



Research Article

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Skiing and Snowboarding at Ski Resorts: Case Studies of Accidents

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Introduction

Millions of people take part in winter sports worldwide [1,2]. Downhill skiing and snowboarding are said to have beneficial effects on health [3], although they are also associated with a potential risk of injury. Previous studies report an injury rate of 4.6 per 1,000 skier-days [4], with differences between alpine skiers (2 to 10

injuries per 1,000 skier-days) and snowboarders (1 to 6 injuries per 1,000 snowboarder-days) [5,6]. The at-risk population in Spain was 5,155,380 during the 2024-2025 season [7], translating these percentages into a high number of injuries per year. The possibility of suffering a serious injury or death whilst skiing or snowboarding means that these are considered high-risk sports [8] Table 1.

Table 1: Sports with the highest injury rates.

Sport	Main risk	Common type of injury
Snowboarding	Falls from a height	Head and neck injuries
Alpine skiing	Loss of control at high speed	Knee ligament injuries, fractures

Accident rates in alpine skiing are a complex issue involving a combination of human, technical, environmental and organisational factors. The available data show a high risk of accidents due to speed, ice, snow conditions and technical manoeuvres; skiing and snowboarding are thrilling, but they also account for a significant number of accidents, with skiing responsible for around 81% of accidents, snowboarding for 15% and sledging and other activities for at least 4%. During the last Winter Olympic Games (Milan-Cortina 2026), several serious accidents were recorded across various disciplines. 90% of accidents in the aforementioned disciplines were due to falls on jumps, loss of control or recklessness caused by excessive speed, overestimating one's abilities or ignoring weather conditions [9].

Materials and Methods

Medical records data for accident victims were collected from the electronic health records.

Study Design

The study was conducted using simplified and pre-anonymised electronic health records of accident victims treated at ski resort medical centres in Aragón during the 2025-2026 season, all of which were managed by the same company.

Study Data

For the study, only the variables of age, sex, final diagnosis, injured body part and patient's destination following treatment

were selected.

Data Analysis

Descriptive and inferential statistical techniques were employed to analyse the data obtained, using the Jamovi statistical package version 2.6.44.0 for Windows. To investigate relationships between variables, Pearson's χ^2 test was used as the variables were qualitative. Statistical significance was set at $p < 0.05$.

Results

A total of 2,812 patients treated at the various healthcare centres in the managed ski resorts were studied. The median age of the participants was 29 (95% CI 31.6-34.8), with a mean of 33.2 years and a range of 4 to 81 years; 55.4% were male. Alpine skiers accounted for 84.38% of those treated for injuries, whilst 15.62% were snowboarders Tables 2&3.

Table 2: Percentage of injury type by gender.

Injury	Sex	% Total by sex	% total	p-value
Concussion	Man	25.00%	47.00%	<.001
	Woman	22.10%		
Contracture	Man	4.40%	5.60%	
	Woman	1.30%		
Fracture	Man	8.60%	13.10%	
	Woman	4.60%		
Luxation	Man	3.30%	3.60%	
	Woman	0.40%		
Polytrauma	Man	0.20%	0.20%	
	Woman	0.00%		
Strain	Man	11.50%	26.40%	
	Woman	14.90%		
Wound	Man	2.60%	4.00%	
	Woman	1.50%		

Table 3: Most common types of injury by sport.

Sport	Typical injuries	Common causes
Skiing	Anterior cruciate ligament, menisci, shoulder	Loss of control, sharp turns, collisions
Snowboarding	Wrist, collarbone, head	Falls forwards/backwards, failed jumps
Both	Bruises, fractures, head injuries	Excessive speed, poor technique

The data indicate that the most common injuries are contusions (47%), followed by sprains (26.4%) and fractures (13.1%). The least common injuries are muscle strains, lacerations and dislocations. The χ^2 test revealed statistically significant differences between injuries and the gender of those involved in accidents ($p < 0.001$). Contusions were most common in the knee, clavicle and rib cage; knee sprains were one of the most characteristic injuries in skiing, just as shoulder dislocations are characteristic of snowboarding; the most common fractures were of the tibia and fibula and the

clavicle. The most serious injury observed was head injury Table 4.

The chi-square test revealed statistically significant differences between injuries and the affected body part ($p < 0.001$). This relationship was also analysed by gender and proved statistically significant only for men ($p < 0.001$). Finally, the vast majority of injuries treated were initially managed at medical centres associated with the ski resorts. However, a significant proportion had to be referred to the A&E department of the nearest referral hospital for more appropriate specialist care Table 5.

Table 4: Percentage of injury type and affected body part.

Injury	Part affected	% Total	p-value
Concussion	Knee	13.5%	<.001
	Rib	4.9%	
	Shoulder	7.7%	
	Thumb	2.0%	
Contracture	Back	0.9%	
	Leg	3.1%	
Fracture	Radius	1.6%	
	Rib	1.3%	
	Tibia	2.7%	
	Tibia and fibula	1.1%	
	Collarbone	2.4%	
	Humerus	1.1%	
Luxation	Shoulder	2.9%	
Strain	Ankle	2.0%	
	Knee	19.1%	
	Radius	0.2%	
	Thumb	2.9%	
	Wrist	2.0%	
Trauma	Traumatic brain injury	4.9%	

Table 5: Percentage of cases by management.

	Sex	% of Total	% Total
A&E	Man	10.6%	16.0%
	Woman	5.5%	
Specialist medical consultation	Man	44.8%	84.0%
	Woman	39.2%	

Discussion and Conclusions

Our data series shows the same accident rate trends that other authors have previously reported: an upward trend that increases year on year due to the gradual rise in the number of skiers [10]. Men take more risks; they continue skiing for longer and are less well prepared than younger people. It is quite normal that, for the reasons mentioned above, many accidents result in patients being taken to hospital A&E departments, given the severity of the accident. Women suffer fewer injuries, and these are less severe than those sustained by men. The data demonstrate the relationship between the increase in the number of skiers and the incidence of accidents. Snowboarding stands out as a sport where the ratio of male to female participants is becoming more balanced.

The practice of winter sports, and particularly skiing and snowboarding, involves risks that result in injuries of varying complexity and severity. In many cases, a serious injury leads to further injuries that will become apparent later at the referral

hospital. In this study, injuries have been observed that result from a lack of technique or inadequate physical fitness, incorrect or poorly fitted equipment, difficult snow conditions (ice, spring snow) or overcrowding on the slopes during the high season. Prevention is the most effective way to reduce the risk of accidents and includes measures such as: technical training (lessons, posture correction, progressive practice...), suitable equipment (compulsory helmet, wrist guards for snowboarding, properly fitted bindings...), checking weather conditions (wind, visibility, snow conditions...), following the rules (right of way for skiers below, speed control, not stopping in narrow areas...), and taking out snow insurance is essential, especially when abroad.

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