

# Dermatoses among snow skiers in North India

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## ABSTRACT

**Background:** Snow skiers are directly exposed to a variety of extreme environmental conditions, which may lead to numerous physiological and pathological changes in the skin, and potentially increased chances of various specific and non-specific skin diseases. Although there are studies on skin diseases caused by exposure to cold and high altitudes, yet those on snow skiers are scarce as the study population is small. **Objective:** This study was undertaken to observe various dermatoses existing exclusively in snow skiers. **Methods:** It was a descriptive, cross-sectional, community-based study conducted at the world-famous ski resort Gulmarg Kashmir in North India. The initial questionnaire-based assessment and the subsequent examination of those exhibiting skin involvement were undertaken by visiting places of accommodation for snow skiers as well as on-spot visits to skiing slopes. **Result:** The most common dermatological manifestations in our study were dryness (xerosis) and its related aftereffects such as pruritus and chapping of the lips, followed by UV-related skin damage such as whole-face tanning, various types of infections and infestations, and endogenous eczema, including seborrheic and xerotic eczema. Direct cold-related injuries such as pernio and various forms of urticaria were also common presentations. **Conclusion:** Snow skiers are especially susceptible to a variety of dermatoses because of exposure to cold conditions and direct contact with the snow. Proper protective measures against cold and snow and awareness about preventive strategies may decrease the chances of snow skiers developing various dermatoses, thereby reducing morbidity and work and economic loss.

**Key words:** Snow Skiers; High Altitudes; Cold; Dermatoses; Gulmarg

## INTRODUCTION

Snow skiers are subject to a variety of environmental conditions during skiing activities. Direct contact of the skin with ice and snow and exposure to low temperatures, low humidity, high altitudes, and cold air, wind, and water lead to transepidermal water loss with subsequent dry and scaly skin [1,2].

Extreme temperature shifts due to cold outside and hot and/or dry conditions inside due to the use of various heating equipment, as well as hot water baths, initiate and aggravate the dry skin conditions. High UV exposure due to direct sunlight and that reflected from snow (the so-called *albedo effect*), lead to UV damage causing erythema, tanning, polymorphic light eruptions, and the aggravation of pre-existing photodermatoses [3-7].

Increased sweating during workouts and compromised skin hygiene because of the decreased frequency of

bathing and changing one's clothing due to various social and circumstantial inhibitions and overcrowding also lead to skin changes.

As a result of the multitude of exposures, numerous physiological and sometimes pathological changes occur in the skin. As a result, skiers are prone to experience a variety of new skin diseases and exhibit the aggravation of those already existing, which may be specifically related to snow skiing activities along with other non-specific as seen in the general population.

Sun damage (erythema, tanning, light eruptions), xerosis, frostbites, and the trench foot are known skin involvements in snow skiers [8-12]. Cold urticaria is common as well [13-15].

Various infestations such as pediculosis, scabies, and bacterial, viral, and fungal infections are also common. Other dermatoses, such as insect bite reactions,

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dermatitis neglecta, and terra forme dermatitis, were also reported [16].

Worldwide, a number of studies have been conducted on dermatological diseases in those residing at high altitudes and in cold areas [17,18]. Yet, studies exclusively on snow skiers are scarce. This encouraged us to conduct this study on snow skiers to search for skin diseases specifically related to snow skiing activities and document any other skin diseases.

## MATERIALS AND METHODS

This descriptive, prospective, observational, cross-sectional, community-based cohort study was conducted at Gulmarg in the Kashmir province of India, a world-famous winter sports resort. Our cohort consisted of snow skiers visiting and camping at the ski resort.

Included were snow skiers aged fourteen years or above camping at the ski resort for the sole purpose of snow skiing. Excluded were smokers, those with comorbidities such as thyroid, kidney, or liver diseases, and those with known hypersensitivity reactions to drugs.

New dermatoses developing after the arrival at the ski resort or those exacerbating were included in the study, such as xerosis, UV-related skin disorders, cold-related injuries, insect bite reactions, infestations, and others, whereas those not specific to high altitudes, such as acne vulgaris, vitiligo, keloids, congenital diseases, were not considered unless specifically exacerbated by exposure to cold and snow.

The snow skiers were screened at hotels, huts, tents, and other places of accommodation and on the spot on snow skiing slopes by a team of dermatologists, who camped at the ski resort for two weeks every year for two consecutive years in 2020 and 2021 one week each in January and February. Subjects once enrolled for a dermatological condition were excluded for the same dermatoses on subsequent visits or in the subsequent year.

All snow skiers coming in contact with the same study team were asked about the appearance of symptoms and signs of new skin conditions or the aggravation of existing diseases after the arrival at the ski resort. After taking proper informed written consent from those with the presence of any skin-related concern, a detailed history was taken and dermatological

examination was performed and documented in a prepared format at the places of accommodation or another convenient place by the same team, keeping subject privacy in consideration. Those in need of necessary investigations were asked to report to our practicing hospital for the same.

Three hundred subjects were studied over the study period of two years, confining to this number for the convenience of statistical analysis.

Approval from the institutional ethics committee of our institute was obtained. Voluntary participation, subject confidentiality, and human subject protection were ensured. The study subjects were made aware of preventive strategies in order to avoid snow-, cold-, and high-altitude-related dermatoses and other medical conditions, and at times provided with some of the medications free of cost from the samples available with the study team.

The data was collected in an Excel sheet and the calculations were performed with Excel formulas.

## RESULTS

The study was conducted on three hundred study subjects, which were all snow skiers. Their age ranged from twelve to sixty years, with an average age of 22.39 years. There were 225 males and 75 females, with a male-to-female ratio of 3:1. Most of the study subjects, 174 (males: 99, females: 75) were in the age range less than or equal to twenty years, followed by 90 (all males) in the age group from 21 to 40 years and 36 (all males) in the age group 41 to 60 years (Table 1).

Some of the skiers were beginners and some regular skiers. The duration of the stay at Gulmarg for the present course of snow skiing varied from eleven days to fifty days.

For the purpose of heating and warmth, 183 subjects employed wood bukharis (chimneys made from iron, in which wood or coal is burnt to provide heat), 45 employed kangris (traditional Kashmiri fire pots), 45

**Table 1:** Age and sex characteristics of the study group.

n = 300			
Age Group	Males	Females	Total
≤ 20 yrs.	99	75	174
21–40 yrs.	90	0	90
41–60 yrs.	36	0	36
Total	225	75	300

employed both kangri and a heat convector, and 27 employed central heating facilities.

Among the three hundred study subjects with dermatological complaints, some showed more than one type of presentation.

The most common dermatological manifestation was related to dryness (xerosis) and its related aftereffects, such as pruritus and chapping of the lips. This was seen in 254 manifestations, out of which eighty had significant chapping of the lips, 78 had visible dryness and scaling of the face, 60 had pruritus, and 36 had visible xerosis of the body.

UV-related skin damage was found in 134 manifestations, with 128 developing whole-face tanning and six with polymorphic light eruption (PMLE).

Infections and infestations were found in 78 cases, out of which scabies was found in 26, folliculitis/furunculosis in 22, superficial fungal infection, including pityriasis versicolor, tinea cruris, and corporis, in 16, labial/facial herpes simplex in 10, and chicken pox in 4.

Endogenous eczema as a manifestation was seen in 78 cases, including 58 cases of seborrheic dermatitis of the scalp and face and twenty cases of xerotic eczema.

Direct cold-related injuries were found in 56 cases, with 48 having perniosis and eight having frostbites.

Various forms of urticaria were found in 44 study subjects, with 24 having insect bite reactions or papular urticaria, fourteen having cholinergic urticaria, and six having cold urticaria.

Thirty-eight skiers presented with other manifestations, which we grouped as miscellaneous dermatoses: non-specific erythema of the face in 28, a non-specific burning sensation of the body in eight, and neglected dermatitis in two (Table 2).

## DISCUSSION

Gulmarg is located at a distance of around 53 kilometers from Srinagar, the summer capital of Jammu and Kashmir in North India. Snow skiing is conducted by various governmental and non-governmental institutions for all interested. Rides on snow scooters and sleds are also an important part of the activities that Gulmarg abounds with during the winter season.

Snow skiers begin their day in the early morning, facing the cold morning breeze, which predisposes to increased chances of facial erythema and dryness (xerosis) [19]. In our study, xerosis, chapping of the lips, and subsequent pruritus and xerotic eczema were the most common occurrences, found in 114, 80, 60, and 20 manifestations, respectively, which was in accordance with previous studies found in the literature [1,8]. Facial erythema was found in twenty-eight cases.

Forced hot and dry conditions indoors because of the use of various heating equipment and hot baths predispose to flushing/erythema and xerosis. These factors lead to transepidermal water loss and subsequent damaging effects on the skin.

Tanning is a usual occurrence among snow skiers due to exposure to UV radiation, both direct and reflected from the snow. Our study found this as well, with 128 subjects having developed visible and significant tanning of the entire face, similar to findings in the literature [8,9].

Exposure to cold air, compromised hygiene, and overcrowding predispose skiers to various infections and infestations. In our study, scabies, folliculitis/furunculosis, superficial fungal infections, and herpes virus infections were found in twenty-six, twenty-two, sixteen, and fourteen cases, respectively [20].

Overcrowding and a decreased frequency of bathing compared to normal routine practice also predispose to pruritus, infestations with lice, scabies, and discoloration. The same reason, along with infrequent floor cleaning and change of bedding, may be cited for the increased predisposition to insect bite reactions, found in twenty-four cases in our study, as also in the literature [21].

Direct exposure to cold air and snow also results in increased chances of cold-related injuries, such as perniosis and frostbites, as was also evident in our study, in which 56 cases developed these conditions. Similar results have also been reported in the literature [22,23].

Cold urticaria was found in six cases in our study, consistent with previous studies [24].

Workout-associated sweating and a raised body temperature increase the likelihood of superficial fungal infections and cholinergic urticaria, as found in sixteen and fourteen patients, respectively, in our study [25,26].

**Table 2:** Patterns of the various dermatoses observed in the study group.

Type of Dermatitis	Dermatitis	No. of Subjects (n = 300)	Total
Xerosis and pruritus	Chapping of the lips	80	254
	Dryness and scaling of the face	78	
	Pruritus	60	
	Xerosis of the body	36	
UV-related skin damage	Tanning	128	134
	Polymorphic light eruption (PMLE)	6	
Infections and infestations	Scabies	26	78
	Folliculitis/furunculosis	22	
	Superficial fungal infection (pityriasis versicolor, tinea cruris/corporis)	16	
	Herpes simplex labialis/facial	10	
	Chicken pox	4	
Eczema	Seborrheic dermatitis (scalp, face)	58	78
	Xerotic eczema	20	
Cold-related injuries	Perniosis	48	56
	Frostbite	8	
Urticaria	Insect bite reactions/papular urticaria	24	44
	Cholinergic urticaria	14	
	Cold urticaria	6	
Miscellaneous	Non-specific erythema of the face	28	38
	Burning sensation of the body (non-specific)	8	
	Neglected dermatitis	2	

The use of coal and wood for bukharis (chimneys made from iron in which wood or coal is burnt to provide heat) and kangris (earthen pots with burnt coal) results in burns, external tattooing, and discoloration. Placing a kangri between thighs also predisposes to burns, erythema ab igne, and Bowen's disease. In our study, we found no such cases.

## CONCLUSION

The common dermatoses among snow skiers directly exposed to environments of high altitudes, cold, and snow include xerosis with associated pruritus and eczema, tanning, infestations, insect bite reactions, and direct cold injuries such as perniois. The awareness among snow skiers about the adoption of various preventive measures may decrease the chances of skiers developing most of the dermatoses. This may help in mitigating the suffering and decreasing morbidity and economic loss occurring as a result of these otherwise preventable dermatoses.

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## Statement of Human and Animal Rights

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation

(institutional and national) and with the 2008 revision of the Declaration of Helsinki of 1975.

## Statement of Informed Consent

Informed consent for participation in this study was obtained from all patients.

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