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Research Article

Raktadushti in Madatyaya Vyadhi- Ayurveda

Evaluation of *Raktadushti* in *Madatyaya Vyadhi*: A Cross Sectional Observational Study

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Abstract: All over the world, alcohol consumption is becoming a lifestyle. The fashion of alcohol ingestion leads to habits of chronic alcoholism. Alcoholism (*Madyapaan*) is a behavioral disorder characterized by repetitive and excessive consumption of alcohol (*Madya*). It is observed that long-term consumption of alcohol damages the liver to a very large extent, leading to either Alcoholic liver disease or liver cirrhosis. In Ayurveda, this condition can be correlated with '*Madatyaya*.' *Madya* is described as the main etiological factor of various diseases at multiple places in Ayurvedic classics, but madatyaya is a primary one. Ayurved explains the etiology, pathogenesis, and treatment of *madatyaya*, but the specific *srotodushti* is not explained. When characteristics of *madya* and causative *moolasthanavikruti* (Hepatotoxicity) are considered, it is assumed that *madya* may cause *raktadushti* also. Hence this topic is an attempt to evaluate *raktadushti* in *madatyaya vyadhi*. It is a cross-sectional observational study performed on 50 patients of *Madatyaya*. Patients were examined thoroughly, and all the details were noted in a specially designed case record format. A comparative study of *madatyaya* and *raktadushti* was conducted; also assessment of *raktadushti* was done based on symptoms of *raktadushti* observed in those patients. Collected data and the observations are then analyzed by statistical tests such as the chi-square test and correlation regression. This study proves the positive correlation between *madyatyaya and raktadushti*. It may be the alcohol metabolized primarily in the liver, which is getting damaged by long-term consumption. Ayurveda explains *Yakrita and pleeha* as the *moolasthana* (roots) of *Raktavaha* srotas. This *moolasthana dushti* (damage to the root) causes damage to the whole system (*Raktavaha srotas*); hence *madatyaya vyadhi* can be labeled as a disease of *Raktavaha srotas.*

Key words: *Madatyaya, Raktadushti, Alcoholism, Yakrita Dushti, Raktavaha srotas*

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1. INTRODUCTION

Alcoholic beverages are similar to food and act as nectar if used judiciously; otherwise, they cause many diseases. Food sustains life if consumed properly; otherwise, it kills the individual. Similarly, poison act as a rejuvenator if used judiciously. *Madyapaan* is a behavioral disorder characterized by repetitive and excessive consumption. Intake of alcohol in more concentration causes vitiation of *tridosha*. The *ruksha guna* of alcohol vitiates *vata dosha* giving rise to symptoms like insomnia, delirium (*Pralaap)*, and Tremors (Kampa); the *pitta dosha* causes Vertigo (*bhrama),* Burning sensation in the palm and soles *(daha)*, Increased thirst (*Trishna)* and the *kapha dosha* causes Vomiting (*chhardi), Nausea (hrullas),* Ageusia *(arochak)*[1], etc. There are similarities between these conditions and the symptoms of alcoholism.[2] The World Health Organization (WHO) has listed alcoholism as one of the three most deadly killer diseases of the 20th century.[3] *Madatyaya* is the disorder which is characterized by pramōhaḥ [fainting/severe confusion], hṛd vyathā [precordial pain/cardiac pain], viḍ bhēda [loose motions/diarrhoea], satataṁ tr̥ṣṇā [continuous thirst], saumya āgnēya [saumya āgnēya], jvaraḥ [fever], aruci [tastelessness], śiraḥ ruk [headache], pārśva ruka [pain in flanks], asthi ruk [pain in bones], kampaḥ [tremors], marma bhēda [injury to vital points], trik grahaḥ [stiffness of sacroiliac region], urō vibandha [chest tightness], timira [errors of refraction/partial blindness], kāsaḥ [cough], śvāsa [breathlessness/difficult breathing], prajāgaraḥ [being awake], atimātrā svēda [excess sweating], viṣṭambhaḥ [constipation/fullness in the abdomen], śvayathu [oedema], citta vibhrama [instability of mind], pralāpa [excess talking/irrelevant speech/incoherent speech], chardiḥ [vomitting], utklēśaḥ [nausea/provocation of dōṣa], bhramaḥ [giddiness or dizziness], duḥsvapna darśana [having unpleaseant dreams][4] Madya is described as primary etiological factor for vitiation of *Rakta dhatu*.[5]When characteristics of *madya*, and causative *moolasthanavikruti* (Hepatotoxicity) are taken into consideration, it is assumed that *madya* may cause *raktadushti* also. In modern texts, alcohol is metabolized almost exclusively by the liver. 80% of alcohol is metabolized to Acetaldehyde by the mitochondrial enzyme ADH (Alcohol Dehydrogenase). Acetaldehyde forms an adduct with cellular proteins in hepatocytes, activating the immune system and leading to cell injury. ADH metabolizes Acetaldehyde to acetyl Co-A and acetate; this generates NADH from NAD (Nicotinamide adenine dinucleotide), which changes the redox potential of the cell.[6] All the studies on *madatyaya Vyadhi* (Alcoholism/Alcohol Abuse) are either interventional studies reflecting the efficacy of certain Ayurvedic preparation on *madatyaya*or some studies on the behavioral aspect of the *madatyaya* patient. There is no such study carried out which will explain the pathogenesis of *madatyaya Vyadhi* scientifically. *Madatyaya* is a *Hetu- Pradhana* disease, which means there will be no *madatyaya* unless there is '*Madya*' as an etiological factor. Hence it is important to elaborate on the progression of pathogenesis in *madatyaya Vyadhi.* This study attempts to establish a relationship between *Raktadushti* and *madatyaya Vyadhi*, which will help to understand the *samprapti* (Pathogenesis) of *madatyaya Vyadhi.* While describing the stages and treatment of *madatyaya,* ayurvedic classics did not explain the *srotasdushti* in *madatyaya.* This study focuses on the pathogenesis part of *madatyaya vyadhi*. Thus this study will bridge the gap between the previous researches can open one another way to treat *madatyaya* focusing on *raktadushti*. It will also help in the assessment of risks and complications. The liver, i.e., *Yakrit*, is one of the *moolasthana* (Roots) of *Raktavaha strotas*[7], and also *yakruta* is said to be *shonita-prabhava* (Developed from blood).[8] When alcohol is metabolized in the liver, it causes cell injury, as described above. Hence liver cells get damaged, leading to*moolasthana vikruti*, i.e., hepatotoxicity, which further causes vitiation of *Raktadhatu and Raktavaha srotas*[9]. Hence this study aims to evaluate *raktadushti* in *madatyaya vyadhi*. The study's objectives are - to study the relationship between *madatyaya* and *raktadushti,* to perform Liver Function Tests, and to study *madatyaya, Raktadushti*, and Alcoholism in detail. In ayurvedic texts, *Madatyaya* is described as a *vyadhi* of *rasavaha srotas*[7] and *manovaha srotas*[10] at some places; but when qualities of *madya*, which all causes vitiation of *Raktadhatu* and causative *moolasthana vikruti* are taken into consideration, *Madya* may cause *raktadushti* also; hence this project is an attempt to study the correlation between *madatyaya* and *raktadushti*. It can be helpful to all Ayurveda students and practitioners if this study proves the positive correlation between the same.

2. MATERIALS AND METHODS

It is an observational study performed on the patients of *madatyaya vyadhi*. A specially designed case record format records the history and other observations. Liver function tests were done in a central laboratory with the help of various reagents of Bilirubin Total and Direct, SGOT, SGPT, and Alk. Phosphatase, Protein Total, and albumin

2.1. Determination of sample size:

P = 48% [11]

Sample size = Z^2 [p (1-p)] / e^2

P= Prevalence of alcoholism
Z= Constant = 1.96
e= margin of error

Sample Size = Z^2 [p (1-p)]/e^2

= $(1.96)^2[0.5(1-0.5)]/(0.15)^2$
= $3.8416\ (0.5)^2/0.0225$
= 42.6 ~ 43

A standard dropout of 15% is considered. Therefore, the sample size will be 50. Therefore 50 patients are enrolled in the study.

2.2. Inclusion Criteria

- Patients who consume 60ml alcohol/day at least 5 days/week for at least the last 5 years.
- Patients are having signs and symptoms of *madatyaya*.
- Age between 18 years to 60 years.
- Irrespective of gender.

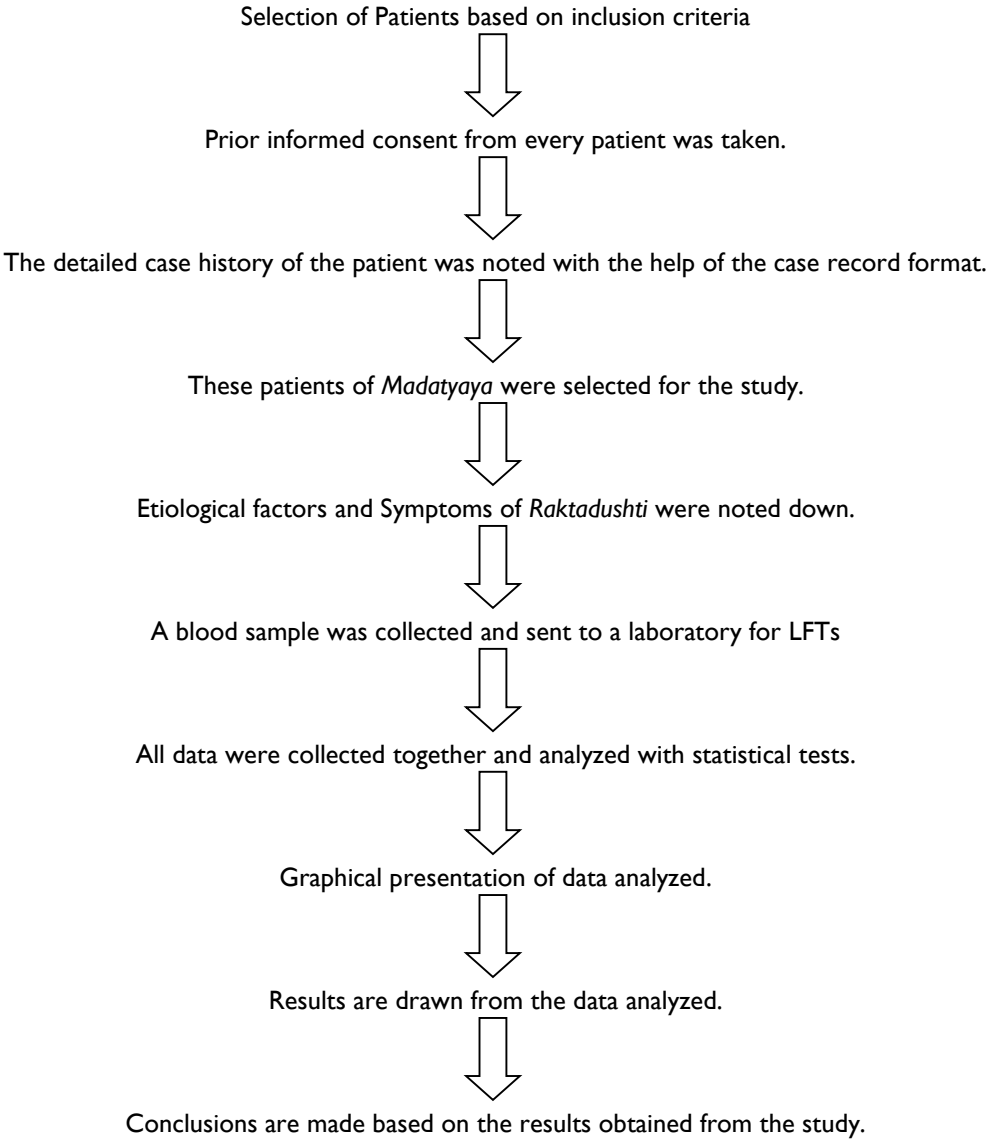
2.3. Exclusion Criteria

- Patients suffering from any major illness like AIDS, Koch's disease, or malignancy, these cases were excluded from the study.
- Patients have blood cell disease or any Blood coagulopathy.
- Patients with altered sensorium.
- Pregnant and lactating mother.
- Occasional alcohol drinker.

2.4. Ethical Statement

Ethical clearance was obtained from the Institutional Ethics Committee of the research center vide letter no. RSJH/PG/IEC/687/2014 Dated 04/12/2014. All the participants clearly explained the purpose of the study, and written informed consent was obtained from all of them before conducting the study. Furthermore, assurance of maintaining confidentiality was given to all the participants.

2.5. Plan of Work



3. RESULTS

While conducting this study, we came across various angles of this study. For results, the Distribution of patients was done based on various parameters; we calculated the mean, standard deviation, and percentage of 50 patients who participated in the study by tables and graphs. The observations are interpreted as follows.

Table 1: *Age-wise Distribution*		
Age (yrs)	**No. of Patients**	**Percentage**
18 – 30	4	8%
31 – 40	23	46%
41 – 50	11	22%
51 – 60	12	24%

Table 01: This table shows the incidence of *madatyaya* in the different age groups of the participants. A high incidence of *madatyaya* is found in the age group of 31 years to 40 years. At the same time, it is lowest (i.e., 8%) in the age group of 18 to 30 years.

Table 2: *Occupation-wise Distribution*		
Occupation	**No. Of patients**	**Percentage**
Heavy workers	15	30%
Workers	29	58%
service	5	10%
Unemployed	1	2%

Table 02: This is the occupation-wise Distribution of all the participants. 58% is the highest percentage of *madatyaya* among the workers doing moderate physical work. And the lowest percentage was found in the unemployed subject because only 1 unemployed subject was enrolled**.** *Srotodushti* was assessed by all the symptoms of *srotodushti* with the help of a specially designed case record format.

Table 3: *Distribution according to Srotodushti*		
Strotas	**No. of Patients**	**Percentage**
Pranvaha	1	2%
Udakvaha	15	30%
Annavaha	41	82%
Rasvaha	50	100%
Raktavaha	50	100%
Mansavaha	0	0%
Medovaha	0	0%
Asthivaha	0	0%
Majjavaha	4	8%
Shukravaha	0	0%
Mutravaha	2	4%
Purishavaha	4	8%
swedavaha	3	6%

Table 03 depicts the body's overall status (Channels). Almost all patients showed the vitiation of *Rasa* and *Raktavaha srotasa*. They were followed by *annavaha srotaodushti* in 82% of patients. Vitiation of *mamsa, meda*, and *asthivaha srotasa* was not observed in any of the participants. All other srotas were found to be vitiated in a very less number of patients.

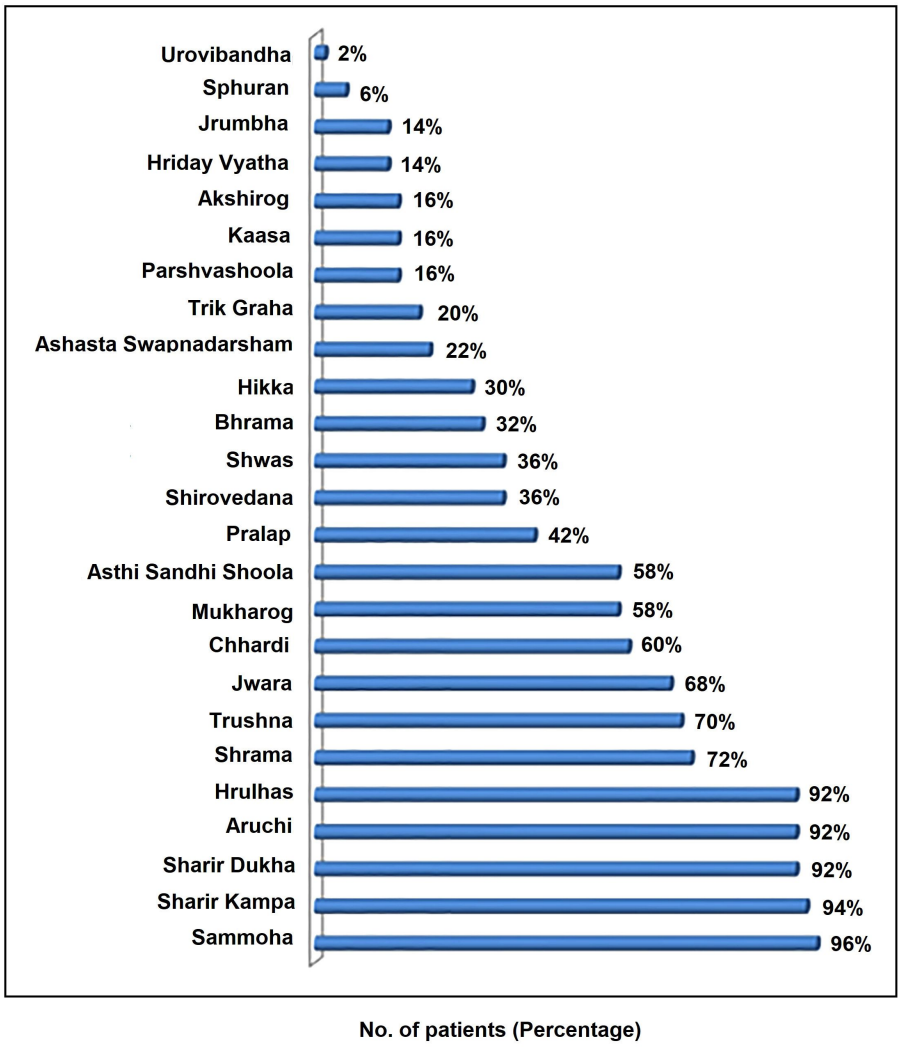


Fig 1: Distribution according to Symptoms of *Madatyaya*

Figure 01: This is the graphical presentation of the distribution of all the participants according to the symptoms of *madatyaya*. Symptoms of *madatyaya*, observed at least in 1 single patient, are plotted here. The symptoms like *sam moha, Kampa, Aruchi, hrilhas*, etc., are observed in most patients, while *uro-vibandha*, *sphurana*, etc., are the least observed.

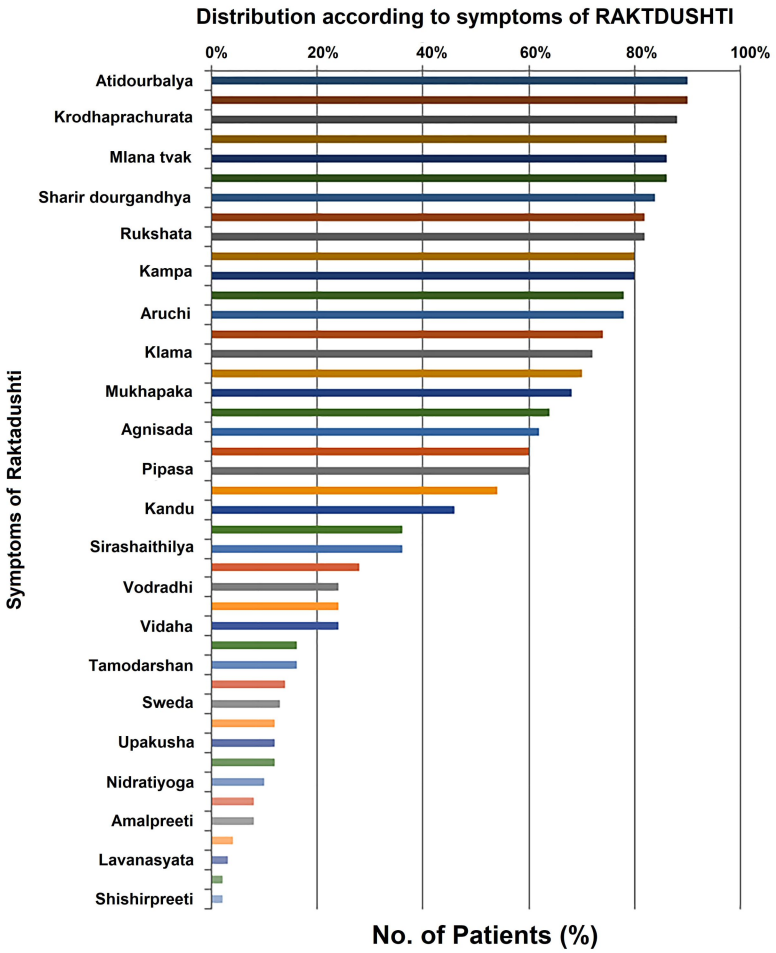


Fig 2: Distribution according to Symptoms of *Raktadushti*

Fig 2: This is the graphical representation of symptoms of raktadushti observed in the study participants. *Dourbalya, mada, krodha-prachurata, akshiraga, mlana-parusha twaka*, etc., symptoms are observed in more than 80% of participants. At the same time, *visarpa, lavanasyata, peedaka*, etc., are the symptoms of *raktadushti*, which are least observed in participants.

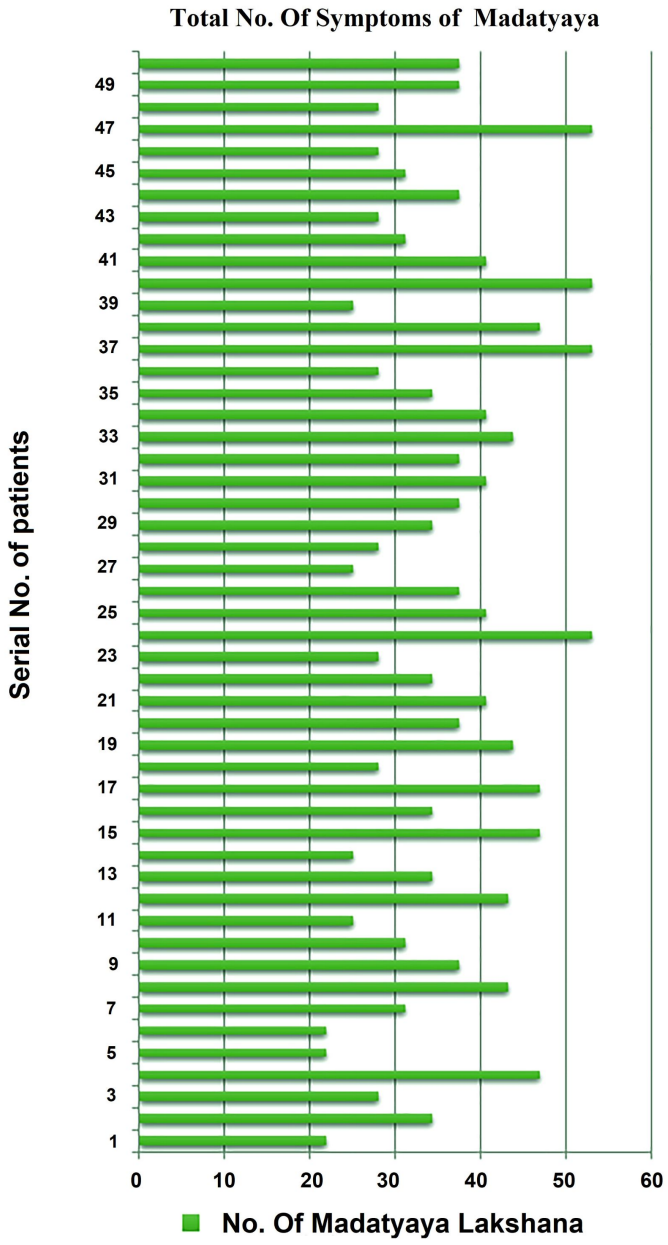


Fig 3: Total No. Of Symptoms of *Madatyaya*

Graph 03: This graph shows the number of symptoms of *madatyaya* present in each patient. Some of the patients showed more than 80% symptoms of *madatyaya*. Most patients with a history of long-term alcohol consumption have shown a maximum number of symptoms. In contrast, the recent history of alcohol consumption (i.e., at least 5 years)—has shown fewer symptoms.

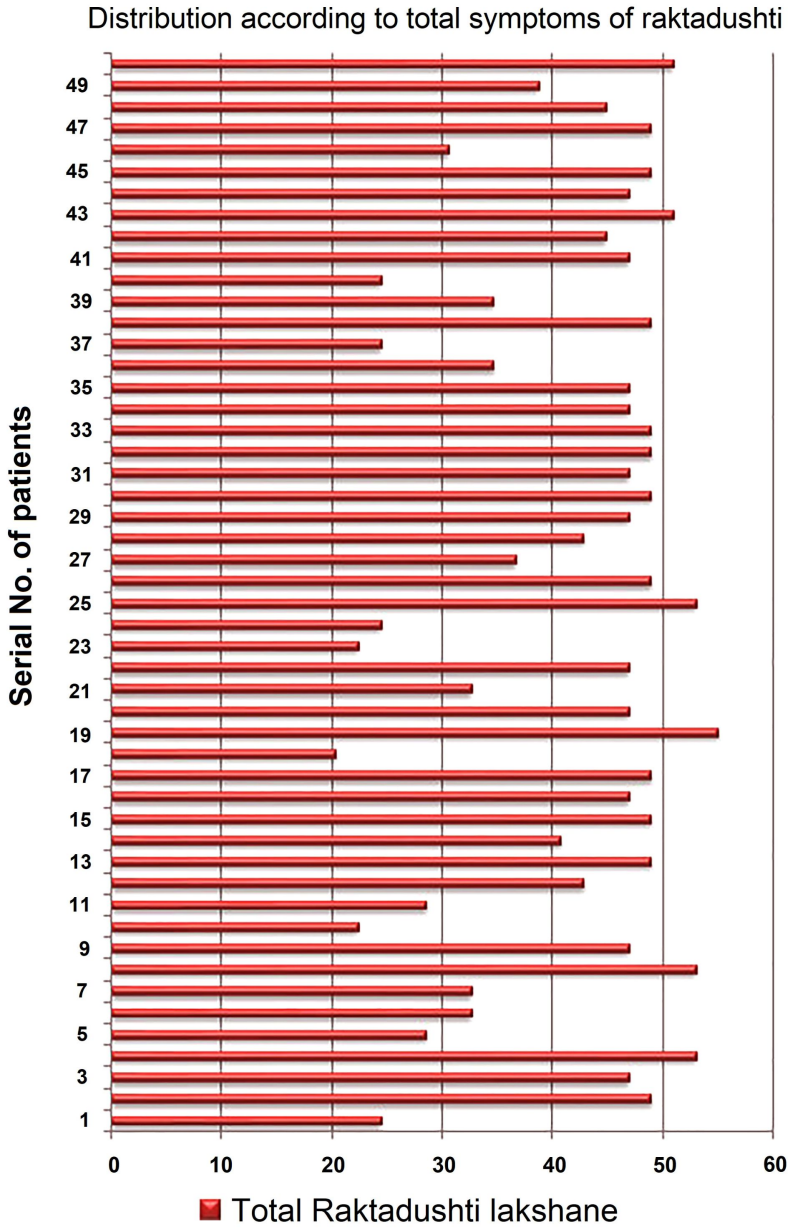


Fig 4: Distribution according to total symptoms of *raktadushti*

Fig 4: This graph shows the number of symptoms of *Rakta-Dushti* in each patient. More than 6o% symptoms are present in most of the patients. All the other possible confounders of *Rakta-dushti* were excluded during this study. These are the symptoms of *raktadushti* because of only alcohol consumption.

Table 4: LFTs Bilirubin Levels

	Total Bilirubin		Direct Bilirubin		Indirect Bilirubin	
	Total Patients	Percentage	Total Patients	Percentage	Total Patients	Percentage
Normal	11	22%	09	18%	09	18%
Deranged	39	78%	41	82%	41	82%

Table 05: Liver function tests were performed on all the study participants, and it was found that more than 80% of participants have hyperbilirubinemia. (Patients with other confounding factors for hyperbilirubinemia and those other than Alcoholic hyperbilirubinemia were excluded from the study.) again proves that chronic alcohol consumption damages liver cells which further leads to disturbed bilirubin metabolism. Hence deranged bilirubin is found in most patients.

Table 5: Liver enzymes Levels

	SGOT		SGPT		ALK.PHOSPHATASE	
	Total Patients	Percentage	Total Patients	Percentage	Total Patients	Percentage
Normal	10	20%	13	26%	18	36%
Deranged	40	80%	27	74%	32	64%

Table 5: SGOT, SGPT, and alkaline phosphatase are the specific enzymes secreted by liver cells or intra-hepatic biliary canaliculi. Once the function of hepatocytes is disturbed, an obvious disturbance in the secretion and metabolism of liver enzymes is seen. 80% of participants showed deranged SGOT, 74% showed deranged SGPT, and 64% showed deranged alkaline phosphatase.

Table 6: Protein levels

	Total Protein		Albumin		Globulin	
	Total Patients	Percentage	Total Patients	Percentage	Total Patients	Percentage
Normal	17	34%	17	34%	45	90%
Deranged	00	00%	00	00%	08	04%
Decreased	33	66%	33	66%	12	06%

Table 6: Protein metabolism is the late function of the liver; hence it does not hamper in early stages of liver damage. Here 66% of patients showed hyperproteinemia. It is a result of chronic liver cell damage.

4. STATISTICAL ANALYSIS

The Data obtained was analyzed using Medcalc statistical software version 9.2.0.2. The chi-square test and test for Correlation-Regression were used for the analysis.

Table 7: Chi-square table

		Symptoms of Raktadushti			Total
		Mild	Moderate	Marked	
Symptoms of Madatyaya	Mild	0	2	0	2
	Moderate	4	34	6	44
	Marked	3	1	0	4
Total		07	37	06	50

Table 07:
The Chi-square (X^2) value of the above table is = 14.031.
Degrees of freedom (df) = 4
Chi-square(X^2) tabulated value of df = 4 is 13.28 at P <0.01
i.e., at a 99 % level of significance.

Where, Mild = 0% to 25% of symptoms
Moderate = 26% to 50% of symptoms
Marked = 51% to 75% of symptoms
Severe = more than 75% of symptoms

Table 8: Test for Correlation

Symptoms of *Madatyaya*	Symptoms of *Raktadushti*	
	Min	Max
7	12	16
8	14	20
9	9	10
10	9	17
11	9	17
12	9	21
13	16	26
14	24	27
15	12	26

Table 08: This table shows the correlation between symptoms of *madatyaya*and symptoms of *Raktadushti.* As the number of symptoms of *madatyaya* increases, the range of symptoms of *Raktadushti* increases.

Variable Y	madatyaya_lakshane madatyaya lakshane
Variable X	Raktadushti_lakshane Raktadushti lakshane

Sample size	50
Correlation coefficient r	0.3891
Significance level	P=0.0052
95% Confidence interval for r	0.1241 to 0.6022

*Correlation coefficient, i.e., "r," calculated from the above table, is 0.3891. As the correlation coefficient (r) lies between 0 and +1, it can be predicted that there is a "Moderately Positive Correlation" between the Symptoms of *Madatyaya* and the Symptoms of *Raktadushti*. (* Data is analyzed based on Medcalc statistical software version 9.2.0.2)

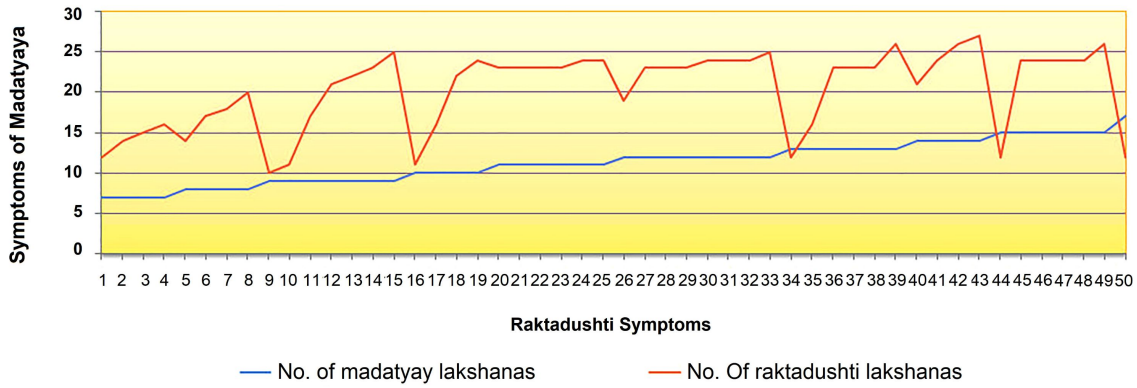


Fig 5: Graph Showing Co-relation between Symptoms of *Madatyaya* and Symptoms of *Raktadushti*

Fig 5: This is the graph plotted against table no 08. This graph shows the Correlation between the Symptoms of *Madatyaya* and the Symptoms of *Raktadushti*. See the graphical representation as the no. of symptoms of *madatyaya* increases, the no. of *Raktadushti* symptoms also increases.

5. DISCUSSION

In the present study, 50 patients of *Madatyaya* were enrolled for the study. The disease was diagnosed based on signs and symptoms described in the Ayurvedic text. Then, clinical examinations and Liver Function tests were done to observe the relationship between *Madatyaya* and *raktadushti.*

5.1. According to age

24% of patients were between the ages of 51-60 years, 22% between 41-50 years, 46% between 31-40 yrs, and 4% were between 18-30 years of age. Therefore, present study shows that the incidence of *Madatyaya* is seen in almost all age groups, but mostly 31-40 years of age group is affected more. (Table No 01)

5.2. According to gender

100% of patients in this study were male, and 0% were female. A high incidence of *madatyaya* is seen in the male gender. It is hard to find a female patient with alcohol addiction in this study setting. No such patient could be found; hence, the study is done on male patients only. [12]

5.3. According to occupation

Out of 50 patients, 58% patients were workers, including sweepers, security guards, *bidi* Kamagra, etc., 30% of patients were heavy workers, which include collie, cycle rickshaw drivers, laborers, etc., next 10% of patients were service which include clerk, office employee, etc. and 2% were unemployed. (Table No. 02). The above observation shows that *madatyaya vyadhi* is commonly found in workers and heavy workers in the present study. The cause behind this may be physical and mental stress leading to alcohol addiction.[13]

5.4. According to srotodushti

In this study, all the patients of *madatyaya* were found to have *Rasvaha and Raktavaha srotodushti*; the rest of the *srotas* were found proportionately normal. (Table No. 03). It may be because *madya* gets absorbed from *amashay* itself (the root of *annavahasrotas*) and reaches *hriday*, the center of Rasa's circulation and *Rakta*. Also, Alcohol causes liver injury when metabolized; the Liver is the root of *raktavaha srotas.* Hence it has become a primary cause for *raktavaha srotodushti*.[14]

5.5. According to etiological factors of madatyaya

The root cause of *madatyaya* is *Madyapaan*. The various factors in *sushrutsamhita* are according to the conditions when *madya*, i.e., alcohol, is consumed. This condition, when studied, is mainly *pitta-vata prakopak*, and *madya* is also *pitta prakopak*. Hence these conditions promote *madya* to progress the *samprapti* of *madatyaya.*[15]

5.6. According to Symptoms of Madatyaya

In *madatyay, vyadhi sam moha* was found in 96%, following *sharir kampa* (Tremors) was found in 94%. *Sharir dukha, Aruchi* and *Hrulhas*, each found in 92 % patients. *Shrama and trushna* were found in 72% & 74%, respectively. *Jwara, Chhardi, Asthi- Sandhi school, and mukhrog* was found in 68%,60%, 58%, and 58%, respectively. Rests of the symptoms are found in less than 50% of patients. (Graph 01). *Shitoshna lakshan, vepan, Atisar, Karnarog, asatam darshan, Pragharshnam vihaigaishcha, and Truna-panshubhishchavapuranam* these symptoms were not found in any patient in the present study.

5.7. According to Raktadushti Hetu

All the patients were having *Pradushta, Teekshna* and Bulk amount of *madyapaan satatya*. 10% of total patients were having *Atikatu aahar sevan* and 54% patients were having aatap sevan.

5.8. According to symptoms of Rakta dushti

In the present study, it was observed that *Mada* and *atidourbalya* these two symptoms were observed in most of the patients, i.e., 90%. *Krodha pracurata* was seen in 88%, *Akshiraga, Mlan tvak*, and *Parush tvak* these symptoms were found in 86% of patients, *Rukshata* and *sphutita* tvak found in 82%, *Asya gandhita* and *Kampa* found in 80% patients, *Buddhi sam moha* found in 78% patients, *swar kshay* and *klama* found

in 74% and 72% patients respectively. *Mukhapak* in 68% and *santap* in 64% patients. *Pipasa* and *pootighrana* were found in 60% of patients. *Tandratiyoga* was seen in 54% of patients. Rests of the symptoms are observed in less than 50% of patients. (Graph No. 02) *Madya* Causes *Pittapradhan tridosh dushti*[15], and *pitta* has *an ashray-ashrayee* correlation with *rakta*.[16] Therefore vitiated *pitta* vitiates *rakta* leading to *raktadushti*.[17] Therefore, most of the symptoms of *raktadushti* observed in the present study are those of *pittaj raktadushti.*[18] *Gulma, pramilaka, kotha, pradar, vatashonit, and raktakankshita. These symptoms* were not found in any patient in the present study.

5.9. According to the total number of symptoms of Madatyaya

In this study, a minimum of 7 symptoms of *madatyaya* were observed in 8% of patients, and 2% of total patients had a maximum of 17 symptoms of *madatyaya*. Rest 80% of patients showed *madatyaya* symptoms in between. (Graph No. 03)

5.10. According to the total number of symptoms of raktadushti

In the present study, a minimum of 12 (i.e., 24.486%) symptoms of raktadushti were observed in 2% of patients, and a maximum of 26 (i.e., 53.061%) symptoms of *raktadushti* were observed in 2% patients. Of the rest, 96% of patients had symptoms of *raktadushti* in between. (Graph No. 04)

5.11. According to LFTs

LFTs of selected 50 patients revealed deranged values of most liver enzymes, which include – Total Bilirubin deranged in 78%, Direct & indirect Bilirubin deranged in 82% each, SGOT deranged in 80%, SGPT deranged in 74% of patients while Alkaline Phosphatase levels deranged in 64% patients. Regarding protein levels, it is seen that Total Protein and albumin values decreased by 66% each, and Globulin levels decreased by 90% and were deranged in 4% of patients. (Table No. 04, 05, 06). The cause behind this may be the metabolism of alcohol takes place in the liver. Alcohol damages liver cells resulting in deranged LFTs.[19]

6. CONCLUSION

Higher prevalence of *Madatyaya* is observed in the age group of 31 years to 40 years. Patients of *Pitta pradhana prakriti* are more prone to *madatyaya.* Patients who are workers or heavy workers are found more prone to *madatyaya.* As the calculated chi-square (X^2) value is higher than the tabulated chi Square (X^2) value, the null hypothesis is rejected, and the alternative hypothesis is accepted. As the correlation coefficient (r) lies between 0 and +1, it can be predicted that there is a "Moderately Positive Correlation" between the Symptoms of *Madatyaya* and the Symptoms of *Raktadushti*. Hence There is *Raktadushti* in *Madatyaya Vyadhi*. LFTs are found elevated in *madatyaya vyadhi.* Hence consumption of alcohol should be done very judiciously. Patients of *madatyaya* should reduce the amount and frequency of alcohol consumption and avoid the other factors which cause *raktadushti.*

7. AUTHORS CONTRIBUTION STATEMENT

Sumant Pande, Maheshwari Joshi, And Seema Thakare conceived, planned, and conducted the experiments. Sumant Pande and Maheshwari Joshi contributed to the draft preparation, and Sumant Pande and seema thakare contributed to interpreting the results. All authors provided critical feedback and helped shape the research, analysis, and manuscript.

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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