



# Study of Cutaneous Manifestations in Alcohol Dependence Syndrome Patients in a Rural Tertiary Care Center in India

Sneha Krishnoji Rao<sup>1</sup>, Rajashekar Talari Srinivas<sup>2\*</sup>, Mohan Reddy<sup>3</sup>, Ashna Ashraf<sup>4</sup>

<sup>1</sup>Senior Resident, Department of Dermatology, Venereology & Leprosy, Sri Devaraj Urs Medical College, Kolar, Karnataka

<sup>2</sup>Head of Department, Department of Dermatology, Venereology & Leprosy, Sri Devaraj Urs Medical College, Kolar, Karnataka

<sup>3</sup>Head of Department, Department of Psychiatry, Sri Devaraj Urs Medical College, Kolar, Karnataka

<sup>4</sup>Resident, Department of Dermatology, Venereology & Leprosy, Sri Devaraj Urs Medical College, Kolar, Karnataka

## Abstract

**Background:** Chronic alcoholism is a multifactorial condition predisposed by environmental, social, and psychological factors. Alcohol dependence syndrome (ADS) can present with varied cutaneous and systemic manifestations. The effects of alcohol use include cutaneous infections, infestations, features of malnutrition, exacerbation of pre-existing dermatoses, and alcohol-related dermatoses. This study aimed to analyze and document cutaneous manifestations secondary to infections, infestations, malnutrition, and modifications of pre-existing dermatoses in ADS patients and investigate the correlation between the presence of cutaneous manifestations and duration and quantity of alcohol intake.

**Methods:** The present observational study was carried out in the Department of Dermatology for a period of one year. A total of 172 male patients with ADS presenting with skin manifestations were included in the study. Detailed analysis of history, clinical examination, and relevant investigations were conducted.

**Findings:** Out of 172 male patients with ADS, the most common dermatoses noted were infections (166, 96.5%) and features of malnutrition (161, 93.6%). Exacerbation of pre-existing dermatoses (101, 58.7%) and alcohol-related dermatoses (85, 49.4%) were also observed.

**Conclusion:** Most of the dermatoses were significantly correlated with the quantity of alcohol intake than with its duration, implying that higher quantity of alcohol intake has more impact on cutaneous and systemic manifestations. Identifying the cutaneous manifestations in ADS patients plays an important role in recognizing the underlying systemic disorders which in turn facilitates early intervention and thereby prevents complications.

**Keywords:** Alcohol dependence syndrome, International Classification of Diseases (ICD-10), Cutaneous manifestations

**Citation:** Rao SK, Srinivas RT, Reddy M, Ashraf A. Study of cutaneous manifestations in alcohol dependence syndrome patients in a rural tertiary care center in India. *Addict Health*. 2023;15(1):45–52. doi:10.34172/ahj.2023.1340

Received: January 30, 2022, Accepted: October 29, 2022, ePublished: January 29, 2023

## Introduction

A multitude of diseases are known to occur due to alcohol consumption including infectious diseases, diabetes, cancer, neuropsychiatric diseases, liver and pancreatic disorders, and cardiovascular diseases and injuries.<sup>1</sup> Cutaneous manifestations of alcohol consumption include infections, infestations, features secondary to malnutrition, alcohol liver disease, and exacerbation of pre-existing dermatoses.<sup>2</sup> Alcohol abuse may present in a variety of ways which can lead to alcohol dependence syndrome (ADS). ADS is a psychiatric disorder and according to the criteria of the International Classification of Diseases (ICD-10), it is characterized by a strong desire or sense of compulsion to take the substance, tolerance, withdrawal, difficulty in controlling substance-taking

behavior, ineffective efforts to reduce use, neglect, or continued use of alcohol despite harmful sequelae resulting from the prolonged and heavy use of alcohol.<sup>3,4</sup>

Alcohol consumption and skin manifestations are related. Due to widespread consumption of alcohol, there is increasing importance in identifying skin manifestations in ADS patients to facilitate timely intervention and treatment of ADS further limiting the adverse medical consequences.<sup>3</sup> Though cutaneous manifestations have been studied earlier in chronic alcoholics, the studies investigating the correlation of this dermatological disease with various factors of ADS such as duration and quantity of alcohol intake are lacking, especially in Indian population. This study was undertaken due to the limited number of studies on the subject.



## Methods

This hospital-based observational cross-sectional study was carried out for one year in the Department of Dermatology of a tertiary care hospital in Southern India on the outpatients visiting the department and inpatients referred to the department. A total of 172 male patients were investigated. The inclusion criteria were being above the age of 18 years, being diagnosed with ADS according to the ICD-10 criteria, and having only comorbid nicotine use. The exclusion criteria were being in complicated withdrawal (delirium tremens), having other substance use disorders apart from nicotine, psychotic disorder, personality disorder, head injury, and loss of consciousness or epilepsy. Patients were enrolled in the study before the commencement of anti-psychotic medications. Written informed consent was obtained from all the patients. Relevant biographical data, including duration of alcohol intake and history of skin disease when present were recorded. Complete cutaneous examination pertaining to skin, hair, and nail was performed. Systemic examination for presence of alcoholic liver disease (ALD) was also done. Routine investigations like complete blood count, random blood sugar, and liver function tests were done for all patients. Specific investigations like skin biopsy, culture and sensitivity for bacterial infection, gram stain, Tzanck smear, potassium hydroxide mount, and fungal culture were done wherever indicated. Counseling was provided by a psychiatrist for alcohol dependence. Data were entered into Microsoft Excel data sheet and analyzed using SPSS software (version 22). Chi-square was used as test of significance and *P* value of <0.05 was considered statistically significant.

## Results

A total of 172 patients were investigated in the present study, the mean age of whom was  $48.91 \pm 16.45$  years with minimum age of 22 and maximum of 95 years. Cutaneous features manifested with pruritus (115, 66.9%), scaling (47, 27.3%), discoloration of skin (63, 36.6%), and pain/burning (45, 26.2%) and systemic manifestations included diabetes (95, 55.2%), tuberculosis (34, 19.8%), and HIV (12, 7%). The data on the duration, quantity (assessed in units per week with one unit different for different types of drinks), and type of alcohol consumption are presented in Table 1. The distribution of various types of dermatoses seen in ADS patients is shown in Figure 1. The most common dermatoses in ADS patients were infections and infestations (166, 96.5%) (Table 2). The bacterial infections noted were cellulitis (20, 11.6%), furuncle (10, 5.8%), paronychia (10, 5.8%), leprosy (9, 5.2%), ecthyma (8, 4.7%), and erythrasma (6, 3.5%). Viral warts were the most common viral infections in 32 (18.6%) patients, followed by herpes zoster in 20 (11.6%) and molluscum contagiosum in 5 (2.9%) patients. The

**Table 1.** History of alcohol intake in the study population

Parameters	Number	Percent
Duration of consumption (year)		
1-10	40	23.3
11-20	45	26.2
21-30	47	27.3
31-40	40	23.3
Quantity (unit per week)		
21-30	11	6.4
31-40	40	23.3
41-50	45	26.2
51-60	40	23.3
61-70	29	16.8
71-80	7	4.1
Type of alcohol		
Beer	17	9.9
Brandy	49	28.5
Rum	36	20.9
Whisky	49	28.5
Country liquor	21	12.2

fungal infections noted were dermatophytosis (69, 40.1%), pityriasis versicolor (55, 32%), candidiasis (48, 27.9%), and pityrosporum folliculitis (37, 21.8%) (Figure 2). Moreover, 40 (23.3%) patients presented with scabies and 10 (5.8%) had pediculosis.

Papulosquamous disorders were manifested as psoriasis (48, 27.9%) and lichen planus (14, 8.1%). Immune-mediated dermatoses noted were alopecia areata (22, 12.8%), drug rash (8, 4.7%), vasculitis (16, 9.4%), and urticaria (6, 3.5%). The most common type of eczema observed was airborne contact dermatitis (15, 8.7%), followed by irritant contact dermatitis (11, 6.4%), stasis eczema (10, 5.8%), asteatotic dermatitis (9, 5.2%), nummular eczema (7, 4.1%), prurigo nodularis (5, 2.9%), and lichen simplex chronicus (3, 1.7%). The data on ADS patients with papulosquamous disorders, immune-mediated dermatoses, and eczema are depicted in Tables 3, 4, and 5.

Exacerbation of pre-existing dermatoses was mostly noted in psoriasis (28, 16.3%), followed by dermatophytosis (17, 9.9%), eczema (14, 8.1%), seborrheic dermatitis (13, 7.6%), itching (11, 6.4%), acne (5, 2.9%), rosacea (4, 2.3%), and urticaria (3, 1.7%). Xerosis was the common feature of malnutrition secondary to ADS (Figure 3). Oral manifestations (127, 73.8%), lesions on palms and soles (103, 59.9%), nail (39, 22.6%), and scalp involvement (106, 61.6%) were few other presentations in patients with ADS. Sexually transmitted infections (STIs) were noted in 12 patients comprising genital warts (8, 4.7%), genital herpes (3, 1.7%), and primary chancre (1, 0.6%). ALD was seen in 74 (43%) patients. Patients

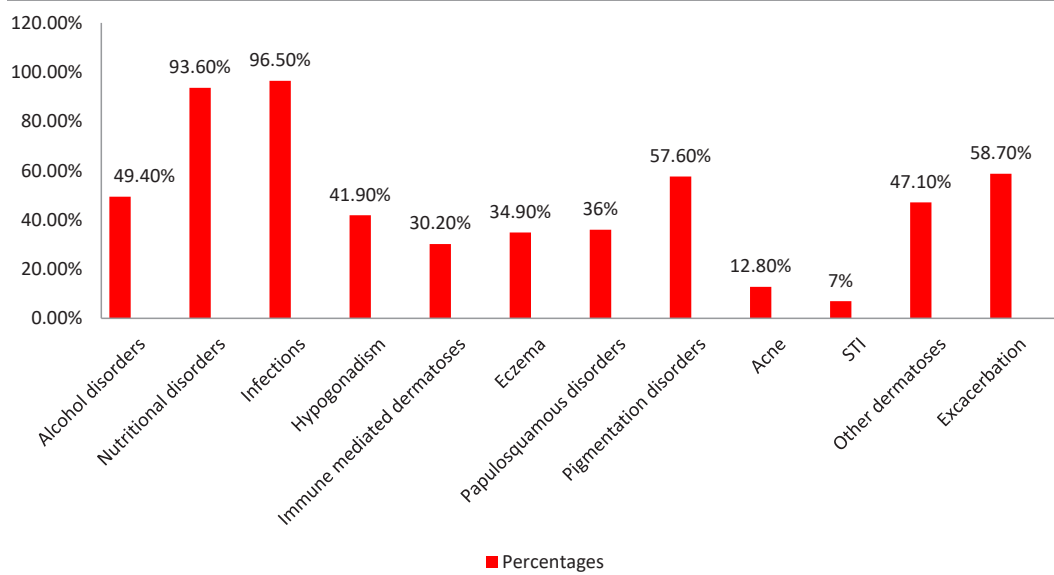


Figure 1. Distribution of dermatoses in ADS patients (N=172)



Figure 2. Seborrheic dermatitis

Table 2. Descriptive analysis of infections and infestations in the study population

Parameters	Frequency	Percent
Bacterial infections	63	36.6
Viral infections	57	33.1
Fungal infections	138	82.2
Infestations	50	29.1

who had alcohol-induced vasodilatation presented with telangiectasia (36, 20.9%), ecchymosis (25, 14.5%), rosacea (10, 5.8%), icterus (87, 50.6%), spider nevi (52, 30.2%), hepatomegaly (61, 35.5%), and liver function test abnormalities (71, 41.4%). Pellagra was noted in 3 (1.7%) patients, shown in Figure 4. Features of ALD

and features secondary to hepatomegaly are shown in Figures 5, 6 and 7. Elevation of liver enzymes such as aspartate transaminase, alanine transaminase, and bilirubin was seen in 71 (41.3%) patients. The random blood sugar was elevated in 68 (39.5%) patients. Elevated lymphocytes and eosinophils were noted in 12 (6.9%) and 7 (4.06%) patients, respectively. Comparing the duration of alcohol consumption with dermatoses showed the difference in the proportion of papulosquamous disorders was statistically significant ( $P=0.006$ ) (Table 3). Concerning the quantity of alcohol consumed with various dermatoses, a statistically significant correlation was found with proportion of hypogonadism ( $P<0.001$ ), alcohol-related dermatoses ( $P<0.001$ ), papulosquamous disorders ( $P=0.005$ ), and pigmentation disorders ( $P=0.016$ ) (Table 4).

**Discussion**

Alcoholism is a chronic, progressive, and potentially lethal disease characterized by alcohol dependence and multiorgan dysfunction, with genetic, environmental, and psychosocial factors playing the main role in its development.<sup>2</sup> ADS is a medical disorder with features of ICD-10 criteria in which a definite diagnosis of dependence can be made only if three or more of the following criteria have been experienced or exhibited at sometime during the previous year. ICD-10 criteria include strong desire or sense of compulsion to take the substance, tolerance, withdrawal, difficulty in controlling substance-taking behavior, ineffective efforts to reduce use, neglect, or continued use of alcohol despite harmful sequelae resulting from the prolonged and heavy use of alcohol.<sup>3,4</sup> Increased duration and quantity of alcohol consumption lead to various cutaneous and systemic features in ADS due to direct toxic effects and indirect

**Table 3.** Comparison of dermatoses with duration of alcohol consumption

Dermatoses	Duration of consumption (year)				Chi-square	P value
	1-10 Years (n=40)	11-20 Years (n=45)	21-30 Years (n=47)	31-40 Years (n=40)		
Infections	38 (95%)	44 (97.78%)	47 (100%)	37(92.5%)	4.097	0.251
Hypogonadism	14 (35%)	21 (46.67%)	19 (40.43%)	18 (45%)	1.402	0.705
Exacerbation	24 (60%)	23 (51.11%)	24 (51.06%)	28 (70%)	4.209	0.240
Alcohol-induced disorders	14 (35%)	24 (53.33%)	23 (48.94%)	24 (60%)	5.399	0.145
Nutritional disorders	36 (90%)	42 (93.33%)	44 (93.62%)	39 (97.5%)	1.888	0.596
Immune-mediated dermatoses	11 (27.5%)	13 (28.89%)	13 (27.66%)	15 (37.5%)	1.329	0.722
Eczema	10 (25%)	16 (35.56%)	15 (31.91%)	19 (47.5%)	4.714	0.194
Papulosquamous disorders	7 (17.5%)	17 (37.78%)	16 (34.04%)	22 (55%)	12.342	0.006
Miscellaneous conditions	19 (47.5%)	17 (37.78%)	24 (51.06%)	21 (52.5%)	2.337	0.506
Pigmentary disorders	20 (50%)	24 (53.33%)	29 (61.7%)	26 (65%)	2.501	0.475
Acne	16 (40%)	2 (4.44%)	4 (8.51%)	0 (0%)	35.997	<0.001

**Table 4.** Comparison of dermatoses with quantity of alcohol consumed

Parameters	Quantity						Chi-square	P value
	21-30 Units (n=11)	31-40 Units (n=40)	41-50 Units (n=45)	51-60 Units (n=40)	61-70 Units (n=29)	71-80 Units (n=7)		
Nutritional disorders	8 (72.73%)	37 (92.5%)	43 (95.56%)	39 (97.5%)	28 (96.55%)	6 (85.71%)	10.5	0.061
Exacerbation	6 (54.55%)	26 (65%)	26 (57.78%)	20 (50%)	18 (62.07%)	3 (42.86%)	2.74	0.739
Hypogonadism	1 (9.09%)	8 (20%)	22 (48.89%)	19 (47.5%)	17 (58.62%)	5 (71.43%)	20.0	0.001
Alcohol-induced disorders	1 (9.09%)	13 (32.5%)	21 (46.67%)	25 (62.5%)	19 (65.52%)	6 (85.71%)	21.3	<0.001
Immune-mediated dermatoses	2 (18.18%)	14 (35%)	12 (26.67%)	9 (22.5%)	14 (48.28%)	1 (14.29%)	7.91	0.161
Eczema	3 (27.27%)	18 (45%)	11 (24.44%)	17 (42.5%)	7 (24.14%)	4 (57.14%)	8.26	0.142
Papulosquamous disorders	3 (27.27%)	9 (22.5%)	13 (28.89%)	14 (35%)	19 (65.52%)	4 (57.14%)	16.8	0.005
Miscellaneous conditions	5 (45.45%)	17 (42.5%)	23 (51.11%)	16 (40%)	16 (55.17%)	4 (57.14%)	2.49	0.777
Pigmentary disorders	1 (9.09%)	23 (57.5%)	29 (64.44%)	21 (52.5%)	20 (68.97%)	5 (71.43%)	13.9	0.016
Acne	5 (45.45%)	7 (17.5%)	7 (15.56%)	2 (5%)	1 (3.45%)	0 (0%)	17.0	0.004

**Table 5.** Content and quantity of alcohol in different alcoholic beverages

Beverage	Alcohol content (%)	Serving size (mL)	Quantity of alcohol (g)
Beer	5	350	14
Wine	12	120	14
Hard liquor	40	30	12

effects of various factors like malnutrition, neglect, etc.<sup>5</sup>

Only male patients were included in this study because women are less likely to abuse alcohol than men as documented in world literature. Besides, due to social and cultural factors in India, females tend not to seek professional help for problems related to alcohol abuse. Moreover, heritability of alcohol-related disorders in men is stronger than in women.<sup>6</sup>

Different alcoholic beverages contain varying quantities of alcohol. One unit of alcohol is 14 g of alcohol as per Indian standards<sup>7</sup> (Table 5).

The mean age of the patients was 48.91 years in the study population with minimum age of 22 and maximum of 95 years. Most of the patients consumed alcohol for a period of 20 to 30 years (47, 27.3%), which is in

contrast to another study wherein maximum alcohol consumption was seen for a period of 31 to 40 years.<sup>8</sup> Similar to another study, the present study showed the highest alcohol consumption (45, 26.2%) was around 41-50 units per week.<sup>9</sup> High-strength spirits such as whisky and brandy were consumed by most of the ADS patients in equal proportion (49, 28.5%) which could be due to easy availability.

**Dermatological manifestations in ADS patients**

Various overlapping dermatoses were noted in ADS patients due to low socioeconomic conditions, poor hygiene, and associated comorbidities.<sup>8,9</sup>

**Infections**

Infections were the most common cutaneous manifestations noted among ADS patients (166, 96.5%). Lack of normal immune function predisposes alcohol-dependent patients to various infections.<sup>10</sup>

In the present study, higher proportions of fungal infections (82.2%) and infestations (scabies-23.3% and pediculosis-5.8%) were observed compared to another



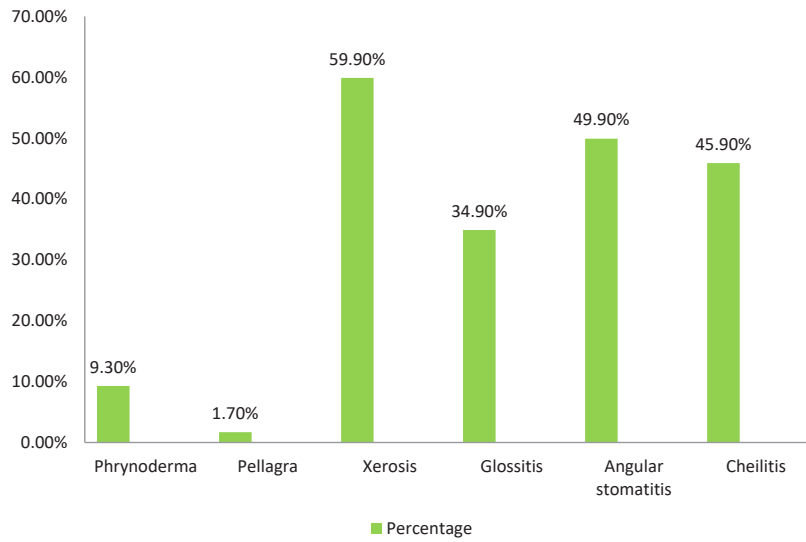


Figure 3. Nutritional disorders in the study population



Figure 4. Casal's necklace in pellagra



Figure 6. Gynecomastia in ADS patient



Figure 5. Loss of body hair in ADS patient

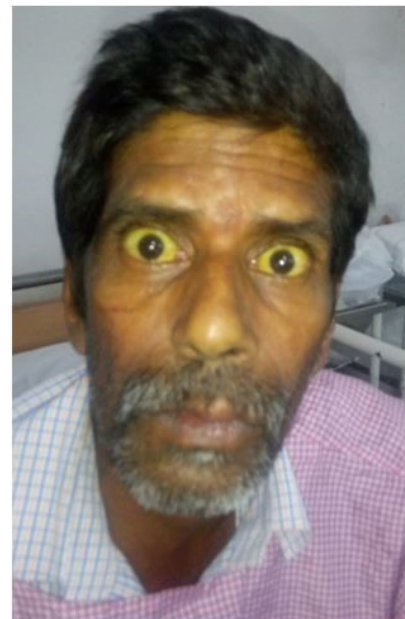


Figure 7. Icterus in ADS patient

study in which bacterial infections were more common (Table 6). This can be due to factors such as overcrowding, low socioeconomic status, and poor hygiene among the present study population.

### Fungal infections

In the present study, the prevalence of fungal infections was the highest among all the infections (138, 82.2%) similar to an Indian study in which 35 out of 45 patients of alcohol abuse presented with fungal infections (77.7%).<sup>8</sup> Of the total superficial fungal infections, dermatophytoses 69(40.1%) including tinea corporis (16, 9.3%) and tinea incognito (15, 8.1%) were commonly observed, whereas pityriasis versicolor was a common presentation in another study.<sup>5</sup> This could be attributed to tropical climate with warm temperature throughout the year in the study area and the easy availability of over-the-counter topical steroids, misused by patients. Tinea pedis was the most common finding among dermatophytic cases in a Brazilian study (28%), while in the present study, just 3 (1.7%) patients were observed with tinea pedis. This might be because of the more common usage of slippers than shoes in Indians unlike Brazilians. Bacterial infections were seen in 63 (36.6%) patients, of which cellulitis was the most common (20, 11.6%). This was comparable to another Indian study which reported 14.3% of alcoholic patients with bacterial infections, which could be attributed to the underlying systemic comorbidities such as diabetes mellitus.<sup>5</sup> Viral infection was seen in 57 patients (33.1%) including viral warts (32, 18.6%), herpes zoster (20, 11.6%), and molluscum contagiosum (5, 2.9%).

### Infestations

A total of 50 patients with infestations were observed (29.1%), of which scabies was the most common infestation (40, 23.3%), while another study found 23(11.7%) scabies cases<sup>3</sup> which could be attributed to the poor socioeconomic status and overcrowding.

### Nutritional dermatoses

Cutaneous manifestations such as xerosis (103, 59.9%), angular stomatitis (85, 49.4%), cheilitis (9, 45.95%), glossitis (60, 34.9%), phrynoderma (16, 9.3%), and

pellagra (3, 1.7%) were the common manifestations noted in nutritional dermatoses among ADS patients, which was similar to the results of two other studies.<sup>5,9</sup>

### Papulosquamous disorders

There was a significant association between papulosquamous disorders and the duration and quantity of alcohol intake ( $P=0.006$ ,  $P=0.005$ ). The prevalence of psoriasis was also found to be individually correlated with the duration of alcohol intake ( $P=0.029$ ), and not with the quantity of alcohol consumed ( $P=0.458$ ). However, no significant association was found with the prevalence of lichen planus and the duration or quantity of alcohol consumed ( $P=0.442$ ,  $P=0.924$ ). In the present study, 62 patients (36%) were observed with papulosquamous disorders, a majority of whom were psoriasis patients (48, 27.9%), with chronic plaque (40), palmoplantar (2), scalp (5), and pustular (1) types. Only 14 (8.1%) lichen planus patients were detected. The prevalence of psoriasis in the present study was comparatively higher than that of two other studies with 6 (5.26%) and 22 (16.9%) psoriasis patients, respectively.<sup>8,9</sup> This could be due to negligence of the patients to seek treatment and noncompliance to treatment noted in this study.

### Eczema

The prevalence of allergic contact dermatitis, irritant contact dermatitis, and stasis eczema in the present study was comparatively higher than that of other studies,<sup>5,9</sup> and this may be because the majority of the patients in the present study were agriculturists.

### Immune-mediated dermatoses

Immune-mediated dermatoses were seen in 52 patients (30.2%) including alopecia areata (22, 12.8%), drug rash (8, 4.7%), vasculitis (8, 4.7%), purpura (8, 4.7%), and urticaria (6, 3.5%). The high number of alopecia areata cases could be related to the autoimmune mechanism of alopecia and the effects of alcohol on the immune system.<sup>11,12</sup> Furthermore, 8 (4.7%) patients were reported with drug rash secondary to intake of drugs like carbamazepine, diclofenac, and cephalosporin, whereas only 2 cases of drug rash in alcoholics (1%) were reported in another study.<sup>1</sup> Similar to another study, 8 cases of urticaria (6.1%) were observed among alcoholics in the present study.<sup>1</sup> Urticaria and angioedema were reported in various studies secondary to the components of the beverages.<sup>1,13,14</sup> Alcohol-induced purpura in patients in this study were comparatively lesser than another study.<sup>9</sup>

### Sexually transmitted diseases

In this study, 12 cases of STIs (7%) were observed. The most common disease was genital warts in 8 patients (4.7%) and 3 cases of genital herpes (1.7%) were also noted. Interestingly, one case of primary chancre was also

**Table 6.** Comparison of cases of infections and infestations between the present study and the study by Sharma et al<sup>5</sup>

Parameters	Present study	Sharma and colleagues' study
Bacterial infections	36.6%	38.4%
Fungal infections	82.2%	36.9%
Viral infections	33.1%	24.7 %
Scabies	23.3 %	11.7%
Pediculosis	5.8%	0.5%

noted. These findings indicate that men who consumed alcohol, had increased prevalence of STI than those who did not consume alcohol. This is suggestive of the high-risk sexual practices of men under the influence of alcohol. It was also revealed that 12 patients were retropositive (7%) in this study, similar to another study.<sup>15</sup>

### **Exacerbation of pre-existing dermatoses**

In this study, exacerbation of pre-existing dermatoses was observed in 101 patients (58.7%). These patients were on treatment for the dermatoses and were compliant to the treatment. The most common manifestation exacerbated was psoriasis in 28 (16.3%) patients. It was observed that mental stress in psoriasis leads to relief drinking which exacerbates the pre-existing psoriasis and further leads to a vicious cycle.<sup>16</sup> Moreover, 17 tinea patients (9.9%) and 13 seborrheic dermatitis patients (7.6%) had exacerbation of the pre-existing lesions. Besides the exacerbation of various other dermatoses such as rosacea, acne, pruritus, and eczema, as mentioned in other studies,<sup>5,8,9</sup> this study also noted an exacerbation of lichen planus and urticaria lesions.

### **Alcohol-related dermatoses**

In this study, 85 patients (49.4%) were detected with alcohol-related dermatoses such as spider nevi (52, 30.2%), telangiectasia (36, 20.9%), palmar erythema (30, 17.4%), ecchymosis (25, 14.5%), and rosacea (10, 5.8%), significantly associated with the quantity of alcohol ( $P < 0.001$ ); however, there was no significant association with duration of intake ( $P = 0.145$ ). Palmar erythema in the present study was more than that noted in another study.<sup>5</sup>

### **Alcoholic liver disease**

ALD was observed in 74 patients (43%) in this study. This was comparatively higher than that of another study which reported 45 cases of ALD (22.9%).<sup>5</sup> Icterus was noted in 87 (50.6%) patients and hepatomegaly in 61 patients (35.5%) in the present study. Elevation of liver enzymes such as aspartate transaminase, alanine transaminase, and bilirubin was seen in 71 (41.3%) patients which is higher compared to another study.<sup>5</sup> A significant correlation was found between ALD and quantity of alcohol intake ( $P < 0.001$ ), but not with duration of alcohol consumption ( $P = 0.110$ ).

### **Hypogonadism**

Features of hypogonadism were noted in 72 patients (42.9%) in this study. Gynecomastia was the most common manifestation noted in 28 patients (16.3%), similar to another study with 19 (9.7%) patients.<sup>5</sup> Fat redistribution was seen in 24 (14%) patients and 20 (11.6%) patients presented with loss of body hair. These features of hypogonadism are due to the inhibitory effect

of ethanol on the germinal epithelium of the testis and increased rate of metabolic clearance of testosterone.<sup>17</sup> This is comparable to the present study as it found a significant association between hypogonadism and quantity of alcohol intake ( $P = 0.001$ ). However, there was no significant association between having features of hypogonadism and duration of alcohol intake ( $P = 0.705$ ) in another study.<sup>17</sup>

### **Conclusion**

Alcohol abuse is known to be the cause of a multitude of medical conditions and both non-communicable and communicable diseases.<sup>18</sup> Various cutaneous manifestations were noted in ADS patients, the most common being infections and features of malnutrition. It is stated that any level of alcohol poses a risk to health.<sup>19</sup> Moreover, there was a significant increase in alcohol-related dermatoses such as spider nevi, palmar erythema, and telangiectasia in ADS patients. Exacerbation of pre-existing skin disorders like psoriasis and seborrheic dermatitis were also noted.

It was observed that most of the dermatoses were significantly correlated with the quantity of alcohol intake than its duration, implying that the higher the quantity of alcohol intake, the more impact on cutaneous and systemic manifestations. Identifying the cutaneous manifestations in ADS patients plays an important role in recognizing the underlying systemic disorders which in turn facilitates early intervention, thereby preventing complications like irreversible liver damage and its consequences.

### **Acknowledgements**

We would like to thank the staff and the postgraduates of the Department of Dermatology and the Department of Psychiatry, Sri Devaraj Urs Medical College, Kolar, Karnataka, India, for their support in sample collection and evaluation of patients. We would like to extend our gratitude to the Department of Community Medicine, Sri Devaraj Urs Medical College, Kolar, Karnataka, India, for the statistical analysis.

### **Authors' Contribution**

**Conceptualization:** Rajashekar Talari Srinivas.

**Data Curation:** Ashna Ashraf.

**Formal Analysis:** Ashna Ashraf.

**Investigation:** Sneha Krishnoji Rao.

**Methodology:** Rajashekar Talari Srinivas.

**Project Administration:** Sneha Krishnoji Rao.

**Resources:** Sneha Krishnoji Rao.

**Software:** Ashna Ashraf.

**Supervision:** Rajashekar Talari Srinivas.

**Validation:** Mohan Reddy.

**Visualization:** Rajashekar Talari Srinivas.

**Writing – Original Draft:** Sneha Krishnoji Rao.

**Writing – Review & Editing:** Sneha Krishnoji Rao.

### **Competing Interests**

The authors declare that they have no conflict of interest.

**Ethical Approval**

The study was approved by the Institutional Ethics Committee of Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India and all participants signed an informed consent form.

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