- Trouble with certain types of steering tasks
- Difficulty processing information.[27]

This happens when large amounts of alcohol are consumed in a very short period of time. Consuming too much alcohol too quickly causes a breakdown of the body's systems, which can lead to death. Although teens may feel invincible while drinking, their body systems may react strongly, particularly if they are not regular drinkers. When a person's body absorbs too much alcohol, it can have a direct impact on the central nervous system, breathing, heart rate, and gag reflex. This can lead to choking, coma, and even death. One reason this can happen is because the medulla, which controls heartbeats, breathing, and other functions, can be affected by heavy drinking and cause these functions to stop working, endangering your life. Another reason this can happen is because the reticular activating system, which controls sleeping and waking, can be depressed, causing unconsciousness.[28]

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) defines binge drinking as the amount of alcohol leading to a blood alcohol content (BAC) of 0.08%, which, for most adults, would be reached by consuming five drinks for men or four for women over a two-hour period. Young teens and college students are most likely to binge drink. Frequent binge drinkers (nearly one million high-school students nationwide) are more likely to engage in risky behaviors, including using other drugs such as marijuana and cocaine, having sex with multiple partners, and getting bad grades. Binge drinking can result in alcohol poisoning, a breaking down of the body's systems that can and does lead to death. People who are at risk for alcohol poisoning can lose the ability to swallow because their gag reflex, a motor response from the body that prevents choking, is impaired.[29]

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Some people who have passed out can choke on vomit, accidentally inhaling it into their lungs. This can lead to asphyxiation, or the inability to breathe that leads to sudden death. As a result, people who survive alcohol poisoning may have irreversible brain damage. Signs of alcohol poisoning include:

- Confusion and stupor
- Vomiting
- Seizures
- Slow or irregular breathing
- Hypothermia, or abnormally low body temperature[30]
- Unconsciousness

Drivers use their hands, eyes, and feet to control the car; but their hands, eyes, and feet must be controlled by their brains. Safe driving requires alertness and the ability to make quick decisions in rapidly changing situations. Drinking alcohol can have a profound effect on driving skills. For example, drinking can have a negative effect on any of these skills:

- Reaction Time – Alcohol can slow reflexes, which can decrease the ability to react swiftly to changing situations.
- Vision – Alcohol can slow eye muscle function, alter eye movement, and alter visual perception, possibly resulting in blurred vision. Night vision and color perception also can be impaired.
- Tracking – Alcohol can decrease the ability to judge the car's position on the road, or the location of other vehicles, center line, or road signs.[31]
- Concentration – Alcohol may cause attention to driving to decrease and/or drowsiness to occur.
- Comprehension - Alcohol can hinder the ability to make rational decisions
- Coordination - Reduced eye/hand/foot coordination can be caused by drinking too much alcohol.

It is estimated that more than 10,000 young people in the United States are killed and 40,000 are injured in auto accidents when alcohol is involved. The National Highway Traffic Safety Administration estimates more than 26,000 lives have been saved since the drinking age was increased to 21.[32]

V. CONCLUSION

Blackouts occur when people have no memory of what happened during a time of heavy drinking. The periods of memory loss may last from a few hours to several days. During a blackout, a person may appear to be fine to others, but the next day they cannot remember all or part of what happened during the blackout. Memories during the time of alcohol consumption are lost or possibly not recorded at all by the brain. Most alcohol-induced blackouts occur with binge drinking. In some people, however, alcohol can produce memory impairments after just a few drinks. People who binge drink, drink on empty stomachs, or drink alcohol too quickly are more at risk to blackout. Blackouts are much more common among social drinkers than people used to think. In one study, 27% of students reported at least one incident of forgetting who they were with or where they were while drinking.[33]

In 2002, researcher Aaron White and his colleagues surveyed 772 college undergraduates, asking them if they ever had a blackout. Of the students who had drunk alcohol, 51% reported blacking out at some point in their lives and 40% reported experiencing a blackout in the year before the survey. The students said they later learned a number of incidents had occurred during the time they did not remember including stealing, unprotected sex, and driving.[34]

Drinking too much alcohol can cause hangovers. This happens because drinking alcohol can cause blood vessels in the brain to swell, leading to pressure that results in severe headaches. A single alcoholic drink is enough to trigger a hangover for some people. In general, more than three to five alcoholic drinks for a woman and over five to six for a man will usually result in a hangover. About 75% of people who drink until they are drunk will have a hangover the next day.

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Several conditions can accompany a hangover, including:

- Dehydration as the body produces more urine than usual leading to thirst, dizziness, and lightheadedness
- Nausea or vomiting that can lead to stomach upset
- Headaches caused by blood vessel expansion
- Sleepiness due to narcotic effects that can cause grogginess and fatigue[35]

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