International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Understanding the Concept of Madya and Madatyaya with Respect to Alcohol Use Disorders

Jesny V Jose[1], Arya J S[2], Dr Sunil John Thykkattil[3]

[1]Post Graduate Scholar, Department of Kayachikitsa, Government Ayurveda College Tripunithura, Kerala university of health science, Kerala, India
[2]Post Graduate Diploma Scholar, Department of Kayachikitsa, Government Ayurveda College Tripunithura, Kerala university of health science, Kerala, India
[3]Associate Professor, Department of Kayachikitsa, Government Ayurveda College Tripunithura, Kerala university of health science, Kerala, India

Abstract:
Intoxicative affection is common for both poisons and alcohol. Alcohol shares all the properties of poison. Alcoholic drinks are prepared of different types of ingredients. They have different attributes and actions. Therefore, they have both useful and harmful effects. If taken inappropriately, alcohol produces poisoning effects like *moha* or unconsciousness. Alcohol use disorder (AUD) is a medical condition characterized by an impaired ability to stop or control alcohol use despite adverse social, occupational, or health consequences. In ayurveda intake of alcoholism is not prohibited but some rules & regulations have been laid down to reap the benefits and avoid ill effects of alcohol consumption.

KEYWORDS: *Madatyaya*, Alcoholism, Alcohol use disorders, *Madya*

Introduction

In ayurveda *madya* is considered as *ahara, visha* and *ousadha* according to its *guna* and its dosage. *Madhyavarga* is included under one of the 12 *aharavarga* according to acharya *Vagbata*[1]. On the basis of use, *madya* is classified into 2 types as medicine as well as beverage. Over consumption of *madya* leads to the pathology named *madatyaya*. It is the state of alcoholic intoxication having all the dosa vitiation leads to *ojonasa* and impairs normal well-being. If *madya* used as a prescribed manner, it will act as *amrut/ nector* and having tremendous qualities told in *samhitas*. In *sarangdhara samhita*, while characterizing the term *madakari, madhya* is included in the drugs having *tamogana* predominantly causing insanity[2]. Hence the judicial use of of *madya* is only appreciated. Alcohol use disorder, is a medical condition characterized by an impaired ability to stop or control alcohol use despite adverse social, occupational or health consequences. It is considered as a brain disorder having mild, moderate and severe stages. A person's risk for developing AUD depends in part on how much, how often and how quickly they consume alcohol. Hence it can compare with stages of *madatyaya* and can understand the risk factors w.r.t its symptoms. The study carried out with the help of *vedic* literature available in ayurveda along with concerned modern literature available from texts and internet sources.

Aims and objectives

To understand the concept of *madya* and *madatyaya* with respect to alcohol use disorders.

Materials and Method

Concepts related to the topics are compiled from ayurvedic literature, modern textbook and authentic internet sources. This article is based on the review of *madyavarga, nidana, lakshanas* of *madatyaya vyadhi* from available ayurvedic literature and relevant matter is compiled and critically analysed with modern aspects of alcohol use disorders.

Results

Madyavarga

According to Ayurveda, medicated fermented liquors, *sura* was first administered by lord Indra as a remedial measure to eradicate the complaints occurred in him due to excess intake of *somarasa*. It is said that from there onwards preparation of different kinds of fermented liquors started. They used these liquors according to proper direction of a physician keeping in view of *ritu* (season), *vaya* (age), stamina, etc. to maintain the proper health of the body and mind. While describing the seasonal routine, Ayurveda suggests to take fermented liquors especially in *Hemanta* (winter) and *Sisira*. It should be administered after taking meat of aquatic marshy animals. Selection of the fermented liquid should be according to *prakriti*, *vaya*, *satvabala* (stamina), etc., of an individual. In spring, Ayurveda suggests to take harmless fermented liquors. In rainy season the intake of fermented liquors with honey is recommended. The above-mentioned information's show that fermented medicated liquors were prescribed by our ancient physicians of Ayurveda mainly for medicinal purpose. They suggested the same according to season so that one could maintain proper health[3].

Certain important fermented liquors and their important merits and demerits are given below[4]:

Sl. No.	Name of medicated fermented liquors	Merits and demerits
1	***Sura*** (prepared from *dhanya varga- masha, Sali* etc)	Beneficial for emaciated persons, obstruction of urine. *grahani*, piles. It alleviates v*ata* and useful in deficiency of lactation and Anaemia
2	***Madira***	Good for hiccup, dyspnoea, coryza, cough, constipation, obstruction in faeces, vomiting and alleviates *vata*.
3	***Jagala*** (*surabheda*)	Useful for colic, dysentery, piles, *gulma*, and curative of *kapha* and *vata* disorders.
4	***Arishta*** **(**prepared from *oushadhadravya kwathasidha*)	Alleviates phthisis, piles, g*rahanidosha*, anaemia, anorexia, fever, *kaphaja* disorders and is relishing and a good appetiser.
5	***Sarkara*** (prepared from sugar)	Is palatable, producing easy intoxication, fragrant, alleviates disorders of urinary bladder and is digestive, cordial and also improve complexion.
6	***Pakvarasa*** (prepared from *ikshurasa*)	Is relishing, appetiser, cordial, beneficial in phthisis, swelling and piles, alleviates disorders of Medas and Kapha and improves complexion.
7	***Sitarasika*** (*apakva rasa seedhu)*	Digestive, alleviates constipation, is emaciating and beneficial in swelling. abdominal disorders and piles.

8	***Gauda*** (prepared from jaggery)	Eliminate faeces and flatus and is saturating and appetiser.
9	***Aksiki*** (prepared from *vibheetaki*)	Is useful in anemia and wounds and is an appetiser.
10	***Surasava*** (prepared by combining *sura* and *asava*)	Is strongly intoxicating, alleviates vata and is palatable.
11	***Madhavasava*** (prepared from *guda* and honey)	Is expectorant and sharp.
12	***Maireya*** (mixed combination)	Is sweat and heavy.
13	***Madhu*** (prepared from honey)	Is relishing, appetiser, cordial, rough, non- antagonistic to *pitta*, alleviates constipations and *kapha*.
14	***Sura* along with *manda***	Along with *manda* (upper clear portion) prepared of barley, is rough, hot and aggravates *vata* and *pitta*.
15	***Madhulika*** (prepared from ragi, *godhuma*)	Is heavy, digests with distension and aggravates *kapha*.
16	***Sauviraka*** (prepared from *yava*)	Is appetiser, digestive, alleviates disorders of heart, anaemia, and helminthiasis are beneficial in *grahani* and piles.

According to ayurveda, in *Panchabhautika* combination, all the *Madakadravyas* in nature is considered to be *agneya* and *vayavya* in character. Apart from it, it is *sarvarasatmaka* (combination of all rasas). In action *madya* (fermented liquors) having entered into the heart counteracts the ten properties of *ojas* with its corresponding ten properties and thus upset mind.

The ten properties of *madya* are, *teekshna*, *ushna*, *ruksha*, *sookshma, amla, vyavayi, asukaram*, *laghu, vikashi, visada*[5]. According to Ayurveda, "heart is the seat of the channels of *rasa*, *vata* psyche, intellect, senses self and primary *ojas*. Hence by excessive drinking and consequent damage of *ojas* there by, heart as well as dhatus located there get affected".

Based on current available alcohol beverages, beer or cooler (12 ounce/ ~5% alcohol), malt liquor (8-9 ounce/ ~7% alcohol), table wine (5 ounce/ ~ 12% alcohol), 80-proof spirit (hard liquor (1.5 ounce/~ 40% alcohol)[6] permissible alcohol limit in India is set as 0 .03% per 100 ml of blood (30 mg/dl = 0.03%). The detection of more than 30 mg of alcohol or drugs in a sample of 100ml blood is considered as a punishable offence by Indian law[7].

Levels of Impairment at Different Blood Alcohol Concentrations[8]

Level (mg/dL)	**Likely Impairment**
20-30	Slowed motor performance and decreased thinking ability
30-80	Increases in motor and cognitive problems
80-200	Increases in incoordination and judgment errors, mood lability, deterioration in cognition
200-300	Nystagmus, marked slurring of speech, and alcoholic blackouts
>300	Impaired vital signs and possible death

Evidence that Alcohol has a genetic influence

Close relatives with AUDs have a 3-4 times increased risk for severe alcohol problems. The rate of alcohol

problems increases with the number of relatives with AUDs, the severity of their illness. The closeness of their genetic relationship to the person studied. Higher concordance for severe AUDs identical twins than fraternal twins in most investigations, which estimate that genes explain 40-60% of the variance. Adoption studies show increased risk for children of patients with AUDs even when separated from their biologic parents since birth and raised without any contact. The risk is not enhanced when the adoptive parents have AUD Animals studies support the role of genes. According to ayurveda less *satvabala* persons are more dependent to alcohol use disorders. In ayurveda *manodosha chikitsa* is explained as "*dhee, dyradmadi vijanam manodoshoushadham param"*, which means intellect, endurance and knowledge of self-etc are the main therapies for the mental disorders. Once the person have *pravara satvabala* , then he can easily conquer all the challenges. So, *satvabala* is important for keeping control for intaking alcohol.

Nidana

Nidana is defined as the *vyadhijanma hetu* (etiological factors) causative factors responsible for the manifestation of disease. There is separate chapter dedicated for *madatyaya* and its *chikitsa* in all classical textbooks of ayurveda and different types of *nidana* factors elaborated for the same.

(Table 1- the *nidanas* of *madatyaya* according to different acharyas)

Sl no	nidanas	C.S	Su.S	AH	AS	BP	KS	MN	YR	HS	VS	GS
1	*Ruksha annapana*	✓				✓						
2	*Atimadyapana*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	*Alpa asana*	✓				✓						
4	*Pramitasana*	✓				✓						
5	*Ruksha parinatha madya*	✓				✓						
6	*Soka karshita*		✓			✓		✓	✓		✓	✓
7	*Bhaya karshita*	✓	✓			✓		✓	✓		✓	✓
8	*Sthri karshita*	✓				✓						
9	*Bhara karshita*	✓	✓			✓		✓	✓		✓	✓
10	*Adva karshitha*	✓	✓			✓		✓	✓		✓	✓
11	*Amlabhoji*	✓	✓			✓		✓	✓		✓	✓
12	*Ushnabhoji*	✓				✓						
13	*Teeksha bhoji*	✓				✓						
14	*Teekshnoshna amla madya*	✓		✓	✓	✓						
15	*Krodha*	✓	✓	✓	✓	✓		✓	✓		✓	✓
16	*Agnipriya*	✓				✓						✓
17	*Atapapriya*	✓				✓						
18	*Taruna-madhura goudika or paishtika madya*	✓				✓	✓					
19	*Madhura snigda guru asana*	✓				✓						

20	*Divaswapna sayyasana sukhi*	✓				✓						
21	*Ajeerna madyapana*		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
22	*Abala*					✓		✓	✓	✓	✓	✓
23	*Vegadharana*		✓			✓						
24	*Ekanthamadyapana*		✓	✓		✓		✓	✓		✓	✓
25	*Nithyam madyapana*			✓	✓	✓	✓					✓
26	*Nirbhukta madyapana*			✓	✓	✓	✓			✓		✓
27	*Laghu satva*			✓	✓		✓					
28	*Sahasa vicheda*						✓					
29	*Pipasita*		✓			✓		✓	✓	✓	✓	✓
30	*Bubukshita*		✓			✓		✓	✓	✓	✓	✓
31	*Vyayama karshita*		✓			✓		✓	✓		✓	✓
32	*Ushnabhitapta*		✓					✓	✓		✓	
33	*Vata-pitha prakruthy*	✓		✓	✓							
34	*Mandagni*			✓	✓							
35	*Excess vaya*			✓	✓							

Saririka nidanas- *ruksha annapana, atimadyapana, alpa asana, pramitasana, rukshaparinatha madya, sthree- bhara- adwa karshita, amla- ushna- teekshna bhoji, agni- atapapriya, taruna- Madhura- goudika or paishtika madya, Madhura- snigdha – guru asana, divaswapna- savyasana sukhi, ajeerna madyapana, vegadharana, ekanthamadyapana, nithyamadyapana, nirbhukta madyapana, sahasa vicheda, pipasita, bubhukshita, vyayama karshita, ushnabhitapta, VP prakruti, mandagni, excess vaya*

Manasika nidanas- *soka- bhaya karsita, krodha, laghu satva, abala,*

(**CS**- Charaka Samhita, **Su S**- Susruta Samhita, **AH-** Ashtanga hrudaya, **AS**- Ashtanga sangraha, **BP**- Bhavaprakasa Samhita, **KS-** Kashyapa Samhita, **MN**- Madhava nidana, **YR**- Yogaratnakara, **HS**- Harita Samhita, **VS**- Vangasena Samhita, **GS**- Gheranda Samhita)

Lakshana

A. Samanya lakshanas of madatyaya

Pramoha/ sammoha (confused state), Hrudayabheda ,Hruddrava (palpitations), Vitbheda / atisara, Trishna, Soumya and agneya jwara, Aruchi, Swayathu, Chithavibrama, Pralapa, Chardi, Ulklesha, Bhrama, Duswapna darshana, Sareeradukha, Vidhyutulya Vedana of sira parsva asthi sandhi, Jrumbha, Sphurana, Vyapana, Hikka, Karnakshi mugharoga, Hrullasa, Asatam roopadarsana, Truna, Bhasma, lataparna, pamsubhischa avapooranam, Ghrishyati, Vilapa (laments), Dahyate (burning sensation), Harsha (horripilation), Vihwala (gets agitated), Sosham (emaciation)

B. Vishesha lakshanas

Vatika madathyaya

Sl no	**lakshanas**	**AH**	**AS**	**CS**	**MN**	**BP**	**KS**	**VS**	**YR**	**HS**
1	**Jagaram**	✓	✓	✓	✓	✓	✓	✓	✓	
2	***Swasam***	✓	✓	✓	✓	✓		✓	✓	

3	***Kampa***	✓	✓							
4	***Sirakampa***			✓	✓	✓		✓	✓	
5	***Murdhniruja***	✓	✓							
6	***Bhrama in swapna***	✓	✓							
7	***Utpatati in swapna***	✓	✓							
8	***Pretai saha bhashate***	✓	✓							
9	***Hikka***			✓	✓	✓		✓	✓	
10	***Parswasula***			✓	✓	✓	✓	✓	✓	
11	***bahupralapa***			✓	✓	✓	✓	✓	✓	✓
12	***Hrutruja,***						✓			
13	***parvaruja***						✓			
14	***Unmatha iva abhati***						✓			

In *vatika madatyaya* patient presents more pain related symptoms and *kasyapa* says that patient in *unmatha avastha*. The cell membrane is highly permeable to alcohol. So once alcohol enters into blood stream it can readily diffuse into almost all the cells in the body. Hence intake of large amount of alcohol leads to manifestation of above-mentioned symptoms.

Paithika madathyaya

Sl no	***Lakshanas***	**AH**	**AS**	**CS**	**MN**	**BP**	**KS**	**VS**	**YR**	**HS**
1	***Murcha***			✓						✓
2	***Daha***	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	***Jwara***	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	***Sweda***	✓	✓	✓	✓	✓		✓	✓	
5	***Moha***	✓	✓		✓	✓		✓	✓	
6	***Atisara***	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	***Trit***	✓	✓	✓	✓	✓		✓	✓	
8	***Bhrama***	✓	✓	✓	✓	✓		✓	✓	
9	***Haritatva of body***	✓	✓	✓	✓	✓		✓	✓	
10	***Haridratva of body***	✓	✓							
11	***Raktata of netra and kapola***	✓	✓							
12	***Raktaprakopa***						✓			
13	***swedapeetata***						✓			
14	***Chardi***						✓			

15	***Srotapaka***						✔			
16	***Peetam pasyati***						✔			

In *paithika madatyaya* patient presents more GIT related symptoms such as thirst, burning sensation, acid reflux etc. the production of vasopressin from hypothalamus and the secretion of this hormone from posterior pituitary limited after alcohol consumption. So, it may result in intense thirst and above-mentioned symptoms.

Kaphaja madathyaya

Sl no	***Lakshanas***	**AH**	**AS**	**CS**	**MN**	**BP**	**KS**	**VS**	**YR**	**HS**
1	***Chardi***	✔	✔	✔	✔	✔	✔	✔	✔	✔
2	***Hrullasa***	✔	✔	✔	✔	✔	✔	✔	✔	✔
3	***Nidra***	✔	✔							
4	***Udarda***	✔	✔							
5	***Angagourava***	✔	✔	✔	✔	✔		✔	✔	✔
6	***Arochaka***	✔	✔	✔	✔	✔		✔	✔	✔
7	***Tandra***	✔	✔	✔	✔	✔	✔	✔	✔	✔
8	***Sthimithya***	✔	✔	✔	✔	✔		✔	✔	✔
9	***Seeta pareeta***	✔	✔	✔	✔	✔		✔	✔	✔
10	***Prathisyaya***									✔
11	***Visanjanatha***						✔			
12	***vishadam***						✔			
13	***Alasa***						✔			
14	***Sthambha***						✔			
15	***Seetajwara***						✔			

In *kaphaja madatyaya* patient presents with more CNS depressants symptoms. Heavy alcohol intake cause CNS depressants action, it results in lowering digestive power, mood, motor activities etc. hence patient presents above mentioned symptoms.

Clinical syndromes of chronic alcoholism

In Ayurveda stages of chronic alcoholism is categorised into 4 clinical conditions as *panatyaya*, *paramada, panajeerna* and *panavibraama*. Among this *panatyaya* is again subdivided based on *doshik* predominance by *susruta acharya*[9].

1.1 panatyaya

Types of panatyaya	**SU**	**VS**
Vatika panatyaya	*Sthambha, angamarda, hrudayagraha, toda, kampa, siroruja*	*Hikka, swasa, sirakampa, parswasula, prajagara, bahupralapa*
Paithika panatyaya	*Sweda, pralapa, mughasosa, daha, murcha, peetata of vadana and lochana*	*Trushna, daha, jwara, sweda, moha, atisara, vibhrama, harita varnata*

Kaphaja panatyaya	*Vamadhu, seeta, kapha praseka*	*Chardi, arochaka, hrullasa, tantra, sthaimithya, gourava, seetapareeta*

1.2 paramada lakshanas

Paramada lakshanas	
Ushma, angaguruta, virasanana, sleshmadhikatva, aruchi, mala mutra sanga, Trishna, siroruja	*Susruta*
ruja, sandhibheda	*Madhavanidana*
tantra, sleshmakshaya	*Bhavaprakasa*

1.3 panajeerna lakshanas

Panajeerna lakshanas	
adhamana, udgirana of amlarasa, vidaha, symptoms of excess pitha	*Susruta*
udgirana	*Madhava nidana*
udgirana	*Bhavaprakasa, Vangasena*

1.4 panavibhrama lakshanas

Panavibhrama lakshanas	
hruttoda, gatratoda, vamathu, jwara, kandadhoomavidaha, murcha, kaphasravana, murdharuja, vidaha, suranna vikrutheshu dwesha	*Susruta*
mada, pradeha	*Bhavaprakasa*
Pradeha	*Mahava nidana, Vangasena*

Withdrawal syndromes of chronic alcoholism

1. Dwamsaka
2. Vikshaya

Dwamsaka	***Vikshaya / Vikshepa (VS)***
Sleshma nishteeva	*Anga atiruk*
Kantasosha	*Siro atiruk*
Atinidrata	*Hrudroga*
Sabda asahatva	*Kantaroga*
Tantra (VS)	*Sammoha*

Hrit Kanta Asyasosya (VS)	*Swasa*
	Trushna
	Vami
	Jwara
	Kasa (VS)

If a person who has stopped drinking alcohol suddenly takes recourse to drinking alcohol in excess, he suffers from two diseases, *dwamsaka* and *vikshaya*. Since such a person is already emaciated because of his earlier drinking habit, these two diseases appearing in him are very difficult to cure[10].

The signs and symptoms of *mada* (intoxication) in three stages[11]:

First stage:

Exhilarating pleasant, pronounces merits of food and drinks, invokes instrumental and vocal music, laughter and anecdotes. Does not affect the memory or lead to incapability to sense. Sleep-awakening are normal. Thus, it is considered to be a pleasure giving stage.

Middle stage:

There are memory and confusion, distinct speech followed by in-distinct one, proper and improper excessive talk, excessive movements, incoherence in standing, food, drink and talk.

Last stage:

Becomes motionless like a cut wood, his mind being covered with narcosis and confusion, though living he appears as dead. Does perceive not the pleasurable senses or does not recognise his friends. Does not get enjoyment for which liquor is taken. Finally, when he becomes addicted, he acquires painful diseases (as consequence)

Alcohol use disorders

Alcohol use disorder (AUD) is a medical condition characterized by an impaired ability to stop or control alcohol use despite adverse social, occupational, or health consequences. It encompasses the conditions that some people refer to as alcohol abuse, alcohol dependence, alcohol addiction, and the colloquial term, alcoholism. Considered a brain disorder, AUD can be mild, moderate, or severe. Lasting changes in the brain caused by alcohol misuse perpetuate AUD and make individuals vulnerable to relapse. The good news is that no matter how severe the problem may seem, evidence-based treatment with behavioural therapies, mutual-support groups, and/or medications can help people with AUD achieve and maintain recovery. According to the 2022 National Survey on Drug Use and Health, 28.8 million adults ages 18 and older (11.2% in this age group) had AUD in 2021.[12] Among youth, an estimated 753,000 adolescents ages 12 to 17 (2.9% of this age group) had AUD during this time frame.

What increases the risk for Alcohol Use Disorder?

A person's risk for developing AUD depends in part on how much, how often, and how quickly they consume alcohol. Alcohol misuse, which includes binge drinking and heavy alcohol use over time increases the risk of AUD. Other factors also increase the risk of AUD, such as:

- Drinking at an early age. A recent national survey found that among people ages 26 and older, those who began drinking before age 15 were more than three times as likely to report having AUD in the past year as those who waited until age 21 or later to begin drinking. The risk for females in this group is higher than that of males.

- Genetics and family history of alcohol problems. Genetics play a role, with hereditability accounting for approximately 60%; however, like other chronic health conditions, AUD risk is influenced by the interplay between a person's genes and their environment. Parents' drinking patterns may also influence the likelihood that a child will one day develop AUD.
- Mental health conditions and a history of trauma. A wide range of psychiatric conditions—including depression, post-traumatic stress disorder, and attention deficit hyperactivity disorder—are comorbid with AUD and are associated with an increased risk of AUD. People with a history of childhood trauma are also vulnerable to AUD.

Pathophysiology

Multiple theories have been proposed to explain the development of AUDs in individuals. Some evidence-supported theories include positive-effect regulation, negative-effect regulation, pharmacological vulnerability, and deviance proneness. Positive-effect regulation theory suggests that certain individuals consume alcohol to seek positive rewards, such as to experience euphoria or pleasure. They may use alcohol to enhance positive emotions or social experiences. Negative-effect regulation theory suggests that individuals may turn toward consuming alcohol to cope with negative emotions or distressing situations. Alcohol consumption can be a self-medication strategy to alleviate symptoms of depression, anxiety, or feelings of worthlessness. Pharmacological vulnerability theory emphasizes individual differences in how they respond to the acute and chronic effects of alcohol. Specific individuals may be more susceptible to the rewarding effects of alcohol or have a reduced capacity for efficient alcohol metabolism, thereby increasing their vulnerability to developing AUDs. Deviance proneness theory proposes that individuals with a history of deviant behaviour or inadequate socialization during childhood may be more prone to developing an AUD. In this theory, alcohol consumption can become a strategy for self-medication to alleviate symptoms of depression, anxiety, or feelings of worthlessness[13].

Toxicokinetics

The metabolism of alcohol (ethanol) primarily occurs in the liver by the enzyme cytosolic alcohol dehydrogenase (ADH). This enzymatic reaction involves the reduction of nicotinamide adenine dinucleotide (NAD+) and produces acetaldehyde as a byproduct. Acetaldehyde is subsequently metabolized by the enzyme aldehyde dehydrogenase (ALDH), which oxidizes it to form acetate. Acetate then enters into various metabolic pathways. ADH is also present in the gastrointestinal tract, contributing to the initial metabolism of ethanol during its ingestion, also known as first-pass metabolism. The cytochrome P450 system, particularly the enzyme CYP2E1, plays a role in alcohol metabolism, although to a lesser extent than ADH. In chronic alcohol users, this pathway is upregulated, leading to an increased rate of alcohol metabolism.

The metabolism of alcohol is affected by various factors. Generally, females tend to eliminate alcohol consumption faster than males. However, females have a slower first-pass metabolism due to lower levels of ADH, resulting in higher initial blood alcohol concentration following alcohol consumption. During pregnancy, the fetal liver metabolizes alcohol slower due to incomplete expression of enzymes CYP2E1 and ADH. As a result, the developing foetus is exposed to alcohol for a prolonged period, increasing the risks of foetal alcohol spectrum disorders. Alcohol metabolism is generally slower in a fasting state, which is attributed to the decreased levels of ADH observed during fasting. Conversely, consuming food can enhance liver blood flow, and the presence of sugars, such as fructose, allows a substrate for the

regeneration of NAD+ from ADH. This conversion enables NAD+ to participate in the oxidation of alcohol[14].

The time of day also impacts alcohol elimination from the body, with the highest rates of elimination observed late in the evening. Heavy drinking can affect the rate of alcohol elimination from the body, which is likely attributed to the increased expression of the CYP2E1 enzyme. However, this increase in alcohol elimination rate eventually slows down in individuals with advanced liver disease. Medications that function as ADH inhibitors can slow down the rate of alcohol elimination. H2 receptor blockers can also inhibit ADH, thereby reducing the first-pass metabolism in the stomach and potentially increasing blood alcohol levels.

Alcohol intoxication results as the amount of alcohol in your bloodstream increases. The higher the blood alcohol concentration is, the more likely you are to have bad effects. Alcohol intoxication causes behaviour problems and mental changes. These may include inappropriate behaviour, unstable moods, poor judgment, slurred speech, problems with attention or memory, and poor coordination. You can also have periods called "blackouts," where you don't remember events. Very high blood alcohol levels can lead to coma, permanent brain damage or even death.

Alcohol withdrawal can occur when alcohol use has been heavy and prolonged and is then stopped or greatly reduced. It can occur within several hours to 4 to 5 days later. Signs and symptoms include sweating, rapid heartbeat, hand tremors, problems sleeping, nausea and vomiting, hallucinations, restlessness and agitation, anxiety, and occasionally seizures. Symptoms can be severe enough to impair your ability to function at work or in social situations.

Diagnosis of AUD

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), AUD is classified based on the presence of 2 or more of the following criteria within 12 months[15]:

- Alcohol is often taken in more significant amounts or consumed longer than intended.
- A persistent desire or unsuccessful efforts exist to reduce or control alcohol use.
- A significant amount of time is spent on activities necessary to obtain or use alcohol or recover from the effects of alcohol.
- Craving or a strong desire or urge to consume alcohol.
- Regular alcohol use leads to an inability to meet essential responsibilities at work, school, or home.
- Continued use of alcohol despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of alcohol.
- Significant reduction of important social, occupational, or recreational activities due to alcohol use.
- Recurrent alcohol use in situations in which it is physically hazardous.
- Continued use of alcohol despite knowing a persistent or recurrent physical or psychological issue is likely to have been caused or exacerbated by alcohol.
- Tolerance is characterized by either of the following:
  - The need for significantly increased amounts of alcohol to attain intoxication or the desired effect.
  - A substantial reduction in the desired effect even with continued use of the same amount of alcohol.
- Withdrawal, demonstrated by either of the following:
  - The presence of the typical withdrawal syndrome of alcohol.
  - Frequent consumption of alcohol (or a closely related substance, such as a benzodiazepine) to alleviate or prevent the onset of withdrawal symptoms.

Based on the number of criteria met, a patient can be classified as having a mild AUD (if they meet 2 or 3 criteria), moderate AUD (if they meet 4 or 5 criteria), or severe AUD (if they meet more than 6 criteria).

AUDIT screening tool[16]

Alcohol Users Disorders Identification Test (AUDIT)

Questions	Scoring System 0	1	2	3	4	Your Score
How often do you have a drink that contains alcohol?	Never	Monthly or less	2 - 4 times per month	2 - 3 times per week	4+ times per week	
How many standard alcoholic drinks do you have on a typical day when you are drinking?	1 - 2	3 - 4	5 - 6	7 - 8	10+	
How often do you have 6 or more standard drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
How often in the last year have you found you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
How often in the last year have you failed to do what was expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
How often in the last year have you needed an alcoholic drink in the morning to get you going?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
How often in the last year have you had a feeling of guilt or regret after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
How often in the last year have you not been able to remember what happened when drinking the night before?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
Have you or someone else been injured as a result of your drinking?	No		Yes, but not in the last year		Yes, during the last year	
Has a relative/friend/doctor/health worker been concerned about your drinking or advised you to cut down?	No		Yes, but not in the last year		Yes, during the last year	

Scoring: 0-7 = sensible drinking, 8-15 = hazardous drinking, 16-19 = harmful drinking and 20+ = possible dependence

What is considered 1 drink[17]?

The National Institute on Alcohol Abuse and Alcoholism defines one standard drink as any one of these:

- 12 ounces (355 millilitres) of regular beer (about 5% alcohol)
- 8 to 9 ounces (237 to 266 millilitres) of malt liquor (about 7% alcohol)
- 5 ounces (148 millilitres) of wine (about 12% alcohol)
- 1.5 ounces (44 millilitres) of hard liquor or distilled spirits (about 40% alcohol)

Systemic complications of unethical use of alcoholic beverages: -

Gastro- intestinal symptoms	Central nervous system	Social complications	Miscellaneous
GERD, fatty liver, cirrhosis, hepatitis	Peripheral neuropathy, delirium tremens	Accidents, marital disharmony, divorce	Acne rosacea, palmar erythema, rhinophyma
Gastritis, liver cell CA, liver failure	Alcohol withdrawal seizures, hallucinations	Loss of productive man-hours	Pellagra, cardiomyopathy, CAD
Nausea & vomiting, reflux esophagitis	Wernick's Korsakoff psychosis, suicide	Increased incidence of drug dependence	Cardiac beri beri, hypoglycaemia
GI bleeding, oesophageal varices, Mallory Weiss syndrome, achlorhydria, peptic ulcer	Marchiafava- Bignami disease, dementia, cerebellar degeneration, pontine melanosis	Financial dependence	Alcoholic myopathy, haemolytic anaemia,
Mal absorption syndrome	Alcohol jealousy, anterograde amnesia	Criminality, sexual abuse	Thrombocytopenia, vit K deficiency

Discussion

Alcohol affects almost all systems of our body: in Ayurvedic view all most all *srothas* get vitiated. After the ingestion of alcohol, it directly enters into digestive tract starting from mouth. It affects our tastebuds and *aruchi* (anorexia) develops also cause *mugharogas*. The person who regularly consuming alcohol experiences tastelessness of food. Then alcohol passing into the stomach via oesophagus. It will affect the healthy mucosa of oesophagus. In stomach alcohol combines with the ingested food. Since The alcohol is acidic in nature, overall acidity of stomach increases- results in gastritis, vomiting, burning sensation, pain over flanks etc due to erosion of gastric mucosa and acid reflux. In chronic alcoholism, peptic ulcer, GERD may develop.

After entering into small intestine absorption of alcohol takes place in the blood stream. Since alcohol is a toxin (ethanol) enzyme alcohol dehydrogenase metabolise ethanol into acetaldehyde. Acetaldehyde is rapidly converted to acetate by acetaldehyde dehydrogenase enzyme. This conversion is vital as acetaldehyde is far more toxic than alcohol and responsible for many of the withdrawal symptoms and other damage in effects. Acetate further converted into water and carbon dioxide.

But if large amount of alcohol consumed, microsomal ethanol oxidising system (MEOS) got activated. It involves enzyme cytochrome P4502G (CYP2E1). This system uses O_2 and NADPH to metabolise ethanol to acetaldehyde, like alcohol dehydrogenase enzyme does.

The only drawback is it needs high energy. MEOS pathway is inducible, meaning its activity can increases with persistent alcohol use, potentially leading to faster alcohol metabolism and greater tolerance. This is the reason for increased tolerance seen in chronic alcoholism. So chronic alcoholism leads to hepatotoxicity, hepatomegaly and fatty liver. This symptom can be correlated with *paithika madathyaya (peetam pasyati, haridratva of body)*.

Alcohol affects gut brain axis by altering gut-microbiota by favouring the growth of harmful bacteria over beneficial ones. It promotes inflammation in gut and other parts of the body like joints and lungs and

thereby producing symptoms like *soola, atisara, vitbheda, trikagraha, swayathu, hrudayavyadha, marmabheda* etc. eventually it increases intestinal permeability (leaky gut) allowing endotoxins like lipopolysaccharides to enter the blood stream, which trigger inflammatory responses potentially affecting the brain health and behaviour. Gut associated lymphoid tissue is part of immune system and plays a significant role in body's immune response. Chronic alcoholism leads to increased susceptibility to infections and exacerbates inflammatory conditions which also affects brain health through systemic inflammation. Gut microbiota produces various neuro active compounds including neurotransmitters such as serotonin (maintains mood & general brain functions). Alcohol induced dysbiosis can disrupt production and function of these neurotransmitters, potentially contributing to mood disorders such as depression and anxiety (*vishada- kaphaja madatyaya)*

Alcohol cross blood brain barrier directly and affects brain and thereby alters neurotransmitters transmitter level such as GABA and glutamate leading to immediate effects like *bahupralapa- vatika madatyaya, chitha vibhrama- samanya lakshana, visamjatha- kaphaja madatyaya, utpatati in swapna, pretai saha bhashate- vatika madatyaya)*. Signals sent via vagus nerve from gut to the brain can also influences stress responses, anxiety & the overall brain health.

In *vata* dominant *panatyaya* (alcohol intoxication due to excessive drinking) *avastha*, pain and stiffness will be more prominent and clinically patients may show *sthambha, kampa, angamarda, siroruja, toda, hrudayagraha etc. kampa and siroruja* seen in acute alcoholism is due to dehydration and increased acetaldehyde. In *pitha* predominant individuals, excessive sweating, *pralapa, mughasosha* (xerostomia due to hyposalivation), *daha, murcha* and yellowish discolouration of face and eyes. Acute alcohol drinking causes decrease in secretion and change in electrolyte concentration of human saliva and decrease in protein synthesis of salivary glands. Also, ethanol has diuretic effect leads to dehydration and acid base electrolyte imbalance leads to *murcha and pralapa*. In kapha predominant cases, *vamana, seetata, gourava, kaphapraseka, sthaimithya, tanthra, arochaka* etc occurs. If the level of acetaldehyde is higher than what liver can process, the body will react by vomiting to get rid of excess chemicals since body will consider it as *visha*.

Conclusion

Whatsoever is useful after death, whatsoever is good for the present life, and whatsoever is supreme for attaining salvation are based on the tranquillity of the mind of an individual. Alcohol considerably agitates this mind as a strong wind shakes the tree located on the bank of a river. If taken in an appropriate manner, in a right dose, at an appropriate time, along with wholesome food, in accordance with one's own strength and with a cheerful mind, alcohol works like ambrosia. If, however, a person drinks whichever type of alcohol is available (without considering its appropriateness), and that too in excess quantity, and if his body is regularly ununctuous and exhausted because of physical exercise (*vyāyāma*), then it works as a poison. If a person having proper *satvabala* can control his addiction towards alcohol and just supportive measures are needed to improve his life.

References

1. Prof.K.R.Srikantha Murthy., Translator. Vagbhata's Astanga Hrdayam. Varanasi. Chowkhambha Krishnadas Academy. Reprint 2018. Volume 1. Sutrasthana. Chapter 5. 68p
2. Dr P. Pushpangathan, Dr S Rajasekharan. Madakadravyas (Narcotics). Kottakkal ayurveda series:92. Vaidyaratnam P S Varier's aryavaidyasala Kottakkal. 2013. 18p

3. Dr P. Pushpangathan, Dr S Rajasekharan. Madakadravyas (Narcotics). Kottakkal ayurveda series:92. Vaidyaratnam P S Varier's aryavaidyasala Kottakkal. 2013. 33p
4. Dr P. Pushpangathan, Dr S Rajasekharan. Madakadravyas (Narcotics). Kottakkal ayurveda series:92. Vaidyaratnam P S Varier's aryavaidyasala Kottakkal. 2013. 34p
5. Prof.K.R.Srikantha Murthy., Translator. Vagbhata's Astanga Hrdayam. Varanasi. Chowkhambha Krishnadas Academy. Reprint 2018. Volume 2. Nidanasthana. Chapter 6. 57p
6. Creyos. Com blog. Cognitive testing for better brain health. Measure alcohol dependency with AUDIT. April 29, 2022. 12.51 PM.
7. TATA AIG TEAM. Drink and drive penalty. 8 October 2023. https://www.tataaig.com
8. Robert boland, Marcia L. Verduin, Pedro Ruiz M.D, South Asian edition of Kaplan and Sadock's Synopsis of psychiatry. Wolters Kluwer. 12 th edition. 276p
9. Prof K R Srikantha Murthy., Translator. Illustrated Susruta Samhita. Varanasi. Chaukhambha Orientalia. Reprint edition 2014. Volume 3. Utarastana. Chapter 47. 305p
10. Ram Karan Sharma, Bhagwan Dash. Agnivesa's Caraka Samhita, Text with English translation and critical exposition based on Cakrapani Datta's Ayurveda Dipika. Varanasi. Chowkhamba Sanskrit series office. Reprint 2013. Volume 4. Chapter 24. 429p
11. Dr P. Pushpangathan, Dr S Rajasekharan. Madakadravyas (Narcotics). Kottakkal ayurveda series:92. Vaidyaratnam P S Varier's aryavaidyasala Kottakkal. 2013. 38p
12. SAMHSA, Center for Behavioral Health Statistics and Quality. 2022 National Survey on Drug Use and Health. Table 5.1A—Substance use disorder for specific substances in past year: among people aged 12 or older; by age group, numbers in thousands, 2021 and 2022 [cited 2023 Dec 29]. Available from: https://www.samhsa.gov/data/sites/default/files/reports/rpt42728/NSDUHDetailedTabs2022/NSDUHDetailedTabs2022/NSDUHDetTabsSect5pe2022.htm#tab5.1a
13. https://www.ncbi.nlm.gov. books. NBK436003. Alcohol use disorders- StartPearls.
14. https://www.ncbi.nlm.gov. books. NBK436003. Alcohol use disorders- StartPearls.
15. Robert boland, Marcia L. Verduin, Pedro Ruiz M.D, South Asian edition of Kaplan and Sadock's Synopsis of psychiatry. Wolters Kluwer. 12 th edition. 270p
16. David A Warrell, Timothy M Cox, John D Firth. Oxford textbook of medicine. 5th edition. Oxford; New York. Oxford University Press. 2010. Volume 3. Chapter 24.7.2. 4880p Oxford section 24, 5354p
17. https://www.mayoclinic.org. alcohol use disorders- symptoms and causes. 18-may-2022.