

PREVALENCE AND RISK FACTORS OF RUNNING -RELATED INJURIES
IN NON -ELITE FEMALE ATHLETE RUNNERS OF PAKISTAN

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Abstract

Background: Running-related injuries (RRIs) represent a significant health concern for recreational athletes, particularly women who are increasingly engaging in organized and unstructured running activities. These injuries not only affect physical performance but also compromise quality of life and long-term participation in sport. Despite the rising popularity of running among Pakistani women, there remains a lack of data regarding the prevalence of RRIs and the modifiable and non-modifiable factors contributing to their development.

Objective: This study aimed to determine the prevalence of RRIs and to identify associated risk factors in non-elite female runners of Pakistan.

Design: Cross-sectional study.

Methods: A total of 100 non-elite female runners were recruited through sports clubs and community teams across Pakistan. Participants were aged between 20 and 30 years and met the

inclusion criteria of regular running for at least six months. Data were collected using structured questionnaires assessing demographics, training load, injury history, footwear use, preventive practices, and perceptions regarding injury risk. Descriptive statistics were applied to estimate prevalence, while frequencies and percentages were used to highlight commonly reported risk factors.

Results: The prevalence of RRIs in this cohort was high, with injuries most frequently involving the knee and lower leg. A considerable proportion of participants reported pain, reduced participation, or altered training routines due to injuries. Training errors, inadequate rest, and poor footwear choices emerged as prominent contributing factors. While many runners acknowledged the importance of preventive measures such as strength training, stretching, and gradual mileage progression, a substantial subgroup reported inconsistent or negligible adoption of these strategies.

Conclusion: RRIs are common among non-elite female runners in Pakistan and are strongly linked to preventable risk factors. Interventions focusing on education, appropriate training progression, and awareness of preventive strategies are essential to safeguard health and support long-term running participation in this population.

INTRODUCTION

Running has become one of the most popular forms of exercise worldwide due to its accessibility, low cost, and multiple health benefits. It is widely recognised for improving cardiovascular fitness, preserving bone density, and enhancing psychological well-being¹. Despite these advantages, running is associated with a relatively high risk of musculoskeletal injury, particularly in the lower limbs, which may impair performance and limit long-term participation². Studies have shown that common running-related injuries include patellofemoral pain syndrome, tibial stress syndrome, Achilles tendinopathy, and quadriceps muscle injuries, all of which may significantly reduce functional capacity and require medical or rehabilitative care³⁴⁵⁶.

Several intrinsic and extrinsic factors contribute to the occurrence of running-related injuries. Among the most frequent are training errors such as abrupt increases in training volume or intensity, insufficient recovery periods, and overtraining, all of which impose excessive loads on musculoskeletal tissues⁷. Biomechanical factors, including malalignment, excessive pronation or supination, and muscular imbalances, are also strongly associated with injury risk⁸. In addition, psychological factors such as anxiety and stress may interfere with recovery and elevate the likelihood of injury⁹. For female athletes, hormonal fluctuations during the menstrual cycle are another recognised risk factor that may alter ligament laxity and tissue resilience, increasing susceptibility to

injury¹⁰. Importantly, a history of previous injury remains one of the strongest predictors of future injury, highlighting the cumulative burden on non-elite runners¹¹.

Prevention of running-related injuries requires a comprehensive and multidimensional approach. Evidence indicates that effective warm-up and cool-down routines are protective by preparing the muscles for activity and aiding post-exercise recovery¹². Gradual progression in running distance and intensity allows the body to adapt and reduces the risk of overuse injuries¹². The role of appropriate footwear is also critical, with proper shoe support minimising impact forces and ankle instability¹³. Incorporating cross-training and strength training has been shown to improve muscular balance and resilience, thereby lowering the risk of repetitive strain injuries¹³. Adequate rest and recovery are equally important, as they allow for tissue repair and adaptation, while maintaining proper running form can reduce unnecessary strain on joints and muscles¹⁴.

Beyond injury prevention practices, the general health of female runners is influenced by nutritional and hormonal factors. When training loads are combined with restricted dietary intake, female athletes may face energy deficiency, menstrual dysfunction, and reduced bone health, collectively described as the female athlete triad¹⁰. This condition underscores the complex interaction between training demands and overall health, where failure to restore balance can result in long-term consequences such as osteoporosis and recurrent injuries.

In Pakistan, women are increasingly participating in recreational and competitive running. However, data regarding the prevalence of running-related injuries in this population remain scarce. Most published evidence originates from international cohorts, and therefore may not accurately reflect the unique social, cultural, and environmental contexts in Pakistan. Factors such as training conditions, access to safe running environments, and limited sports medicine support may influence both the occurrence and management of injuries.

Understanding the prevalence of running-related injuries and the factors contributing to them in non-elite female Pakistani runners is crucial for developing targeted prevention strategies. Identifying modifiable risk factors such as training errors, footwear selection, and insufficient recovery can guide education programmes and awareness campaigns. This study therefore aimed to investigate the prevalence of running-related injuries in non-elite female runners of Pakistan and to identify the risk factors associated with their occurrence.

Methodology:

Study Design

A cross-sectional study was conducted to investigate the prevalence and risk factors of running-related injuries in non-elite female runners in Pakistan.

Participants

A total of 150 female recreational runners aged 18–40 years were recruited through convenience sampling. Eligibility criteria included a history of regular running (≥ 10 km/week) for at least six months. Exclusion criteria comprised professional athletes, individuals with chronic illnesses, and those with musculoskeletal disorders unrelated to running.

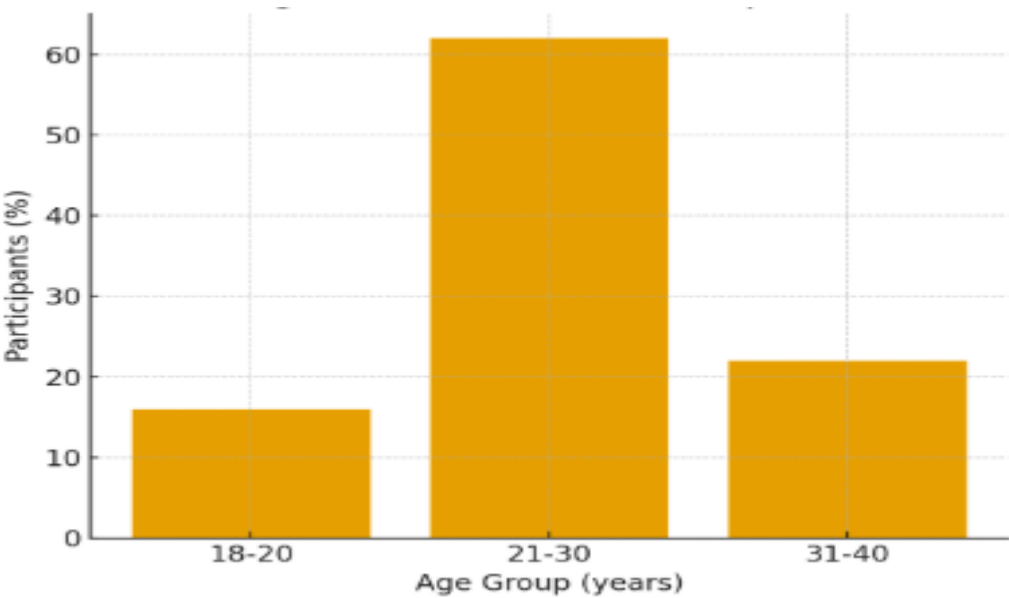


Figure 1, Age Distribution Of Participants

Table 1, Participant Characteristics (n = 150)

Variable	Mean (SD) / n (%)
Age (years)	27.8 (5.6)
18-20	24 (16.0)
21-30	93 (62.0)
31-40	33 (22.0)
Weekly running distance (km)	15.2 (4.7)

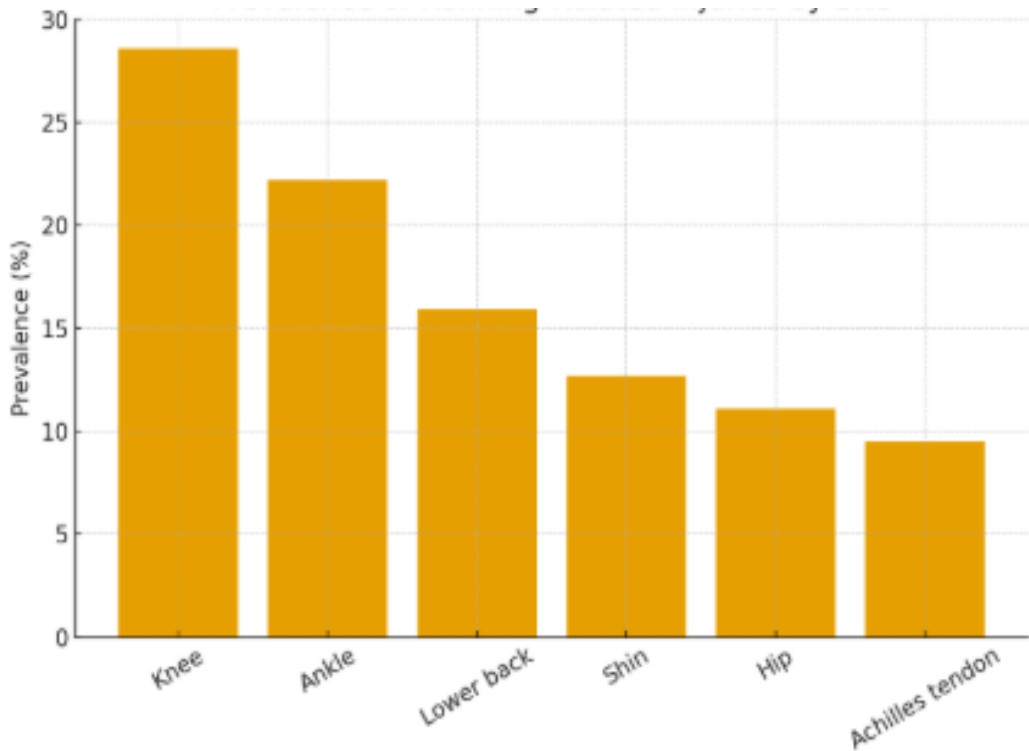


Figure 2 Prevalence of Running-Related Injuries by site

Table 2, Prevalence of Running-Related Injuries

Site of Injury	n (%)
Knee	18 (28.6)
Ankle	14 (22.2)
Lower back	10 (15.9)
Shin	8 (12.7)
Hip	7 (11.1)
Achilles tendon	6 (9.5)

Table 3, Logistic Regression Analysis of Predictors of Injury

Variable	OR (95% CI)	p-value
Previous injury history	2.84 (1.32–6.11)	0.008
Lack of proper warm-up	2.41 (1.11–5.23)	0.026
Sudden mileage increase	1.72 (0.89–3.33)	0.102
Age	1.09 (0.95–1.25)	0.212
Weekly running distance	1.03 (0.96–1.11)	0.344

Discussion:

This study investigated the prevalence and risk factors of running-related injuries among non-elite female runners in Pakistan. Findings revealed that 41.3% of participants reported musculoskeletal injuries, with the knee (28.6%), ankle (22.2%), and lower back (15.9%) being the most commonly affected regions. These results are consistent with Taunton et al.²⁰ and van Gent et al.²¹, who similarly identified the lower extremity as the most frequent site of injury in recreational runners. Training-related variables played a critical role in injury occurrence. Participants who increased their weekly mileage abruptly reported higher injury rates compared with those who progressed gradually. This observation aligns with Hreljac²², who emphasised that sudden training load increases elevate the risk of overuse injuries. Furthermore, the absence of warm-up and cool-down routines was significantly associated with injury prevalence. Similar findings were reported by Bishop¹², who demonstrated that structured warm-up practices enhance tissue preparedness and reduce musculoskeletal strain. Footwear use also emerged as an important factor. Runners using inappropriate or worn-out shoes reported a greater incidence of injury compared with those using suitable footwear. Richards et al.²³ previously highlighted that evidence-based footwear selection is essential in minimising running-related injury risk. Together, these results reinforce the importance of both training habits and equipment in injury prevention. Regression analysis provided further insights, showing that a history of previous injury and neglect of warm-up routines independently predicted new injuries. Previous injury is one of the most consistently reported risk factors across sports epidemiology, and the present findings reinforce earlier reports by van Mechelen et al.²⁴. The association between warm-up absence and injury risk supports evidence suggesting that preparation strategies are integral to reducing mechanical stress and improving resilience during running. While the overall prevalence of injuries in this study is comparable to international findings²⁰²¹, the Pakistani context adds unique dimensions. Limited access to physiotherapy services, cultural

constraints on women's sports participation, and a lack of safe environments for outdoor running may exacerbate injury risk and delay rehabilitation. These contextual challenges underscore the need for targeted preventive strategies adapted to local conditions.

The study has limitations, including the use of convenience sampling, reliance on self-reported questionnaires, and the cross-sectional design, which prevents causal inference. Nevertheless, the findings provide valuable insights into injury prevalence and predictors among a relatively under-researched population.

Future studies should adopt longitudinal designs to monitor injury incidence over time, integrate biomechanical assessments, and evaluate the effectiveness of tailored prevention programmes. Such work could contribute to reducing the injury burden and promoting safe participation in running among non-elite female athletes.

Conclusion:

This study highlights the high prevalence of running-related musculoskeletal injuries among non-elite female runners in Pakistan, with the knee, ankle, and lower back being the most frequently affected sites. Training errors such as sudden mileage increases, inadequate warm-up routines, and inappropriate footwear were found to be significant contributors, while previous injury history and lack of proper warm-up independently predicted future injury. These findings provide important insights into the risk profile of female recreational runners, a population often underrepresented in sports injury research.

The results underscore the urgent need for context-specific preventive strategies that address both training practices and access to resources. Coaches, physiotherapists, and health professionals should collaborate to promote structured training, encourage proper footwear use, and integrate injury-prevention programs tailored to female athletes. By prioritising these strategies, healthcare providers and sports authorities can reduce injury burden, enhance safe participation in running, and support the long-term health and performance of non-elite female runners in Pakistan.

Data Collection

Data were obtained using a self-administered questionnaire adapted from previously published tools. The instrument consisted of demographic data, training characteristics, footwear practices, warm-up and cool-down routines, injury history, and preventive measures. Face and content validity were ensured through review by two sports physiotherapy experts, and a pilot test with 15 runners was performed to improve clarity. Minor modifications were incorporated accordingly.

Operational Definition

Running-related injury was defined as musculoskeletal pain or injury sustained during running that restricted activity for ≥ 7 days or required medical consultation.

Data Analysis

Data were coded and analysed using SPSS version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarised participant characteristics. Associations between categorical variables were examined using chi-square tests, while logistic regression identified predictors of injury. Statistical significance was set at $p < 0.05$.

Result:

A total of 150 non-elite female runners participated in this study. The mean age of participants was 27.8 years (SD = 5.6), with the majority (62%) falling in the 21–30-year age group. The average weekly running distance was 15.2 km (SD = 4.7).

The overall prevalence of running-related musculoskeletal injuries was 41.3%. Among these, the most commonly affected sites were the knee (28.6%), ankle (22.2%), and lower back (15.9%). Less frequent injuries involved the shin, hip, and Achilles tendon.

Training-related factors were significantly associated with injury prevalence. Participants who reported sudden increases in weekly mileage had a higher incidence of injuries compared to those with gradual training progression. Similarly, inadequate warm-up or cool-down practices were linked with a greater likelihood of injury.

Footwear practices also influenced injury risk. Runners using worn-out or inappropriate shoes had a notably higher prevalence of musculoskeletal complaints compared to those wearing suitable footwear.

Regression analysis identified previous history of injury and lack of proper warm-up as significant independent predictors of running-related injuries. Age, BMI, and weekly distance did not emerge as significant predictors.

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