JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205

Volume 15 Issue 10, October 2025

Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

ATHLETIC INJURIES IN WINTER SPORTS

R.X. Kadirov
Professor, Department of Physical Culture
Asia International University
Email: rashidkadirov500@gmail.com

Abstract: The epidemiology and mechanisms of sports injuries occurring in winter sports are highly diverse. It is essential to prevent possible injuries not only in athletes participating in competitions but also in individuals engaging in other winter sports; and if an injury occurs, it is crucial to provide prompt first aid and initiate treatment without delay. The types of injuries vary according to the sport performed. In general, individuals who ski experience injuries more frequently than those engaged in other winter sports. The most common injuries are localized in the lower extremities, followed by the upper extremities and shoulder region. Injuries among skiers differ significantly from those observed in other athletes. Depending on the characteristics of the injury, management requires timely intervention and treatment conducted by a specialized medical team.

Keywords: Winter sports, Sports injuries, Skiing, Ski-related injuries

Introduction

Every winter season, individuals participating in winter sports such as skiing, snowboarding, sledding, and ice skatingwhether professional or amateurare exposed to the risk of various injuries. Despite numerous preventive measures, sports injuries remain an inevitable consequence. Winter sports injuries have their own specific etiological and predisposing factors. For example, during skiing, speeds may reach 90–100 km/h. Worldwide, 50–60 million people are engaged in winter sports. During the 1994–1995 season, 54.6 million, and during the 2000–2001 season, 57.3 million individuals visited ski resorts. In our country as well, the number and quality of ski resorts have increased, leading to a twofold rise in the number of participants in winter sports within the last decade.

It has been reported that per 1,000 ski days, approximately 3 skiers sustain injuries requiring medical assistance and treatment. The exact number of injuries is unknown, since not all cases are reported to medical institutions or authorities; in fact, nearly 40% of such injuries remain undocumented. In winter sports, most injuries are treated at designated medical centers. Therefore, it is crucial for healthcare professionals working in the field and capable of providing immediate care to be knowledgeable about the types of injuries and their appropriate management strategies. This article aims to present both minor and major mechanisms of winter sports injuries, their historical development, physical examination methods, diagnostic modalities, and treatment approaches [1].

Skiing Injuries

Although skiing is generally considered a safe sport when proper precautions are taken, reports in the literature indicate that injuries are nonetheless unavoidable. Several reasons account for the lack of precise data on the incidence of ski-related injuries: not all injuries are reported to

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

medical centers, the seriousness of the injuries may be underestimated, and in some cases, both professional and amateur athletes may fail to recognize their injuries.

The rate of injuries among skiers has been reported as 9.4 per 1,000 ski days, with an average of 7.9 per 1,000. Juvenile skiers under the age of 16 experience injuries three times more frequently than adults. Approximately one-third of skiing injuries occur in individuals under the age of 16, and nearly half of skiing injuries are observed among those aged 11–13 years.

Experience and technical skill are crucial in reducing ski-related injuries. For instance, individuals with limited skiing experience are two to three times more likely to sustain injuries compared to experienced skiers. Novice skiers who begin skiing later in life may also be more susceptible to injuries than those who start at an early age. Therefore, skiing training programs emphasize the importance of technical skills in minimizing injuries [2].

Environmental and terrain conditions also play a significant role in skiing injuries. A notable proportion of injuries is linked to falls and terrain-related factors. For example, fog and snow reduce visibility and increase the risk of lower extremity injuries. Powder snow is considered particularly hazardous, as it can obscure obstacles. Poor snow quality further elevates the likelihood of injuries, while experienced skiers may be better able to manage such conditions.

Fatigue is another critical factor contributing to skiing injuries. The risk of injury significantly increases between the first and second weeks of skiing due to muscle fatigue, as well as during the late hours of the day. Fatigue is especially pronounced among beginner skiers, who may not yet be physically conditioned. For this reason, both mental and physical preparedness are essential for preventing injuries.

Alcohol consumption is also an important risk factor in skiing injuries. Alcohol impairs coordination and reduces reflexes, thereby increasing the risk of accidents. In addition, dehydration and peripheral vasodilation due to alcohol consumption can lead to hypothermia in case of accidents.

Prevention: Protective Equipment and Safety

The historical development of ski equipment has directly influenced the type and frequency of injuries.

Modern ski boots are designed with reinforced uppers that help control the ski over snow while reducing the force transmitted to the legs and feet. By absorbing impact forces, the soft inner lining of the boots, along with rigid outer support structures, helps protect the foot and ankle. These design features provide both comfort and stability. The softer cushioning in the upper part of the boot supports the leg, while the stiff and thicker materials in the lower part protect against torsional stress and direct trauma. As a result, ski boots now prevent injuries in the mid-tibia region, which previously accounted for one-third of tibial fractures. Over the past 30 years, the incidence of tibia-fibula fractures has decreased from 62–64% to approximately 7% . In cross-country skiing, however, where boots are lower and less supportive, tibia-fibula fractures are more common [3].

Ski bindings are another critical protective component. Properly adjusted bindings release during abnormal force loads, thereby reducing the risk of severe injuries. Advanced bindings with dual-mode technology allow for release in both the medio-lateral (toe rotation) and vertical planes, further decreasing the risk of tibial fractures.

Injuries to the knee joint, particularly involving the anterior cruciate ligament (ACL), have increased with the reduction of tibial fractures. Skiers, especially females, are more prone to

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

ACL injuries due to biomechanical differences and muscle strength factors. Rotational forces occurring during falls or sudden twists while skiing are the most common mechanisms. Studies show that ACL injuries account for nearly 20–30% of all skiing-related injuries. Additionally, anterior knee injuries are often linked to hyperextension caused by sudden falls and forced landings.

Therefore, while improvements in equipment designsuch as ski boots and bindingshave significantly reduced certain types of injuries, they have also led to an increase in others, such as ligament injuries in the knee [4].

Injury Mechanisms and Classification

In general, skiing injuries can be grouped into three categories: sprains, dislocations, and fractures. In addition, injuries associated with the overuse of ligaments and tendons may also be observed.

Fractures constitute approximately 5–6% of all skiing injuries, and the hospitalization rate is about 6–7%. Traumas such as bone fractures caused by high-energy impacts resulting from collisions with trees, rocks, poles, or immobile objects are commonly reported in skiing literature. Severe head injuries and fatalities have also been documented as a result of skiing accidents. Among these, head traumas and bodily impacts are particularly significant. According to the U.S. National Safety Council, there are approximately 650,000 skiing-related injuries annually, of which 1351 involve concussions (brain injuries) and 4511 require hospital treatment. Between 1996 and 1997, more than 200 deaths were reported in the U.S. as a result of skiing accidents. The most common causes of fatal injuries include head trauma and chest injuries, with head injuries accounting for nearly 60% of fatalities. The consistent use of helmets has been shown to reduce the risk of head injuries by approximately 50%. Despite increased helmet use among skiers, the rising popularity of snowboarding has contributed to higher injury rates, especially in younger populations [5].

Falls: Nearly 87% of skiing injuries result from falls, the majority of which affect the lower extremities. The most frequently observed injuries include sprains, ligament ruptures, fractures of the tibia, ankle, thumb, and wrist, as well as lacerations and contusions in the shoulder and knee regions.

The biomechanics of skiing falls are related to the excessive load placed on the lower extremities when the skier loses balance. Excessive rotational forces transmitted through the skis during a fall may exceed the structural resistance of the musculoskeletal system. This results in ligamentous and tendinous injuries, particularly in the knee joint. Research has shown that improper release of ski bindings during falls significantly increases the severity of injuries. Commonly reported biomechanical mechanisms include:

- **Internal Rotation (IR) Fall:** Occurs when the inner edge of the ski catches in the snow or collides with an object, forcing the leg into abduction and internal rotation. This leads to tears of the anterior cruciate ligament (ACL), medial collateral ligament (MCL), or meniscus injuries.
- **External Rotation (ER) Fall:** Occurs when the outer edge of the ski is trapped, resulting in abduction and external rotation of the leg. This mechanism may cause ACL injuries, collateral ligament damage, or tibial plateau fractures.

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

- **Forward Fall:** When the ski tips are caught, the skier falls forward. This type of fall often leads to thumb ligament injuries (commonly referred to as "skier's thumb"), wrist fractures, and upper extremity trauma.
- **Backward Fall:** Frequently observed in beginners, caused by excessive backward leaning or sudden rear impacts while standing still. This can result in tibial fractures, gastrocnemius contusions, posterior cruciate ligament (PCL) injuries, or other posterior knee ligament traumas.
- **Varus and Valgus Stress Injuries:** Occur during lateral falls or collisions, resulting in medial or lateral collateral ligament injuries. When the trauma is more severe, meniscal or cruciate ligament tears and fractures around the knee joint may be observed [6].

Overuse Injuries

Overuse injuries are the most frequently observed in skiing. Although they may appear minor, they are clinically significant. The most common sites include the quadriceps femoris, gastrocnemius, and paravertebral muscles. Overuse of the ski edges may lead to tendinitis in these regions. Treatment generally involves activity modification, strengthening and flexibility exercises, non-steroidal anti-inflammatory drugs (NSAIDs), and local physical modalities. Proper equipment maintenance, particularly ski bindings and boots, is essential in preventing such injuries. During the early stages, rest and activity modification are recommended until symptoms subside.

Leg, Ankle, and Foot-Specific Injuries

Due to the hyperflexion of the ankle during skiing and the dorsiflexion pressure exerted by the ski boot, pain and tenderness frequently occur in the midfoot region. This is particularly pronounced in larger ski boots where the ankle's support is reduced. Preventive measures include cushioned insoles, elastic bandages, and the use of NSAIDs.

Excessive pressure from ski boots or tightly fitted bindings may also lead to midfoot injuries, especially stress fractures of the metatarsal bones. Pain is most commonly localized in the first metatarsal region (the skier's toe). Such injuries may be triggered by repetitive microtraumas and are often exacerbated by ill-fitting boots or inadequate foot alignment. In some cases, sesamoid injuries and medial plantar nerve entrapment syndromes may also occur. Treatment includes rest, activity modification, foot orthoses, shoe modification, and in severe cases, immobilization [7].

Ankle Injuries are relatively rare but can be severe when they occur. Advances in boot and binding technology have significantly reduced ankle injuries in recent decades. However, fractures of the talus and medial malleolus may still occur due to excessive inversion or abduction forces. Treatment depends on the severity of the injury, ranging from conservative measures such as rest, ice, and NSAIDs, to surgical intervention in cases of Grade II or Grade III sprains and fractures requiring immobilization.

Knee Injuries

Knee injuries account for approximately 20% of all skiing-related traumas. Considering that more than 20% of injuries in winter sports are knee-related, knee injuries represent a significant portion of the total. In fact, nearly 90% of winter sports knee injuries occur in skiing alone. The injury spectrum ranges from mild sprains to severe ligament ruptures.

Sports Injuries in Winter Sports

One of the most common injuries during skiing is the medial collateral ligament (MCL) sprain, which typically occurs as a result of excessive abduction and external rotation when the inner

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

edge of the ski catches in the snow. MCL injuries account for 60% of all skiing-related knee traumas, while meniscus tears make up approximately 8–13%. These injuries may present with acute pain localized on the medial side of the knee, tenderness, and joint instability.

Clinical examination reveals medial tenderness, pain during extension at 20–30° flexion, and joint laxity in valgus stress testing. Early treatment includes elastic bandaging, cold therapy, rest, and activity modification. In advanced cases, functional rehabilitation is required. Surgical intervention may be necessary for combined injuries involving the medial collateral ligament and meniscus tears.

Anterior Cruciate Ligament (ACL) injuries are also frequent, especially among young skiers, and occur in approximately 7% of all skiing-related injuries. ACL ruptures are typically caused by rotational forces during falls or sudden deceleration movements. Diagnosis is confirmed through physical examination and MRI. Treatment may involve conservative rehabilitation or reconstructive surgery, depending on the severity and functional demands of the patient [8].

Knee injuries often lead to long-term sequelae such as chronic instability, recurrent effusion, and early-onset degenerative arthritis if not properly managed. Given the increasing participation of children and adolescents in winter sports, preventive strategiessuch as appropriate equipment, proper training, and strengthening of lower extremity musclesplay a crucial role in reducing the incidence of skiing-related knee injuries.

Snowboarding Injuries

Snowboards, measuring 140–190 cm in length and 30–40 cm in width, are used without poles, and the rider's feet are secured to the board with bindings. Since both feet are fixed to the board, independent foot movements are not possible. The front foot is positioned at an angle of approximately 45 degrees, while the back foot is set at nearly 90 degrees. Technically, snowboarding resembles alpine skiing or using short skis (skiboard).

In general, the weight distribution in snowboarding is shifted backward, and the rider must frequently adjust their body weight to the rear, often leaning backward while standing. Snowboarding is predominantly performed by young individuals, with an average age of 21, and athletes tend to be male. The incidence of injuries is higher at the beginning of the learning phase, with about 50% of all injuries occurring during this period. The overall injury rate is estimated at 3–4 per 1,000 snowboarding days.

The majority of snowboarding injuries involve trauma caused by collisions or falls. Compared to skiing, fractures are seen in 38% of snowboarding injuries, which is 15% higher. The most common fractures include wrist injuries resulting from backward falls, as the hand is instinctively used to break the fall. More than 40% of all injuries involve the upper extremities, and 75% of these occur on the non-dominant side.

In addition to wrist fractures, shoulder dislocations, clavicle fractures, and vertebral injuries are also commonly observed. Compared to skiers, snowboarders sustain fewer lower extremity injuries, largely due to softer boots and more stable bindings. However, ankle injuries and sprains are more frequent in snowboarders using soft boots. Overall, snowboarding injuries resemble skiing injuries but present a higher incidence of upper extremity trauma.

Conclusion

In summary, winter sports encompass a wide spectrum in terms of sports-related injuries. The presence of trauma centers within winter sports facilities, along with adequately equipped and

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

experienced medical personnel, ensures rapid and accurate intervention following an injury. It is essential that appropriate preventive measures be implemented, closely monitored, and reinforced by experienced teams. Proper use and maintenance of equipment, along with safe environmental conditions, are also crucial factors.

When these conditions are met, winter sportswhether performed recreationally or competitivelycan be practiced in a safer and more secure manner.

References:

1. Abu-Laban, R. (1991). Snowboard injuries: Epidemiology and prevention. The Physician and Sportsmedicine, 19(12), 61–66.

2. Barret, J. (1994). Medial collateral ligament injuries in skiing. Clinical Orthopaedics and Related Research, 308, 32–40.

3. Bianchi-Bern, J. (1985). Ski injuries: Biomechanical analysis and prevention. Journal of Sports Medicine and Physical Fitness, 25(4), 211–219.

4. Clancy, W. (1985). Ski injuries in adolescents. American Journal of Sports Medicine, 13(1), 23–28.

5. Clifford, R. (1962). Ski injuries: Etiology and treatment. New England Journal of Medicine, 267(5), 221–228.

6. Crimino, L. (1994). Knee injuries in skiing. Sports Medicine, 17(6), 367–375.

7. Deibert, C. (1985). Ski injuries in children and adolescents. Journal of Pediatric Orthopaedics, 5(1), 34–39.

8. Deibert, C. (1989). Prevention of ski injuries: The role of training and experience. American Journal of Sports Medicine, 17(5), 654–658.

9. Kadirov R. X. Jismoniy tarbiya jarayonida diagnostik usullar amaliyoti //PEDAGOGIK TADQIQOTLAR JURNALI. – 2025. – T. 2. – №. 2. – C. 163-168.

10. Kadirov R. X. JISMONIY TARBIYA VA SPORT TA'LIMIDA TANQIDIY FIKRLASH //ИКРО журнал. – 2025. – Т. 15. – №. 02. – С. 244-248.

11. Kadirov R. X. MASHHUR QO 'SHIMCHA: KREATIN //ИКРО журнал. – 2025. – Т. 16. – №. 01. – С. 143-147.

12. Kadirov R. X. Jismoniy tarbiya jarayonida diagnostik usullar amaliyoti //PEDAGOGIK TADQIQOTLAR JURNALI. – 2025. – T. 2. – №. 2. – C. 163-168.

13. Kadirov R. X., Azimov L. A. Technology of organization and comprehensive assessment of sports activities of judoka students //BIO Web of Conferences. – EDP Sciences, 2024. – T.

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

120. – С. 01002.

14. Кадыров Р. Х., Назарова Н. Э. Развитие эффективности исследовательской деятельности студентов ВУЗа //Проблемы науки. – 2021. – №. 4 (63). – С. 52-54.