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Original article

Prevalence and associated factors of chronic ankle instability among athletes in the Sri Lanka Army Sports Development Village

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ABSTRACT

Background & Aim: Chronic Ankle Instability (CAI) is a common complication following lateral ankle sprains, causing persistent symptoms, functional limitations, and reduced athletic performance. Research on CAI among Sri Lankan athletes remains limited. This study aimed to determine CAI prevalence among Sri Lanka Army Sports Development Village (ASDV) athletes, identify associated intrinsic, extrinsic, and functional factors, and compare CAI prevalence across sport categories by contact type, playing environment, participation mode, and combat classification.

Methods: A cross-sectional analytical study was conducted among 344 from 389 ASDV athletes. Data collection included an interviewer-administered questionnaire, Foot and Ankle Ability Measure (FAAM)-Sports subscale, and musculoskeletal assessments covering pain (Visual Analogue Scale), ankle range of motion (ROM-goniometer), muscle power (manual muscle testing), proprioception (joint position sense error), static balance (Balance Error Scoring System), and dynamic balance (Y-Balance). CAI was identified using the Identification of Functional Ankle Instability (IdFAI) questionnaire, with a cut-off score of ≥11. Categorical variables were analysed using chi-square tests, and continuous variables by Mann-Whitney U tests, logistic regression to identify independent predictors of CAI, with significance set at $p<0.05$.

Results: CAI prevalence was 24.4% (84/344). It was more common in contact and team sports, while athletes in both team and individual sports showed lower prevalence. No significant differences were found across playing environments or combat classifications. Previous ankle sprain was strongly associated with CAI. CAI-positive athletes demonstrated higher pain levels, lower FAAM-Sports scores, reduced ankle AROM, greater proprioceptive error, increased balance errors, and greater Y-Balance anterior reach asymmetry.

Conclusions & Recommendations: Approximately one in four Army athletes had CAI. Key associated factors included contact and team sports, prior sprain history, and significant functional deficits such as higher pain, impaired proprioception, poor static and dynamic balance. These findings highlight urgent need for routine CAI screening and targeted sensorimotor rehabilitation.

Keywords: *chronic ankle instability, army athletes, ankle sprain*

Introduction

Ankle sprain is one of the most common musculoskeletal injuries encountered in sports, accounting for a substantial proportion of time loss injuries among athletes (1-3). The lateral ankle complex is most frequently involved, with inversion mechanisms responsible for the majority of injuries (4-6). Although many individuals return to training and competition within a relatively short period following an ankle sprain, a considerable number, estimated between 40% and 70%, continue to experience persistent symptoms such as pain, recurrent swelling, repeated episodes of the ankle "giving way," and reduced confidence during sporting activities (5,7).

When these symptoms persist beyond 12 months following the initial sprain, the condition is commonly referred to as chronic ankle instability (CAI) (8,9). CAI is recognized as a multifactorial condition encompassing mechanical and functional components (10). Mechanical instability arises from structural changes such as ligamentous laxity and altered arthrokinematics following repeated sprains, whereas functional instability is characterized by deficits in proprioception, neuromuscular control, postural stability, and muscular strength (8,10-12).

Several intrinsic factors have been identified as contributors to the development of CAI. These include reduced ankle joint range of motion, impaired proprioception and joint position sense, deficits in static and dynamic postural control, decreased muscle strength particularly of the peroneal muscles, and a prior history of ankle sprain (10,13,14). Extrinsic factors associated with CAI include sport type, training surface, training load, level of competition, footwear characteristics, and the use or non-use of protective equipment such as ankle taping or bracing (13-16). The interplay between these intrinsic and extrinsic factors contributes to the complexity of CAI and highlights the need for comprehensive assessment in athletic populations.

In elite athletic populations, the consequences of CAI extend beyond individual health outcomes. Persistent ankle instability can interfere with training continuity, limit competition readiness, and impose additional demands on sports medicine and rehabilitation services (17,18). Furthermore, unresolved CAI may contribute to reduced sports participation, diminished athletic performance, and the development of early degenerative changes in the ankle joint (18,19). Military sports environments are particularly demanding, as athletes are often required to balance high-intensity sports training with military duties. These dual demands may increase exposure to injury risk and reduce opportunities for adequate recovery and rehabilitation following acute injuries (16,20).

Reported prevalence rates of CAI vary considerably across athletic populations, ranging from approximately 20% to over 50% depending on the sport type, diagnostic criteria, and population studied (7,21). Among collegiate athletes, Koshino et al. reported a CAI prevalence of 26.5% in Japanese collegiate athletes (22), while Donovan et al. reported a prevalence of 23.4% among adolescent athletes in the United States (23). In high-demand military and combat-sport populations, the burden of CAI is expected to be similarly significant given the intensive physical demands, exposure to contact, and limited recovery opportunities inherent to these environments (16,20). Despite this, published evidence specifically describing the prevalence of CAI among military athletes in South Asian contexts remains limited.

The diagnosis and classification of CAI in research settings have been guided by the International Ankle Consortium (IAC), which recommends the use of validated patient-reported outcome measures to identify individuals with CAI (9). The IAC criteria specify that individuals are classified as having persistent symptoms, including episodes of giving way or perceived instability, and functional limitations during physical activity (8,9). In this study, CAI was identified using the Identification of Functional Ankle Instability (IdFAI) questionnaire with a cut-off score of ≥11, a tool that has demonstrated strong reliability and validity in athletic populations and is consistent with IAC recommendations (24,25). Understanding the magnitude of CAI and identifying factors associated with its presence are essential for informing targeted screening, injury prevention, and rehabilitation strategies (7). Differences in sport type, training exposure, and injury management practices limit the generalizability of existing findings to the Sri Lankan military sports context, and there is a need to examine not only the prevalence of CAI but also its impact on pain, sports-specific function, balance, and proprioception using both subjective and objective outcome measures (26,27).

Therefore, this study aimed to determine the prevalence of chronic ankle instability among athletes residing in the Sri Lanka Army Sports Development Village, to examine associations between CAI and selected demographic, training-related, injury-related, equipment-related, and sport-specific factors, and to compare pain and functional outcomes between athletes with and without CAI. The findings are expected to provide evidence to support the development of context-specific strategies for the management and prevention of ankle instability within the Sri Lanka Army sports system.

The objectives of this study were to determine the prevalence of chronic ankle instability among athletes residing in the Sri Lanka Army Sports Development Village, to examine the association between chronic ankle instability and selected demographic factors, training characteristics, injury history, equipment-related factors, and sport-specific classifications, and to compare pain intensity, sports-specific functional ability, ankle joint mobility, proprioception, static balance, and dynamic balance between athletes with and without chronic ankle instability.

Methods

This is an observational cross-sectional analytical study, and the research was conducted among athletes residing in the Sri Lanka Army Sports Development Village, a residential high performance training facility for elite Army athletes. All physical assessments and measurements were carried out at the Sri Lanka Army Sports Medicine Wing, Panagoda. Ethical approval for the study was obtained from the Ethical Review Committee of the Faculty of Allied Health Sciences, University of Peradeniya (AHS/ERC/2023/135), and administrative permission was granted by the Commandant of the Sri Lanka Army Sports Development Village. Written informed consent was obtained from all participants prior to data collection.

Sample selection

Data were collected from December 2024 to February 2025. All 389 athletes residing at the ASDV during this period were invited to participate. Inclusion criteria were being an active member of a Sri Lanka Army sports pool, residence at the Sports Development Village for a minimum of one year, and willingness to participate. Athletes were excluded if they had an acute ankle injury at the time of assessment, a history of ankle fracture or surgery, neurological disorders, or other musculoskeletal conditions that could confound ankle assessment. Eleven athletes declined and 34 were excluded based on eligibility criteria, resulting in a final sample of 344 athletes. Based on a previously reported CAI prevalence of 23% (23), with a 95% confidence level and 5% margin of error, the minimum required sample size was calculated as 272, which was exceeded by the final sample.

CAI Diagnosis

A case of CAI was identified using the Identification of Functional Ankle Instability (IdFAI) questionnaire, a validated nine-item self-report tool (24). Athletes scoring ≥11 on the IdFAI were classified as CAI-positive. History of ankle sprain was recorded separately as an injury related variable and examined as a potential associated factor. This approach was adopted because the IdFAI captures functional instability symptoms directly, and a subset of athletes in this cohort met the IdFAI cut-off score without reporting a prior ankle sprain. The use of the IdFAI score as the sole classification criterion is consistent with its validated purpose as a patient-reported outcome measure for identifying functional ankle instability (9,24).

Study variables and data collection

Demographic and anthropometric variables collected included age, sex, height, weight, body mass index category, and limb dominance. These data were obtained using an interviewer-administered questionnaire and standardized measurement procedures.

Training-related variables included the number of training hours per week, number of rest days per week, and level of competition. Injury-related variables included history of ankle sprain, number of previous sprains, side of the sprained ankle, and whether the injury occurred during training or competition (5,13). Equipment-related and external factors such as use of ankle taping or bracing, footwear characteristics, training surface, and perceived external contributors to ankle injury were also recorded (16,28).

Sport type was operationalized by categorizing each sport according to predefined dimensions based on its inherent characteristics. These included contact type (contact versus non-contact), playing environment (indoor, outdoor, or indoor/outdoor), mode of participation (team, individual, or both), and combat status (combat versus non-combat sports) (16,29).

Functional associations of chronic ankle instability were assessed using a combination of subjective and objective outcome measures. Pain intensity was measured using the Visual Analogue Scale (VAS), a validated and widely used instrument for quantifying pain in musculoskeletal conditions, with scores ranging from 0 (no pain) to 10 (worst imaginable pain) (30-32). Sports-specific functional ability was assessed using the Foot and Ankle Ability Measure Sports (FAAM-Sports) subscale, a validated self-report measure of physical function specific to sports-related activities in individuals with foot and ankle conditions (33). Higher scores on the FAAM-Sports subscale indicate better functional ability.

Ankle joint active range of motion (AROM) and passive range of motion (PROM) were measured using a standard goniometer, following standardized protocols for plantarflexion, dorsiflexion, inversion, and eversion (34). Goniometric measurement of ankle range of motion has been reported to have acceptable intra-rater and inter-rater reliability in clinical and research settings (34). Muscle strength was assessed using the Manual Muscle Test (MMT) scale, graded from 0 to 5, which provides a standardized method for evaluating the strength of major muscle groups surrounding the ankle joint (35,36).

Proprioception was assessed using joint position sense (JPS) testing, with absolute angular error recorded in degrees (37). Joint position sense error has been widely used as an indicator of proprioceptive deficit in individuals with CAI and has demonstrated sensitivity to sensorimotor impairments associated with lateral ankle sprain (26,37). A greater absolute error value indicates poorer proprioceptive accuracy.

Static balance was evaluated using the Balance Error Scoring System (BESS), a clinically validated tool that quantifies postural stability errors during single-leg and double-leg stance conditions on firm and foam surfaces (27). The BESS has demonstrated acceptable reliability and has been used extensively in both clinical and sports medicine research settings to assess static postural control (27). A higher error score on the BESS indicates poorer static balance performance.

Dynamic balance was assessed using the Y-Balance Test (YBT), which measures maximum reach distances in the anterior, posteromedial, and posterolateral directions during single-leg stance (27,38). The YBT provides a composite score expressed as a percentage of limb length, and anterior reach asymmetry between limbs was calculated to identify dynamic postural control deficits (27,38). The Y-Balance Test is a reliable and valid measure of dynamic postural control in athletic populations and has demonstrated the ability to identify individuals at increased risk of lower limb injury (27,38).

Statistical analysis

Descriptive statistics summarized participant characteristics and CAI prevalence. Normality was assessed using the Kolmogorov-Smirnov test. Chi-square tests examined associations between CAI and categorical variables. Mann-Whitney U tests compared continuous outcomes between CAI-positive and CAI-negative groups due to non-normal data distribution. Bivariate logistic regression was performed to examine individual functional predictors of CAI, with odds ratios and 95% confidence intervals reported. Statistical significance was set at $p < 0.05$, and all analyses were performed using IBM SPSS Statistics, Version 29.

Results

Among the 344 athletes included in the analysis, 84 athletes were classified as having chronic ankle instability, resulting in an overall prevalence of 24.4%. The remaining 260 athletes were classified as CAI-negative.

Table 1. CAI prevalence and sport type classification (N=344)

Category		**Total (n)**	**CAI – No. (%)**	**CAI + No. (%)**	***p* value**
Overall		344	260 (75.6)	84 (24.4)	
Contact type	Contact sports	231	166 (71.9)	65 (28.1)	0.031
	Non-contact sports	113	94 (83.2)	19 (16.8)	
Mode of participation	Team sports	140	97 (69.3)	43 (30.7)	0.034
	Individual sports	146	105 (71.9)	41 (28.1)	
	Team & individual sports	58	53 (91.4)	5 (8.6)	0.001
Playing Environment	Indoor	101	74 (73.3)	27 (26.7)	>0.05
	Outdoor	181	132 (72.9)	49 (27.1)	
	Indoor/Outdoor	62	50 (80.6)	12 (19.4)	
Combat Classification	Combat sports	94	70 (74.5)	24 (25.5)	>0.05
	Non-combat sports	250	191 (76.4)	59 (23.6)	

CAI: chronic ankle instability

Data are presented as frequency (n) and percentages (%)

Table 2. Factors associated with CAI Status (N=344)

Variable	Category	CAI – (n=260)	CAI + (n=84)	*p* value
Age (years) [a]		23.0 (3.2)	23.3 (3.0)	0.682
Gender [b]	Male	187 (71.9%)	57 (67.9%)	0.476
	Female	73 (28.1%)	27 (32.1%)	
BMI category [b]	Underweight	23 (8.9%)	14 (16.7%)	0.191
	Normal	120 (46.2%)	38 (45.2%)	
	Overweight	79 (30.4%)	24 (28.6%)	
	Obese	37 (14.2%)	8 (9.5%)	
Rest days/week [b]	1 day	82 (31.5%)	19 (22.6%)	0.119
	2 days	178 (68.5%)	65 (77.4%)	
Training hours/week [c]		24 (22–26)	24 (22–26)	0.231
Level of competition [b]	Club/District	78 (30.1%)	32 (38.1%)	0.303
	Provincial/ Inter Service/ National	181 (69.9%)	52 (61.9%)	
Ankle sprain history [b]	Yes	90 (34.6%)	50 (59.5%)	<0.001
	No	170 (65.4%)	34 (40.5%)	
Sprained ankle side [b,1] **(n=137)**	Left	34 (38.6%)	15 (30.6%)	0.050
	Right	54 (61.4%)	31 (63.3%)	
	Bilateral	0	3 (6.1%)	
Occurred during training [b]	Yes	83 (31.9%)	37 (44.0%)	<0.001
	No	170 (65.4%)	34 (40.5%)	
Protective equipment [b]	None	203 (78.4%)	36 (42.9%)	<0.001
	Taping	53 (20.5%)	48 (57.1%)	
	Ankle guards	3 (1.2%)	0	
External factors for Ankle Sprain /CAI [b]	Nothing	173(66.5%)	35 (41.7%)	0.001
	Coaching method	24 (9.2%)	20 (23.8%)	
	Floor condition	34 (13.1%)	15 (17.9%)	
Lower limb malalignment [b]	Yes (any type)	23 (8.8%)	12 (14.3%)	0.246
	No	237(91.2%)	72(85.7%)	
Footwear [b]	Sport shoes	126(48.5%)	43 (51.2%)	0.675
	Barefoot	1 (0.4%)	0 (0.0%)	
	Sport shoes / Barefoot	126(48.5%)	37 (44.0%)	
	Sport shoes / Boots	7 (2.7%)	4 (4.8%)	
Sports/training surface [b]	Soft	94 (36.2%)	33 (39.3%)	0.171
	Moderate	87 (33.5%)	28 (33.3%)	
	Soft / Moderate	30 (11.5%)	3 (3.6%)	
	Moderate / Hard	24 (9.2%)	7 (8.3%)	
	Hard	25 (9.6%)	13 (15.5%)	
Sprain ankle dominance [b,2] **(n=137)**	Dominant	54 (63.5%)	31 (63.3%)	0.826
	Non-dominant	34 (36.5%)	18 (36.7%)	

CAI: chronic ankle instability, BMI: body mass index,

[a] *Data are presented as mean and standard deviation (SD),* [b] *Data are presented as frequency (n) and percentages (%),* [c]*Data are presented as median and interquartile range (IQR)*

[1] *Denominator restricted to athletes who reported a history of ankle sprain only (n=137: 88 CAI−, 49 CAI+). Percentages for sprained ankle side and sprain ankle dominance variables were calculated within each respective CAI subgroup*

[2] *Denominator restricted to athletes who reported a history of ankle sprain only (n=137: 88 CAI−, 49 CAI+). Percentages for sprained ankle side and sprain ankle dominance variables were calculated within each respective CAI subgroup*

When individual sports were analysed, the prevalence of CAI varied across sports disciplines; however, no statistically significant association was observed between specific sport type and CAI status. When sports were grouped into broader categories, significant associations emerged. Athletes participating in contact sports demonstrated a higher prevalence of CAI compared to those involved in non-contact sports. Similarly, athletes participating in team sports exhibited a higher prevalence of CAI compared to those engaged exclusively in individual sports. Athletes who participated in both team and individual sports demonstrated the lowest prevalence of CAI. No significant association was observed between CAI status and playing environment or combat versus non-combat sport classification.

Table 3. Functional outcomes associated with CAI Status, Mann-Whitney U test results (N=344)

Outcome Variable	CAI− (n=260) Median (IQR)	CAI+ (n=84) Median (IQR)	U	Z	p value
IdFAI Score	7.00 (5.00–9.00)	12.00 (11.00–15.00)	0.000	−13.85	<0.001
FAAM Sports (%)	93.80 (90.60–96.90)	89.05 (84.40–93.80)	3272.00	−9.83	<0.001
VAS Pain Score	0.00 (0.00–0.00)	2.00 (1.00–2.00)	3140.00	−11.42	<0.001
AROM Plantarflexion L (°)	50.00 (50.00–50.00)	50.00 (48.00–50.00)	8758.50	−4.10	<0.001
AROM Plantarflexion R (°)	50.00 (50.00–50.00)	50.00 (47.00–50.00)	7633.00	−5.72	<0.001
AROM Dorsiflexion L (°)	20.00 (20.00–20.00)	20.00 (18.00–20.00)	9261.00	−3.13	0.002
AROM Dorsiflexion R (°)	20.00 (20.00–20.00)	20.00 (18.00–20.00)	8972.50	−3.44	<0.001
AROM Inversion L (°)	35.00 (35.00–35.00)	35.00 (34.00–35.00)	9507.00	−2.76	0.006
AROM Inversion R (°)	35.00 (35.00–35.00)	35.00 (33.00–35.00)	8085.00	−4.84	<0.001
AROM Eversion L (°)	15.00 (15.00–15.00)	15.00 (15.00–15.00)	9661.50	−2.66	0.008
AROM Eversion R (°)	15.00 (15.00–15.00)	15.00 (12.00–15.00)	8335.00	−4.39	<0.001
IdFAI Score	7.00 (5.00–9.00)	12.00 (11.00–15.00)	0.000	−13.85	<0.001
FAAM Sports (%)	93.80 (90.60–96.90)	89.05 (84.40–93.80)	3272.00	−9.83	<0.001
PROM All planes	-	-	-	0.00	1.000
MMT All muscle groups	-	-	-	0.00	1.000
Proprioception Error (°)	1.50 (0.50–2.50)	3.50 (2.50–4.50)	7434.00	−9.44	<0.001
BESS Errors Left Foot (n)	5.00 (4.00–7.00)	7.00 (6.00–9.00)	3489.00	−6.94	<0.001
BESS Errors Right Foot (n)	4.00 (2.00–6.00)	10.00 (8.00–12.00)	1922.50	−11.40	<0.001
YBT Anterior Reach Diff (cm)	2.90 (1.27–3.90)	3.90 (3.18–4.83)	6108.50	−6.07	<0.001
YBT Composite Score Diff (%)	4.20 (2.40–4.90)	4.80 (4.07–5.40)	8114.00	−3.54	<0.001

CAI: chronic ankle instability, IdFAI: identification of functional ankle instability, FAAM: foot and ankle ability measure, VAS: visual analogue scale, AROM: active range of motion, PROM: passive range of motion, MMT: manual muscle test, BESS: balance error scoring system, YBT: Y-Balance test, IQR: interquartile range, L: left, R: right

Table 4. Crude odds ratios (OR) for functional predictors of CAI: Bivariate logistic regression (N=344)

Predictor	Crude OR	95% CI	p value
VAS pain score	3.26	2.48–4.29	<0.001
Proprioception error (°)	3.44	2.53–4.67	<0.001
BESS errors - Right foot	2.01	1.68–2.39	<0.001
YBT anterior reach difference (cm)	1.81	1.43–2.28	<0.001

CAI: chronic ankle instability, VAS: visual analogue scale, BESS: balance error scoring system, YBT: Y-Balance test, CI: confidence interval

Results represent crude (unadjusted) odds ratios from individual bivariate logistic regression analyses. Each predictor was examined separately without adjustment for other covariates.

There was no statistically significant difference in age between athletes with and without CAI. Sex distribution, height, weight, and body mass index category were also not significantly associated with CAI status. Limb dominance did not differ significantly between groups.

A previous history of ankle sprain was significantly more common among athletes with CAI compared to CAI-negative athletes. Athletes with CAI were more likely to report recurrent ankle sprains and persistent symptoms following the initial injury. The side of ankle sprain and whether the injury occurred during training or competition did not show a significant association with CAI status.

With respect to equipment-related factors, the use of ankle taping was significantly more common among CAI-positive athletes. In contrast, athletes without CAI more frequently reported not using any form of ankle support. Differences were also observed in reported external contributing factors to ankle injury, including training surface and coaching-related factors.

Athletes with CAI reported significantly higher pain intensity on the Visual Analogue Scale compared to athletes without CAI. Sport's specific functional ability, as measured by the Foot and Ankle Ability Measure Sports subscale, was significantly lower among CAI positive athletes.

Objective assessments revealed that athletes with CAI demonstrated reduced ankle joint range of motion, particularly in plantarflexion and dorsiflexion. Proprioceptive accuracy was significantly impaired in the CAI-positive group, as evidenced by greater joint position sense error.

Static balance performance was poorer among athletes with CAI, with higher error scores recorded on the Balance Error Scoring System. Dynamic balance assessment using the Y-Balance Test demonstrated greater reach asymmetry and reduced composite scores among CAI-positive athletes, indicating impaired dynamic postural control.

Bivariate logistic regression identified selected functional and balance-related variables as significantly associated with the presence of chronic ankle instability, highlighting the importance of sensorimotor and balance impairments in this population.

Discussion

This study found that 24.4% of elite Sri Lanka Army athletes met the criteria for chronic ankle instability, indicating that approximately one in four athletes residing at the ASDV was affected. This prevalence is consistent with figures reported in comparable athletic populations. Koshino et al. reported a CAI prevalence of 26.5% among Japanese collegiate athletes (22), and Donovan et al. reported 23.4% among adolescent athletes in the United States (23).

In broader athletic and military-relevant populations, prevalence estimates have ranged from approximately 20% to over 50% depending on diagnostic criteria and population characteristics (7,21). The finding of the present study falls within this range and suggests that CAI is a similarly common condition among elite military athletes in Sri Lanka.

The case definition applied in this study was based solely on the IdFAI questionnaire with a cut-off score of ≥11, consistent with its validated purpose as a patient-reported outcome measure for identifying functional ankle instability (8,9,24). History of ankle sprain was recorded as a separate injury-related variable and examined as an associated factor rather than a classification criterion. This approach reflects the clinical reality that functional ankle instability may develop or be perceived in the absence of a recalled discrete sprain event.

A statistically significant association was observed between contact sport participation and CAI prevalence. Athletes in contact sports had a higher proportion of CAI compared to those in non-contact sports. This association is consistent with previous reports indicating that contact and collision sports are associated with greater ankle sprain incidence and subsequent instability (1,2,5,15). However, given the cross-sectional design of this study, it is not possible to determine whether contact sport participation contributed to the development of CAI, or whether athletes with existing CAI continued to participate in contact sports. Similarly, a higher proportion of CAI was observed among team sport athletes compared to those participating exclusively in individual sports. This pattern has been reported in previous studies and may be related to the reactive, multidirectional movement demands of team sports (4,39). Causal relationships cannot be inferred from these findings.

A significant association was found between a previous history of ankle sprain and CAI status. Athletes with CAI were more likely to report prior ankle sprains compared to CAI-negative athletes. This finding is consistent with the established literature, in which prior ankle sprain is consistently identified as one of the strongest risk factors associated with CAI across multiple populations (5,7,10,13). The cross-sectional nature of this study precludes conclusions about whether prior sprain preceded or resulted from CAI, and longitudinal research is needed to clarify this relationship.

Athletes classified as CAI-positive demonstrated significantly higher pain intensity and lower sports-specific functional scores compared to CAI-negative athletes, as measured by the VAS and FAAM-Sports subscale respectively. These findings are consistent with previous research demonstrating that individuals with CAI report greater pain and reduced functional ability compared to unaffected peers (17,18,30,33). CAI-positive athletes also demonstrated reduced ankle active range of motion across all planes bilaterally. Similar ROM deficits have been reported in previous studies of CAI and may be associated with soft tissue changes, altered movement strategies, or neuromuscular adaptations following recurrent ankle injury (26,34). As this was a cross-sectional assessment, the directionality of these associations cannot be established.

Significantly greater proprioceptive error was observed among CAI-positive athletes, consistent with previous evidence that lateral ankle ligament injury impairs mechanoreceptor function and joint position sense (26,37). Poorer static balance, as measured by the BESS, and greater anterior reach asymmetry on the YBT were also observed among CAI-positive athletes. These findings align with previous studies reporting impaired postural control and dynamic balance in individuals with CAI (27,38). Bivariate logistic regression identified VAS pain score, proprioceptive error, BESS errors on the right foot, and YBT anterior reach difference as factors significantly associated with CAI. These associations highlight the importance of sensorimotor and balance assessment in identifying athletes with CAI, although the cross-sectional design does not permit causal conclusions.

The greater use of ankle taping among CAI-positive athletes is consistent with previous reports and likely reflects a reactive management strategy in response to perceived instability rather than a preventive measure (11,28). While external ankle supports may provide short-term symptomatic relief, previous evidence suggests that they do not fully address the underlying neuromuscular and proprioceptive deficits associated with CAI (11,28).

This study has several limitations. The cross-sectional design limits causal interpretation of all observed associations. The use of a single trained assessor, while improving consistency, limits generalizability. Manual muscle testing may lack sensitivity to detect subtle neuromuscular deficits associated with CAI, as all participants demonstrated normal MMT scores. Future longitudinal research in military athletic populations is recommended to clarify the temporal relationships between identified risk factors and CAI development.

Conclusions

This cross-sectional study found that chronic ankle instability was present in approximately one in four elite Sri Lanka Army athletes, with a prevalence of 24.4%. CAI was associated with participation in contact and team sports, a previous history of ankle sprain, and the use of ankle taping. CAI-positive athletes demonstrated significantly greater pain intensity, reduced sports-specific functional ability, restricted ankle active range of motion, impaired proprioception, and poorer static and dynamic balance compared to CAI-negative athletes. However, given the cross-sectional design, causal relationships between these factors and CAI cannot be established.

These findings suggest that routine screening for CAI within military sports environments may be warranted, and that assessment protocols incorporating pain, proprioception, and balance measures could assist in identifying affected athletes. Targeted rehabilitation programmes addressing sensorimotor control, balance, and ankle mobility may be beneficial for athletes identified with CAI, although longitudinal evidence is needed to confirm the effectiveness of such approaches in this population.

Further prospective research is recommended to examine the temporal relationships between identified associated factors and the development of CAI among military athletes in Sri Lanka and similar contexts.

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Author Declarations

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Author contributions: WKPS Bandara contributed to the conception and designed the study, collected data, performed statistical analysis, interpreted findings, and prepare the manuscript. VM Pathiraja supervised the study, critically revised the manuscript, and provided final approval. Both authors approved the final version and agree to be accountable for all aspects of the work.

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