



(REVIEW ARTICLE)



## Present scenario of policies & hazards related to alcohol in India

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International Journal of Science and Research Archive, 2021, 03(02), 097–106

Publication history: Received on 21 August; revised on 23 September 2021; accepted on 25 September 2021

Article DOI: <https://doi.org/10.30574/ijrsra.2021.3.2.0141>

### Abstract

Although the use of various psychoactive substances such as alcohol, cannabis and opioids has been observed in India for centuries. Use of psychoactive substances impacts on academic, social, psychological, economical and physiological development of people with their families negatively. Alcoholic beverages are the most important product of global addiction demand, which is a reason of many deaths and diseases worldwide. Alcohol consumption is a major problem in India because of the various reasons like socio-cultural, difference in alcohol policies and practices state wise, lack of awareness of alcohol related problems, false mass media propaganda, various patterns of alcohol consumption and as a symbol of status both in urban and rural areas across the country. As per people's opinion, they consumes it because it induces feeling of relaxation and tranquility, suppress anxiety and increases confidence. However with increasing dose, pleasant euphoric starts which means they feels that they are in heaven and that gives way to feelings of depression. That's why this is called as substance of abuse. This review article focuses on ethyl alcohol (alcohol), its pharmacology, policies in India, different patterns of drinking, prevalence of alcohol consumption globally and nationally, medical and other consequences like suicide and road accidents, harmful effects on the mental, physical and social health with treatment options for alcoholism.

**Keywords:** Alcoholic beverages; Intoxication of alcohol abuse; Patterns of alcohol consumption; Legal drinking age; Treatment option of alcoholism; Alcohol policy in India

## 1. Introduction

### 1.1. Alcohol

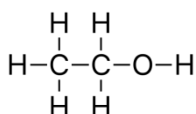
Alcohol can be categorized into four types i.e. methyl alcohol, ethyl alcohol, propyl alcohol and butyl alcohol. Ethyl Alcohol or ethanol is the type used in the production of alcoholic beverages [1]. It is consumed as an alcoholic beverage in diluted concentrations of absolute (i.e., 100%) ethyl alcohol [2]. Except ethyl alcohol, methyl, propyl and butyl alcohol are not used in alcoholic beverages and if these are consumed even in relatively small doses, it can lead to blindness or even death. Alcohol is produced by the process of fermentation of yeast, sugars and starches [1]. For production of wine, beer and liquors, fruits (grapes) and grains (barley and wheat) are most commonly used. Other plants like cactus or sugar cane may also be used in liquor production [3].

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## 1.2. Chemistry of Ethyl Alcohol or Ethanol [4]

Ethyl alcohol is a colorless, volatile liquid with a characteristic odor and a pungent taste. It is a compound of carbon, hydrogen and oxygen. The chemical formula for ethyl alcohol is  $C_2H_5OH$  or  $CH_3CH_2OH$ . Ethyl alcohol consists of two carbon atoms, five hydrogen atoms and an OH group. In simple words we can say hydroxyl group (-OH) is attached to ethane. Structural Formula of ethyl alcohol consists of carbon atoms which are  $sp^3$  hybridized i.e. they have a free rotation and it is represented as -



**Figure 1** Structural formula of ethyl alcohol

There are various types of alcoholic beverages which are consumed across the world. Alcoholic beverages differs by their content of alcohol and production method. The most common alcoholic beverages are beer, wine, whisky, rum, vodka, gin and brandy [1].

## 2. Alcohol content in different alcoholic beverages

Different alcoholic beverages available in market gave different concentration or content of alcohol. Table 1 below provides us information about alcohol content in different alcoholic beverages.

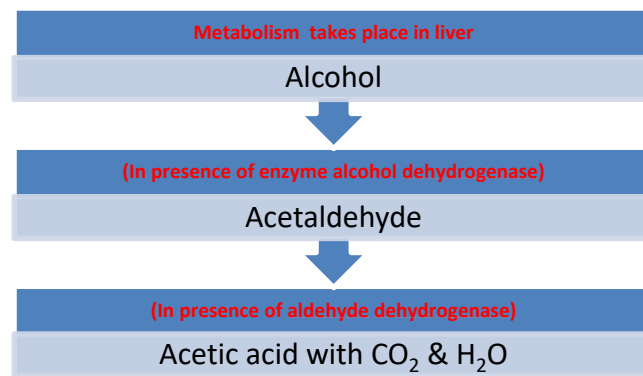
**Table 1** Alcohol Content in Alcoholic Beverages [5]

S.NO.	Alcoholic beverages	Ethyl alcohol content at 20°C (% by volume), max
1	Brandy or grape brandy	36-50
2	Blended brandy	36-50
3	Country liquor or plain country liquor	19-43
4	Blended country liquor	19-43
5	Fenny (Cashew)	19-43
	Fenny (Coconut)	19-43
6	Gin	36-50
7	Liqueur or Cordial Aperitif	15-50
8	Rum	36-50
9	White rum	36-50
10	Vodka	36-50
11	Whisky	36-50
12	Malt or grain whisky or single malt	36-50
13	Blended whisky	36-50
14	Pot distilled spirits	36-50
15	Table or grape wine (White)	7-15.5
	Table or grape wine (Red)	7-15.5
16	Wine with carbon dioxide	7-15.5
17	Fortified wine	15-24

18	Fruit wine (other than grape wine)	7-15.5
19	Cider	0.5-9
20	Perry	0.5-9
21	Wine from other agricultural and plant sources	1.5-8
22	Beer (Regular)	0.5-5
23	Beer (Strong)	5-8
	i. Draught beer (Regular)	0.5-5
	ii. Draught beer (Strong)	5-8

### 3. Pharmacology of Ethyl Alcohol (Alcohol)

Alcohol is highly soluble in water and its absorption decreased by fatty food. Alcohol when consumed, gets distributed into body water. Blood-alcohol concentration (BAC) is concentration of alcohol in blood. The concentration of alcohol in blood depends on many factors like weight, body fat, amount of alcohol consumed, time frame of alcohol consumption and effect of food. BAC becomes higher in cases like drinking over shorter time periods, larger quantities and on an empty stomach. BAC is expressed in g/dL (grams per deciliter).



**Figure 2** Flow chart showing the Pharmacology of alcohol



**Figure 3** Portable Breathalyzer Alcohol Tester (Courtesy: www.smartnetk.com)

Alcohol is metabolized mostly in the liver. The enzyme alcohol dehydrogenase converts alcohol to acetaldehyde (a sympathomimetic toxin responsible for the 'hangover' effect). Then the aldehyde dehydrogenase metabolize acetaldehyde to acetic acid with carbon dioxide and water. Figure 2 shows this process in flowchart.

Small amounts of alcohol is excreted through the urine, lungs i.e. breath and sweat. Ethyl alcohol excretion by the lungs constitutes the basis for the to check the suspects of drinking and driving Breathalyzer test is used which works on the principle of measurement of ethyl alcohol excreted by the lungs. Figure 3 shows a breathalyzer. Alcohol increases the inhibitory neurotransmitter GABA (gamma amino butyric acid) and decreases the nerves signals along that neuronal pathway. Due to this action, alcohol is known as a central nervous system (CNS) depressant which results in decreased both cognitive and physical capacities. Alcohol in combination with other CNS depressants like opiates, barbiturates or benzodiazepines can lead to synergistic and dangerous effects [6].

#### 4. Intoxication of Alcohol abuse

Health problems like liver and cardiovascular disease, cancer and nervous system damage may arise due to long term consumption of alcohol. Apart from these psychiatric problems such as depression, anxiety and antisocial personality disorder may also arise [7]. Lot of behavior changes are marked due to alcohol consumption. Even low doses can cause impaired judgment and coordination, induces feelings of relaxation and tranquility, suppress anxiety and in some cases, people observe the feeling of confidence. However with increase in dose, euphoria begins which gives way to feelings of depression. Intoxication occurs because the liver is unable to metabolize more than 29.6 ml of alcohol every hour. Therefore, when a person consumes more alcohol than the body cannot metabolize, intoxication occurs. Intoxication can generally last anywhere from one to 12 hours, and the after-effects ("hang-over") of intoxication can last 24 hours or more. Repeated use of alcohol increases the tolerance which leads to greater amounts to achieve the desired effects. Once the body develops dependence to alcohol, a sudden cessation of its intake is likely to produce withdrawal symptoms. Withdrawal symptoms can be life-threatening and include severe anxiety, tremors, hallucinations, and convulsions.

Alcohol can be life threatening if the amount of alcohol reaches a concentration above 460 milligrams of alcohol per 100 milliliters of blood (0.46 g/dL). Severe alcohol intoxication can lead to death from respiratory depression and this can be more dangerous if alcohol gets combined with CNS depressant medications [8]. Alcohol intoxication give rise to crimes which include sexual/physical assault, rape, exploitation of women in commercial sex work and homicide [9].

**Table 2** Use of Alcohol as Psychoactive substance in India [10]

<b>Population (10 to 75years) uses alcohol nationally</b>	<b>14.6% (about 16 Crore)</b>
Men's percentage	27.3%
Women's percentage	1.6%.
Country liquor/Desi sharab	30%
Spirits/Indian made foreign Liquor	30%

#### 5. Various patterns of alcohol consumption

**Table 3** Various patterns of alcohol consumption

Social Drinking	Men not more than two drinks per day. Women not more than one drink per day [3].
Binge drinking	Men five or more drinks on a single occasion. Women four or more drinks [11].
Harmful drinking pattern	According to WHO, The consumption pattern which results in physical or psychological harm to the individual or society [12].
Hazardous drinking pattern	The quantity or pattern which results risk for adverse health events [11].
Alcohol dependence	Conditions of alcoholics like a strong desire to consume alcohol, difficulties in controlling, persisting in its use despite harmful consequences, giving priority to alcohol use than to other activities and obligations, increased tolerance and sometimes a physiological withdrawal state [13].

## 6. Disease burden because of Alcohol consumption

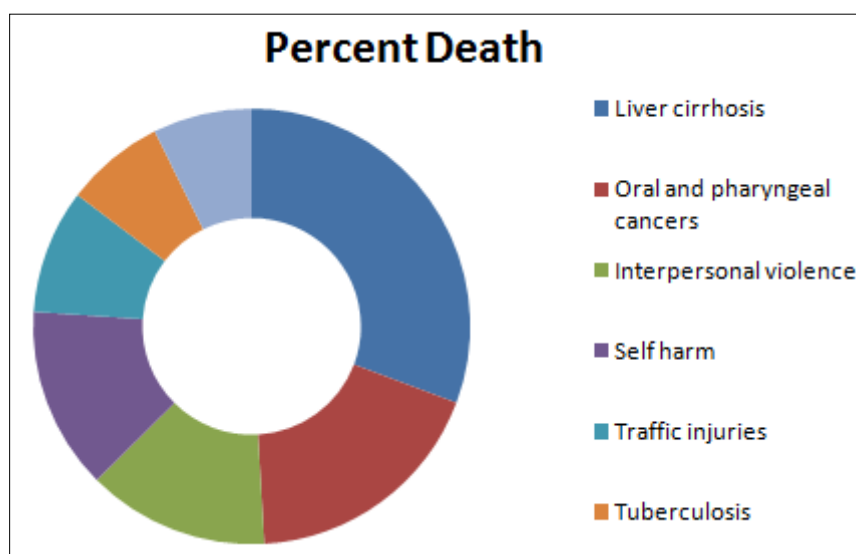
According to recent data published by the World Health Organization (WHO), the total per capita consumption of alcohol by individuals above 15 years of age is 6.2 L of pure alcohol per year, which equals 13.5 g of pure alcohol per day. However, there is a wide variation between the WHO regions and member states. Nearly 5.1% of the global burden of disease is attributable to alcohol consumption, and it causes nearly 3.3 million deaths every year [1].

According to the reports of Global information system on alcohol and health (GISAH) globally, approximately 3.3 million deaths (5.9% of all deaths) per annum attributable to the harmful use of alcohol and liquor consumption is strongly related to 5.1% of the global burden of disease [15].

WHO's Global status report on alcohol and health 2014, distributed the deaths due to alcohol consumption which is mentioned in Table 4.

**Table 4** Global deaths distributed to alcohol consumption [1]

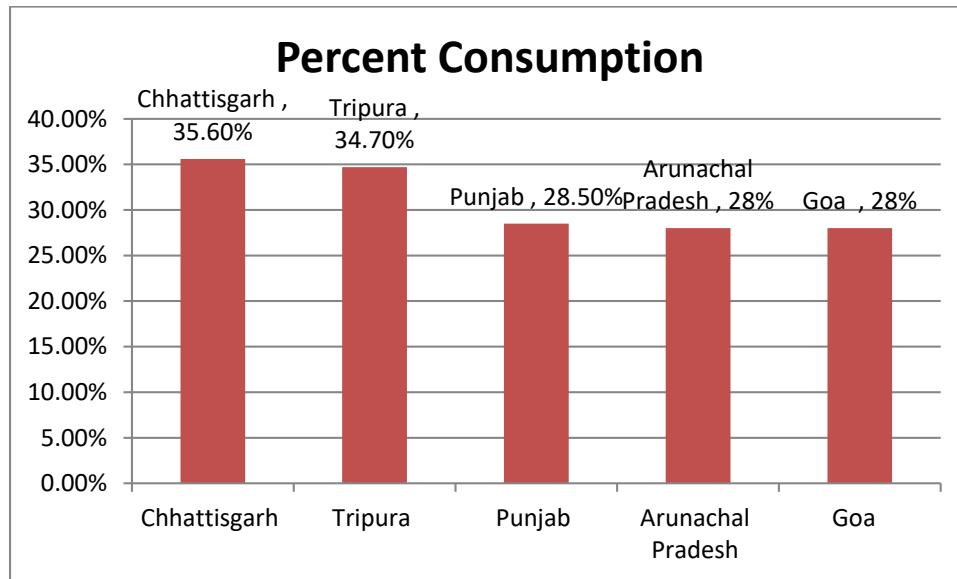
Highest prevalence of Alcohol use disorder (AUD)	Europe (7.5%)
Lowest prevalence of Alcohol use disorder (AUD)	Eastern Mediterranean regions (Afghanistan, Bahrain and Egypt)
<b>Deaths caused by</b>	
Liver cirrhosis	50%
Oral and pharyngeal cancers	30%
Interpersonal violence	22%
Self-harm	22%
Traffic injuries	15%
Tuberculosis	12%
Liver cancer	12%



**Figure 4** Causes and their percent deaths due to alcohol consumption

At the national level, 33.1% of all the road traffic accident deaths were attributable to drunk and driving in 2012. As per the National Mental Health Survey of India 2015-16, the prevalence of alcohol use disorder is 9% in adult men. In India,

5.4% deaths were found due to alcohol. On comparing all deaths due to liver cirrhosis, around 62.9% was found due to alcohol use [14].



**Figure 5** States with highest prevalence of alcohol

## 7. Medical consequences of Alcohol use

**Gastrointestinal (GI) complications:** vomiting, hyperacidity, peptic ulcer disease [13]. In 2012, WHO proclaimed that age standardized death rates (ASDR) of 39.5 per 1 lakh population and 19.6 per one lakh population globally were owing to alcohol related liver diseases (Cirrhosis of liver) [15].

**Cancer:** Breast cancer, oral and esophageal cancers, rectal cancers, cancers of the pharynx, oral cavity, esophagus and larynx [16].

**Changes in the genitourinary system:** decrease in the erectile capacity in men, decrease in ejaculate volume and a low sperm count [17] high-risk of HIV infection [18].

**Muscular changes:** skeletal muscle weakness, lower bone density [17], avascular necrosis of the femoral head [19].

**Neurological complications:** blackouts, blurred vision, impaired memory and slower reaction times [20] alcoholic tremors, myopathy, Wernicke's encephalopathy and cerebellar degeneration [21].

**Psychiatric complications:** increased risk for suicide, personality disorders and risk-taking behaviors [21].

### 7.1. Other consequences

#### 7.1.1. Suicides due to alcohol consumption

As per a comparative study carried out by Gururaj in Bangalore, cases of suicide are nearly 25 times more among the alcohol users compared to non-alcoholics [22]. Another study done by Vijayakumar et al., in Chennai found that suicide rates were higher among alcohol users as compared with non-alcoholic [23].

#### 7.1.2. Road traffic accidents due to alcohol consumption

**Drunken driving (Motor vehicle Act):** Several laws are there governing drunken driving in India. The BAC limits are fixed at 0.03%. As per the Motor Vehicle Act, any person whose BAC values are found to be more than this limit are booked under the first offence and may be fined about INR2,000 to 10,000 and/or he or she may face a maximum of 6 months to 4 years imprisonment [32].

In a study conducted by the National Institute of Mental Health and Neurosciences (NIMHANS) in 12 major hospitals of Bangalore city, it was found that nearly 28% of injuries because of road traffic accidents were directly attributable to alcohol. The roadside survey revealed that nearly up to 40% of the drivers were under the influence of alcohol [24, 25]. In a study done by Aditya et al., it was found that 20% of the fatal road traffic accidents were because of alcohol use. The blood alcohol concentration (BAC) of 38% of those alcohol users were above the permissible limits [26]. According to the latest data released by the National Crime Records Bureau (2015), Tamil Nadu recorded the highest number of drunk and driving accidents in the country [27].

## 8. Beneficial effects of Alcohol

It is reported that consumption of small amounts of alcohol is beneficial for cardiovascular health, particularly red wine because it contains Resveratrol and Flavonoids which acts as antioxidant and provides cardioprotective effects to the heart. The role of antioxidants is to prevent heart disease by increasing levels of high-density lipoprotein which is called as good cholesterol and protects artery damage. Moderate drinking means neither less nor more which means two drinks per day for men and one drink per day for women. A drink means 355 ml of beer, 148 ml of wine etc. Moderate consumption of alcohol raises high density lipoproteins, prevents formation of blood clots and also prevents artery damage due to low density lipoprotein which is called as bad cholesterol. It does not mean that everybody starts drinking for prevention of heart disease because it leads to other health problems and a man become addictive [28].

## 9. Alcohol policy in India

According to the National Crime Records Bureau of India, the different crimes that are related to alcohol consumption fall under four major acts namely, the Prohibition Act, Gambling Act, Psychotropic Substance Act and Excise Act [9]. In India, State Governments have the power to make alcohol related legislation and control on excise rates, production, distribution and sale of alcohol in their states. Only three states are there which have complete or partial prohibition on alcohol namely Gujarat (complete prohibition), Bihar (complete prohibition) and Manipur (partially prohibited). The Government of Manipur lifted the ban of alcohol in some districts because of some traditions of some scheduled castes and scheduled tribes in these districts. But trade of illicit liquor are flourished along the borders because there is no prohibition on alcohol in neighboring states. In addition, due to prohibition of alcohol in these states people have begun other substances for addiction like narcotic drugs, as a result illicit trade of narcotic drugs are raising [9, 29, 30].

### 9.1. Legal drinking age in various states of India

Legal drinking age is the minimum age after which a person is allowed to buy alcohol. The legal age in different states in India is given in Table 5 [31].

**Table 5** Legal drinking age in various states of India

Name of state/Union territory	Age in years
Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Puducherry, Sikkim	18
Andaman and Nicobar, Arunachal Pradesh, Andhra Pradesh, Uttar Pradesh, Assam, Jharkhand, Telangana, Tamilnadu	21
Chandigarh, Daman and Diu, Delhi, Punjab	25
Gujarat, Bihar, Lakshadeep, Nagaland	Complete ban
Manipur	Partial ban

## 10. Treatment options for Alcohol abuse and alcoholism [33]

The alcoholism can't be treated only by medicines but it requires strong family and social support too. Treatment for alcohol dependence is achieved usually by stepped therapy, group support, counseling along with medications. Medically, alcohol dependence is treated by three oral medications i.e. Disulfiram, Naltrexone and Acamprosate and a parenteral drug i.e. Naltrexone. These drugs helps in reducing drinking, relapses and leads to full recovery and temperance from alcohol.

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## 11. Conclusion

Alcohol consumption is emerging as a major public health problem in our country. Alcohol consumption not only affects a person's health but his/her mind, body and soul also. Government of India is taking many steps through sensitization programmes and health education campaigns to educate/aware people about the negative impacts of alcohol consumption i.e. social, mental and economic but this much is not enough. Many things or steps are needed to take. Alcohol policy differs from state to state; hence we would like to recommend policymakers to make a rational/uniform alcohol control policy with specific objectives like alcohol taxation, minimum age, production and promotion policy and also the liquor shops must be far from residential, public or market place. There are many Government rules and regulations, they must be strictly followed. It's a strong need because it's a matter of physical, mental and social health and definitely the steps will lower down the illegal trafficking, number of deaths and alcohol use diseases as well.

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## Compliance with ethical standards

### *Acknowledgments*

We would like to deliver our sincere thanks to the authors of the articles mentioned in the reference, due to whom I succeeded in writing this article in a better and beneficial way.

### *Disclosure of conflict of interest*

The authors declare that they have no competing interests.

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