



CLINICAL PROFILE AND DETERMINANTS OF CHRONIC ANKLE INSTABILITY FOLLOWING ANKLE SPRAINS IN YOUNG ADULTS: A HOSPITAL-BASED CROSS-SECTIONAL STUDY FROM NORTH INDIA

Dr Rajeev Kumar¹, Dr Amar Kumar², Dr Dhruv Kumar³

¹ Associate Professor, Department of Orthopaedics, Teerthanker Mahaveer Medical College, Moradabad, Uttar Pradesh, India.

Email ID: rajeevkumar3536@gmail.com

² Assistant Professor, Department of Orthopaedics, Netaji Subhash Medical College, Bihta, Patna, Bihar, India.

Email: dramanortho35@gmail.com

³ Assistant Professor, Department of Orthopaedics, Netaji Subhash Medical College, Bihta, Patna, Bihar, India.

Email: drdk007@gmail.com

***Corresponding Author:** Dr Rajeev Kumar

* Department of Orthopaedics, Teerthanker Mahaveer Medical College, Moradabad, Uttar Pradesh, India

Email ID: rajeevkumar3536@gmail.com

ABSTRACT

Background: Ankle sprains are among the most common musculoskeletal injuries in young adults and frequently lead to chronic ankle instability (CAI), resulting in long-term functional limitations. Despite their high prevalence, limited data exist regarding the clinical profile and determinants of CAI in the Indian population.

Objectives: To evaluate the clinical characteristics of ankle sprains and determine the prevalence and associated factors of chronic ankle instability among young adults attending a tertiary care hospital in North India.

Methods: A hospital-based cross-sectional study was conducted from March 2021 to August 2021 among 80 participants aged 18–35 years with a history of ankle sprain. Data were collected using a structured proforma, including demographic details, injury characteristics, and treatment history. Clinical examination and functional assessment using a validated instability scoring tool were performed. Statistical analysis was conducted using SPSS version 20.0. Associations between variables were analyzed using Chi-square and t-tests, with $p < 0.05$ considered statistically significant.

Results: The majority of participants were males (65%) and belonged to the 18–25-year age group. Inversion injury was the most common mechanism (72.5%). Chronic ankle instability was present in 40% of participants. Recurrent sprains ($p = 0.002$) and lack of physiotherapy ($p = 0.04$) were significantly associated with CAI. Clinical examination revealed ligamentous laxity and reduced range of motion in a substantial proportion of affected individuals. Functional assessment scores correlated with clinical findings of instability.

Conclusion: Chronic ankle instability is a common sequela of ankle sprains among young adults. Recurrent injuries and inadequate rehabilitation are key contributing factors. Emphasis on early management and structured physiotherapy is essential to prevent long-term disability.

Keywords: Ankle sprain; Chronic ankle instability; Young adults; Ligament injury; Physiotherapy; Rehabilitation; India

INTRODUCTION

Ankle sprains are among the most common musculoskeletal injuries worldwide, particularly affecting physically active populations and young adults. They account for a substantial proportion of emergency department visits and sports-related injuries, contributing significantly to morbidity and healthcare burden [1]. Lateral ankle sprains, involving injury to the anterior talofibular and calcaneofibular ligaments, are the most frequently reported subtype and are often associated with inversion injuries during physical activity [2]. Despite being considered relatively minor injuries, ankle sprains can lead to persistent symptoms, including pain, swelling, and recurrent instability, thereby impacting quality of life and functional performance [3].

Globally, it is estimated that up to 40% of individuals who sustain an initial ankle sprain may develop chronic ankle instability (CAI), characterized by repeated episodes of the ankle “giving way,” ongoing discomfort, and functional limitations [4]. Chronic instability not only predisposes individuals to recurrent injuries but also increases the risk of long-term complications such as post-traumatic osteoarthritis [5]. The burden is particularly high among young adults due to their increased participation in sports and physically demanding activities, making this group especially vulnerable [6].

In the Indian context, the prevalence and patterns of ankle sprains are influenced by diverse factors including occupational activities, sports participation, and limited access to early rehabilitation services. Studies from developing countries suggest that inadequate initial management and lack of structured physiotherapy contribute significantly to the progression from acute sprain to chronic instability [7]. Furthermore, sociocultural factors, delayed healthcare seeking behavior, and variability in clinical practices may further exacerbate outcomes in such populations.

At the level of tertiary care hospitals in North India, patients frequently present with both acute ankle sprains and long-standing symptoms of instability. However, there is a relative paucity of well-structured hospital-based studies that systematically evaluate the clinical profile, risk factors, and functional outcomes associated with ankle sprains and chronic instability in young adults within this region. Existing literature is often limited by small sample sizes, heterogeneous populations, or lack of standardized assessment tools [8].

Given the significant functional impairment and economic burden associated with ankle sprains and their sequelae, there is a clear need for context-specific research to better understand the epidemiology and clinical characteristics of these injuries in young adults. Such data are essential for developing targeted preventive strategies, optimizing early management protocols, and reducing the risk of chronic instability.

Therefore, the present study aims to evaluate the clinical profile of ankle sprains and the prevalence of chronic ankle instability among young adults attending a tertiary care hospital in North India. The objectives are to assess the associated risk factors, characterize patterns of injury, and examine functional outcomes in this population.

METHODOLOGY

Study Design: This study was designed as a hospital-based cross-sectional observational study.

Study Setting: The study was conducted in the Department of Orthopedics at a tertiary care teaching hospital in North India, catering to both urban and rural populations.

Study Duration: The study was carried out over a period of six months, from March 2021 to August 2021.

Study Population: The study population comprised young adult patients presenting with a history of ankle sprain or symptoms suggestive of chronic ankle instability attending the outpatient and emergency departments of the hospital during the study period.

Inclusion Criteria

Patients aged 18–35 years

History of at least one ankle sprain within the past 12 months

Patients presenting with symptoms of instability (e.g., giving way, recurrent sprains)

Willingness to participate and provide informed consent

Exclusion Criteria

History of fracture around the ankle joint

Previous ankle surgery

Neurological disorders affecting balance or gait

Congenital deformities of the lower limb

Systemic musculoskeletal disorders (e.g., rheumatoid arthritis)

Sample Size: The sample size was calculated using the formula for estimating a proportion in a cross-sectional study:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Assuming a prevalence (p) of chronic ankle instability following ankle sprain as 40% based on previous literature, with a confidence level of 95% (Z = 1.96) and an absolute precision (d) of 10%, the calculated sample size was approximately 92. However, considering feasibility constraints and the study duration, a final sample size of 80 participants was included.

Sampling Technique: A consecutive sampling technique was employed, wherein all eligible patients meeting the inclusion criteria during the study period were recruited until the desired sample size was achieved.

Data Collection Tools & Procedure: Data were collected using a pre-structured and pre-tested case record form. Detailed demographic information, including age, gender, occupation, and level of physical activity, was recorded. Clinical history focused on mechanism of injury, number of previous sprains, time since last injury, and treatment received. Physical examination included assessment of swelling, tenderness, range of motion, and ligament stability tests such as the anterior drawer test and talar tilt test. Functional instability was evaluated using a validated questionnaire (e.g., Cumberland Ankle Instability Tool). All assessments were performed by trained orthopedic residents under supervision to ensure consistency.

Study Variables: Independent variables included demographic factors (age, gender), lifestyle factors (physical activity level), and injury-related characteristics (mechanism of injury, number of sprains, treatment received). Dependent variables included presence of chronic ankle instability, functional scores, and clinical findings such as ligament laxity and range of motion limitation.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Descriptive statistics were expressed as mean $\pm$ standard deviation for continuous variables and as frequencies and percentages for categorical variables. Association between variables was assessed using Chi-square test or Fisher's exact test for categorical

data and independent t-test for continuous variables. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to inclusion in the study. Confidentiality and anonymity of patient information were strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

RESULTS

A total of 80 participants were included in the study, with the majority belonging to the 18–25 years age group and a predominance of males. (Table 1)

Table 1: Demographic characteristics of study participants (n = 80)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–25	34	42.5
	26–30	26	32.5
	31–35	20	25.0
Gender	Male	52	65.0
	Female	28	35.0
Occupation	Student	30	37.5
	Sedentary worker	18	22.5
	Manual laborer	20	25.0
	Athlete	12	15.0

Students and manual laborers constituted a significant proportion of the study population. Inversion injury was identified as the most common mechanism of ankle sprain, and more than half of the participants reported experiencing recurrent sprains. (Table 2)

Table 2: Injury characteristics and clinical profile of ankle sprains (n = 80)

Variable	Category	Frequency (n)	Percentage (%)
Mechanism of injury	Inversion	58	72.5
	Eversion	12	15.0
	Others	10	12.5
Number of previous sprains	Single episode	36	45.0
	≥2 episodes	44	55.0
Time since last sprain	<3 months	28	35.0
	3–6 months	30	37.5
	>6 months	22	27.5
Initial treatment received	Rest/ice/compression	40	50.0
	Physiotherapy	16	20.0
	No formal treatment	24	30.0

The prevalence of chronic ankle instability (CAI) was found to be 40%, with a substantial number of participants demonstrating positive anterior drawer and talar tilt tests, indicating ligamentous laxity. (Table 3)

Table 3: Prevalence of chronic ankle instability and clinical findings (n = 80)

Variable	Category	Frequency (n)	Percentage (%)
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Chronic ankle instability	Present	32	40.0
	Absent	48	60.0
Anterior drawer test	Positive	30	37.5
	Negative	50	62.5
Talar tilt test	Positive	26	32.5
	Negative	54	67.5
Reduced range of motion	Present	28	35.0
	Absent	52	65.0

A statistically significant association was observed between recurrent ankle sprains and the presence of CAI ($p = 0.002$). Additionally, lack of physiotherapy was significantly associated with higher rates of instability ($p = 0.04$). However, the mechanism of injury did not show a statistically significant association with CAI. (Table 4)

Table 4: Association between selected variables and chronic ankle instability (n = 80)

Variable	Category	CAI Present (n=32)	CAI Absent (n=48)	p-value
Number of sprains	Single	8	28	0.002*
	≥ 2	24	20	
Physiotherapy received	Yes	4	12	0.04*
	No	28	36	
Mechanism of injury	Inversion	26	32	0.08
	Others	6	16	

*Statistically significant ($p < 0.05$)

Functional assessment using instability scoring revealed that a notable proportion of participants had impaired ankle stability. (Table 5)

Table 5: Functional instability scores among participants (n = 80)

Score Category (CAIT)	Frequency (n)	Percentage (%)
≤ 24 (Instability)	34	42.5
> 24 (Stable)	46	57.5

DISCUSSION

The present hospital-based cross-sectional study evaluated the clinical profile of ankle sprains and the prevalence of chronic ankle instability (CAI) among young adults in a tertiary care setting in North India. The key findings indicate that ankle sprains are more common in younger males, with inversion injury being the predominant mechanism. Notably, 40% of participants developed chronic ankle instability, and recurrent sprains along with lack of physiotherapy were significantly associated with this condition.

The predominance of males and individuals in the 18–25-year age group observed in this study is consistent with previous literature, which attributes higher incidence rates to increased participation in sports and physically demanding activities [6]. Similar demographic patterns have been reported in other epidemiological studies, highlighting that young, active populations are at a greater risk for ankle injuries and their sequelae [4]. The high proportion of students and manual laborers further underscores the role of activity level and occupational exposure in the occurrence of ankle sprains. Inversion was identified as the most common mechanism of injury, accounting for over two-thirds of cases. This aligns with established biomechanical evidence indicating that lateral ligament complexes

are particularly vulnerable during inversion stress [2]. Comparable findings have been reported by Fong et al. [1], who noted inversion injuries as the predominant cause in sports-related ankle sprains. The anatomical predisposition of the lateral ligaments, especially the anterior talofibular ligament, explains this consistent pattern across different populations.

The prevalence of chronic ankle instability in the present study was 40%, which is in agreement with earlier reports suggesting that approximately one-third to half of individuals with an initial ankle sprain develop persistent instability [4,7]. This finding reinforces the notion that ankle sprains are not always benign injuries and can have long-term functional consequences if not managed appropriately. The presence of positive anterior drawer and talar tilt tests among a substantial proportion of participants further supports the role of mechanical instability in the pathogenesis of CAI.

A significant association between recurrent ankle sprains and CAI was observed, which is consistent with the existing body of evidence. Repeated ligamentous injuries can lead to both mechanical laxity and proprioceptive deficits, thereby increasing susceptibility to further episodes of instability [3]. Additionally, the study demonstrated a statistically significant relationship between lack of physiotherapy and the development of CAI. This finding highlights the importance of early and structured rehabilitation in restoring joint stability and preventing chronic sequelae. Previous studies have emphasized that neuromuscular training and balance exercises play a crucial role in improving functional outcomes and reducing recurrence rates [8].

Although inversion injury was the most common mechanism, it did not show a statistically significant association with CAI in this study. This suggests that while the mechanism of injury contributes to initial ligament damage, the progression to chronic instability is likely influenced by multiple factors, including rehabilitation, neuromuscular control, and patient adherence to treatment protocols.[9,10]

From a clinical and public health perspective, these findings underscore the need for improved awareness regarding the potential long-term consequences of ankle sprains. Early diagnosis, appropriate management, and emphasis on rehabilitation programs are essential to prevent chronic instability. In resource-limited settings, where access to physiotherapy may be restricted, integrating simple home-based rehabilitation protocols could be beneficial.

The strengths of this study include its focus on a relatively under-researched population in North India and the use of both clinical examination and functional assessment tools to evaluate instability. However, certain limitations must be acknowledged. The cross-sectional design limits the ability to establish causal relationships. The sample size, although adequate for preliminary analysis, may restrict generalizability. Additionally, reliance on patient-reported history may introduce recall bias. Future longitudinal studies with larger sample sizes and objective biomechanical assessments are recommended to further elucidate the natural history and risk factors of chronic ankle instability.

CONCLUSION

This study demonstrates that ankle sprains are a common musculoskeletal injury among young adults, particularly affecting males and physically active individuals. A substantial proportion of patients developed chronic ankle instability, highlighting that ankle sprains are not always self-limiting conditions. Recurrent sprains and inadequate rehabilitation, particularly lack of physiotherapy, were identified as significant factors associated with chronic instability. These findings emphasize the importance of early diagnosis, appropriate initial management, and structured rehabilitation programs to prevent long-term functional impairment. From a clinical standpoint, routine assessment for instability following ankle sprain and timely referral for physiotherapy should be integrated into standard care protocols. Public health strategies focusing on awareness, injury prevention, and accessible rehabilitation services are warranted, especially in resource-constrained settings. Further

longitudinal studies are recommended to explore causal relationships and evaluate the effectiveness of targeted interventions in reducing the burden of chronic ankle instability.

DECLARATIONS

Funding: None.

Conflict of Interest: The authors declare no conflict of interest.

Consent: Written informed consent was obtained from all participants prior to inclusion in the study.

Acknowledgment: The authors acknowledge the support of the Department of Orthopedics and all participants who contributed to this study.

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