

The Prevalence of Knee Pain and Associated Risk Factors in Malaysian Long-Distance Runners

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ABSTRACT

Background: Running is one of the most popular and accessible sports worldwide. Despite its accessibility, running may increase the likelihood of musculoskeletal disorders such as knee pain. There is a paucity of evidence regarding knee pain among long-distance runners in Malaysia. Therefore, this study aimed to determine the prevalence of knee pain and its associated risk factors among long-distance runners in Malaysia. **Methods:** A cross-sectional study was conducted using the Running-related Injury (RRI), the Oslo Sports Trauma Research Centre (OSTRC) Overuse Injury, and the Kujala Anterior Knee Pain Scale (AKPS) questionnaires. The questionnaires were distributed to Malaysian runners through social media platforms using Google Forms. Data were analysed using the Chi-square test and independent t-test. **Results:** A total of 66 runners completed the study. Approximately 69.7% of runners experienced knee pain, with half-marathon runners being the most common group to report such discomfort. No significant association was observed between any potential risk factors - such as gender, body mass index (BMI), and running experience - and the occurrence of knee pain ($p > 0.05$). **Conclusion:** Although no significant association was found between gender, BMI, running experience, and knee pain, a high prevalence of knee pain was observed among long-distance runners. This suggests that knee pain among these runners may be influenced by multifactorial elements beyond the examined demographic and training variables. However, the relatively small sample size may have limited the statistical power to detect true associations. Future studies with larger, more representative samples are recommended to strengthen the evidence.

Keywords:

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INTRODUCTION

Running stands out as one of the most popular and accessible sports worldwide. It has been shown to provide significant cardiovascular and metabolic benefits (Kutac et al., 2023). Despite these advantages, running may elevate the risk of various musculoskeletal injuries, particularly knee injuries (Kakouris et al., 2021).

A previous study reported that approximately 90% of 200 recreational half-marathon runners in South Africa experienced musculoskeletal injuries, with knee injuries being the most prevalent (26%) (Ellapen et al., 2013). This finding is consistent with a systematic review that identified the knee as the most frequently injured site and the joint with the highest injury prevalence among runners (Kakouris et al., 2021). These results are likely related to the propulsion generated primarily by the lower limbs during running, which imposes increased biomechanical loads on these structures (Kakouris et al., 2021).

A growing body of literature has identified intrinsic characteristics such as gender and age, as well as extrinsic

factors such as running frequency and distance, as contributors to knee pain (Buist et al., 2010; Kakouris et al., 2021; Linton & Valentin, 2018). Runners experiencing knee pain often face a progressive loss of function and a reduction in health-related quality of life (Bindawas et al., 2015).

Although running is a popular sport among Malaysians, limited research has explored the relationship between running and knee pain in this population. Therefore, this study aims to determine the prevalence of knee pain among Malaysian long-distance runners, its associated risk factors, and its impact on their knee function.

MATERIALS AND METHODS

A cross-sectional study design was employed. Malaysian long-distance runners were recruited using convenience sampling. As there was no prior research reporting the prevalence of knee pain and its associated factors in Malaysia, the G*Power 3 software was used to calculate the sample size. Based on the G*Power analysis, with an effect size of 0.4, a sample of 70 participants would

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provide 95% power at a type 1 error of 0.05 using a t-test. The inclusion criteria were as follows: (1) Malaysian runners with at least one year of running experience, (2) aged between 19 and 70 years, (3) voluntary participation, and (4) ability to understand the English language. Runners who ran less than one kilometre (short-distance runners) were excluded.

The questionnaires were distributed to Malaysian runners via social media platforms such as Facebook and WhatsApp using Google Forms.

Participants were required to complete demographic information, including age, gender, state of residence, weight, height, and running history. Subsequently, they completed the Running-related Injury (RRI) questionnaire. The RRI questionnaire, consisting of 10 items, was used to analyse predictive factors of knee pain such as training frequency, weekly running distance, and stretching routine (Hsu et al., 2020).

Participants also completed the Oslo Sports Trauma Research Centre (OSTRC) Overuse Injury questionnaires, to monitor knee pain and assess the impact of overuse injuries on running participation and performance (Kaewkul et al., 2021). Each question was scored from 0 (no problems) to 25 (maximum difficulty). The scoring scale varied depending on the number of response options: 0–6–13–19–25 for five-choice questions and 0–8–17–25 for four-choice questions (Clarsen et al., 2013; Kaewkul et al., 2021). Total scores were then categorised as mild pain (1–25 points), moderate pain (26–50 points), and severe pain (51–75 points).

In addition, participants responded to selected items from the Kujala Anterior Knee Pain Scale (AKPS) to avoid redundancy and reduce response time. The items assessed activities such as walking, stair climbing, squatting, running, jumping, swelling, abnormal kneecap movement, and flexion deficiency (da Silva-Junior et al., 2024). The total score ranged from 0 to 65, with higher scores indicating better knee function. Scores were categorised as poor (≤ 20 points), fair (21–40 points), good (41–60 points), and excellent (≥ 61 points). Ethical approval for this study was obtained from the institutional Research Ethics Committee (ID number: KAHS 97/22).

Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 26 for macOS. Descriptive statistics were used to summarise participants' demographic characteristics, running history, and severity of knee pain in terms of frequencies and percentages. The association between knee pain and training frequency was examined using an independent t-test, while the Chi-

square test was employed to determine the association between runner categories and other potential risk factors with the occurrence of knee pain.

RESULTS

Characteristics of Participants

A total of 70 participants voluntarily took part in this survey. However, only 66 respondents met the inclusion criteria and were included in the analysis. Table 1 presents the characteristics of the participants. The study population comprised 80.3% males and 19.7% females. Participants consisted of 22 young adults (aged 19–24), 18 adults (aged 25–44), and 26 middle-aged adults (aged 45–64). Respondents from 10 out of 14 states participated in this study, with the majority from Selangor (51.5%). Among the runners, 9.0% had 4 to 10 years of running experience, while the remaining 6.0% had more than 10 years of running experience. Participants were categorised into five groups based on the type of race they had participated in, with the majority running less than 10 km (31.8%), followed by half-marathon (~21 km) runners (30.3%).

Table 1: Demographic data (n = 66)

Variable	n (%)
Gender:	
Male	53 (80.3)
Female	13 (19.7)
Age Classes:	
Young adult	22 (33.3)
Adult	18 (27.3)
Middle-aged adult	26 (39.4)
State:	
Selangor	34 (51.5)
Kedah	5 (7.6)
Perak	5 (7.6)
Negeri Sembilan	5 (7.6)
Pahang	3 (4.5)
Johor	2 (3.0)
Pulau Pinang	2 (3.0)
Terengganu	1 (1.5)
Kelantan	1 (1.5)
Wilayah Persekutuan, Putrajaya, and Kuala Lumpur	8 (12.1)
Running Experience:	
1-3 years	15 (22.7)
4-10 years	41 (62.1)
More than 10 years	10 (15.2)
Groups of Runners:	
< 10 km	21 (31.8)
10 km	6 (9.1)
Between 10 and 21 km	7 (10.6)
Half marathon (~21 km)	20 (30.3)
Marathon (~42 km)	12 (18.2)

Prevalence of Knee Pain

A total of 46 runners (69.7%) reported having experienced knee pain related to running, while the remaining 20 runners (30.3%) reported no knee pain. Among participants who ran less than 10 km, 11 runners (52.4%) experienced knee pain, while 10 runners (47.6%) did not. All 10 km runners reported knee pain, with a frequency of 6. For runners covering distances between 10 km and 21 km (less than a half-marathon distance), 5 runners (71.4%) experienced knee pain, while the remaining 2 runners (28.6%) did not. Among half-marathon runners, 16 runners (80%) reported knee pain, whereas among marathon runners, 8 runners (66.7%) experienced knee pain. In each group, the remaining participants—4 half-marathon runners (20%) and 4 marathon runners (33.3%)—did not report knee pain.

Knee Pain and its Associated Risk Factors

Based on Table 2, this study found that 73.6% of male runners developed knee pain, whereas the rate among female runners was 53.8%. The highest prevalence of knee pain was observed among middle-aged adults (80.8%), followed by young adults (63.6%) and adults (61.1%). Among overweight runners, 81.5% reported knee pain, which was higher compared to other BMI categories. Notably, all three runners classified as underweight also reported experiencing knee pain.

Runners with 4 to 10 years of running experience had the highest occurrence of knee pain (70.7%). In contrast, 60% of those with less than 3 years of experience and 80% of those with more than 10 years of experience reported knee pain.

Although stretching is commonly regarded as a preventive measure against injuries, Table 2 shows that 76.3% of runners developed knee pain despite always stretching before running. Similarly, 67.7% of runners who consistently stretched after running also reported knee pain. Among the participants, 55 runners engaged in other sports, of whom 36 (65.5%) experienced knee pain, while the rest did not. Interestingly, among the 11 runners who did not participate in other sports, 10 (90.9%) reported knee pain.

This study also found that runners with a weekly running distance of 1–10 km had a higher risk of knee pain compared to those running more than 20 km per week. Of the four runners who ran 31–40 km weekly, half experienced knee pain. Surprisingly, the one runner who trained more than 50 km per week did not report knee pain. As shown in Table 2, no statistically significant

association was found between knee pain and any of the associated factors mentioned above ($p > 0.05$).

Table 2: Associated Factors of Knee Pain

Variables	Knee Pain		Total n (%)	p-value
	Yes (%)	No (%)		
Gender				
Male	39 (73.6)	14 (26.4)	53 (100)	0.190
Female	7 (53.8)	6 (46.2)	13 (100)	
Age				
Young adult	14 (63.6)	8 (36.4)	22 (100)	0.277
Adult	11 (61.1)	7 (38.9)	18 (100)	
Middle-aged	21 (80.8)	5 (19.2)	26 (100)	
BMI				
Underweight	3 (100)	0	3 (100)	0.052
Normal	18 (56.3)	14 (43.8)	32 (100)	
Overweight	22 (81.5)	5 (18.5)	27 (100)	
Obesity (C1)	3 (100)	0	3 (100)	
Obesity (C2)	0	1 (100)	1 (100)	
Running experience				
1-3 years	9 (60)	6 (40)	15 (100)	0.549
4-10 years	29 (70.7)	12 (29.3)	41 (100)	
> 10 years	8 (80)	2 (20)	10 (100)	
Stretching (Before)				
Always	29 (76.3)	9 (23.7)	38 (100)	0.196
Sometimes	16 (64)	9 (36)	25 (100)	
Never	1 (33.3)	2 (66.7)	3 (100)	
Stretching (After)				
Always	21 (67.7)	10 (32.3)	31 (100)	0.805
Sometimes	20 (74.1)	7 (25.9)	27 (100)	
Never	5 (62.5)	3 (37.5)	8 (100)	
Involvement in other sports				
Yes	36 (65.5)	19 (34.5)	55 (100)	0.152
No	10 (90.9)	1 (9.1)	11 (100)	
Weekly running distance				
1-10 Km	17 (65.4)	9 (34.6)	26 (100)	0.500
11-20 Km	14 (73.7)	5 (26.3)	19 (100)	
21-30 Km	10 (83.3)	2 (16.7)	12 (100)	
31-40 Km	2 (50)	2 (50)	4 (100)	
41-50 Km	3 (75)	1 (25)	4 (100)	
51-60 Km	0	1 (100)	1 (100)	

The means of runners experiencing knee pain and those without knee pain were compared based on training frequency using an independent sample t-test. No significant relationship was found between training frequency and the knee pain among runners ($p = 0.472$).

Scoring of Knee Function

The 46 runners who had experienced knee pain due to running were further classified according to the severity of their pain based on the OSTRC Overuse Injury Questionnaire. The results showed that 21 runners (45.7%) reported mild pain, 23 (50%) reported moderate pain, and only 2 runners (4.3%) experienced severe knee pain.

Concerning knee function, only one runner with knee pain received a fair knee function score. Despite experiencing knee pain, 33 runners achieved good knee function scores, while 12 runners attained excellent scores, representing 100% and 37.5%, respectively.

DISCUSSION

The findings of this study revealed a high prevalence of knee pain among runners, consistent with previous articles identifying the knee as the most frequently injured anatomical region in this population (Kakouris et al., 2021; Van Gent et al., 2007). Moreover, overuse injuries have been reported to account for approximately 60.6% of all running-related injuries, with patellofemoral pain syndrome and iliotibial band syndrome being the most common knee conditions resulting from excessive repetitive running and jumping (Sanfilippo et al., 2021).

It is postulated that runners experience a high prevalence of knee pain due to repetitive submaximal strain and/or insufficient tissue recovery (Gizinska et al., 2025; Mellinger & Neurohr, 2019). This hypothesis aligns with the findings of the present study, suggesting that many runners may have experienced overuse injuries, possibly due to their training regimens involving longer training runs. Consistently, a study on runners preparing for a half-marathon race reported that 37.3% of participants experienced health issues, with overuse injuries accounting for the greatest burden (18%) (Hollander et al., 2018).

Conversely, anatomical malalignment of the lower extremities including femoral neck anteversion, genu valgum, knee hyperextension, and excessive rearfoot pronation, together with muscular imbalance or weakness, particularly of the quadriceps and poor running mechanics, may further contribute to the development of knee pain (Mellinger & Neurohr, 2019).

This study also found that the number of runners with knee pain was higher among males compared to females. However, this finding is not conclusive, as there was a large gender imbalance among participants. Furthermore, the study demonstrated no significant association between gender and knee pain. According to Buist et al. (2010), male runners are influenced by factors such as BMI, previous musculoskeletal injuries of the lower limbs or back, and running experience, whereas female runners are more commonly associated with no prior running experience. Collectively, these findings suggest that the predictors of knee pain differ between male and female runners (Buist et al., 2010; Hootman et al., 2002).

This study also observed that middle-aged adults constituted the group with the highest prevalence of knee pain, aligning with previous studies (Naderi et al., 2024; Nielsen et al., 2013; Satterthwaite et al., 1999). This may be attributed to age-related degeneration, in which the joint deteriorates due to repeated impact and loading on the articular cartilage. However, this finding contradicts a previous study that reported runners with lower age had a higher risk of injury (Rasmussen et al., 2013). Differences in running experience may help explain the conflicting results regarding age and injury risk. The present study showed that runners with more than 10 years of running experience were the least likely to develop knee pain. This may be because experienced runners have developed musculoskeletal adaptations that reduce their susceptibility to injury and are likely better at recognising their body's signals and adjusting their training accordingly to prevent injuries.

This study found that overweight runners were the most likely to experience knee pain. This occurrence is likely related to the kinetics and kinematics of the knee joint during running. Obese runners were shown to generate ground reaction force impulses that were 40.2% greater than those of non-obese runners, ultimately increasing joint loading, especially at the knee (Vincent et al., 2020). Additionally, carrying external weight equivalent to 10–30% of body mass has been shown to increase leg stiffness by 2.8–25.7%, leading to greater loading on the lower limbs (Vincent et al., 2020). To cope with this additional load, the body automatically stiffens the leg through increased muscle co-contraction to stabilise the limb and control impact. However, this adaptation results in excessive biomechanical stress, which can adversely affect the knee.

Generally, it is widely believed that stretching helps prevent sports-related injuries. Exercises that include stretching have been shown to reduce the risk of knee pain by improving the flexibility of the muscle–tendon unit (Coppack et al., 2011). Nevertheless, the present study found that most of the runners who experienced knee pain performed stretching both before and after running. This result is aligned with previous systematic reviews. This finding aligns with previous systematic reviews reporting that stretching has no significant association with injury prevention (Almaawi et al., 2020; Thacker et al., 2004). However, stretching may still enhance running performance by improving muscle and joint flexibility.

This study found that runners who ran less than 20 km per week were more likely to sustain knee injuries than those who ran more than 20 km per week. This result is

supported by another study, which reported that runners with a weekly training volume below 30 km had a 2.34 times higher relative risk of injury (Rasmussen et al., 2013). It is postulated that lower training loads may lead to weaker active and passive stabilisers of the patellofemoral complex (Hreljac, 2004), thereby increasing the risk of patellofemoral pain syndrome among runners. Furthermore, running experience may also play a contributing role in this relationship.

Although the runners reported knee pain, most achieved good functional scores, indicating that their activity limitations were not severe. Half-marathon runners constituted the group with the highest proportion of good scores compared to other categories. This could be attributed to their adaptation to pain when performing mobility or knee-related exercises. Only one runner reported that most activities involving the knee were painful and limited, which may be due to a lack of knowledge about pain management. Notably, eight out of twelve marathon runners achieved excellent functional scores, potentially reflecting greater running experience and accumulated knowledge related to injury management and symptom control.

However, the observation that more experienced runners reported lower levels of knee pain should be interpreted with caution. While musculoskeletal adaptation associated with prolonged training may partly explain this pattern, it may also reflect survivor bias, whereby runners who experience persistent or severe knee pain reduce their training load or discontinue running altogether. Consequently, the remaining sample may represent a healthier subset of runners, leading to an underestimation of knee pain severity among long-distance runners.

Study Strengths and Limitations

This study is limited by convenience sampling, a small sample size ($n = 66$), and a marked gender imbalance (80.3% male), which may restrict generalisability. The use of selected items from the Kujala Anterior Knee Pain Scale may have compromised outcome validity and limited comparability with studies using the full instrument. Statistically, violations of Chi-square assumptions, lack of adjustment for multiple comparisons, and limited power may have affected the reliability of the findings. Future studies should recruit larger samples and apply more robust analytical approaches.

Despite these limitations, this study has notable strengths, including addressing a significant gap in the regional sports medicine literature by providing preliminary evidence on

this under-researched population.

CONCLUSION

It can be concluded that the prevalence of knee pain among selected Malaysian long-distance runners is high. Although no significant association was found between gender, BMI, running experience, and the occurrence of knee pain, this suggests that knee pain among these runners may be influenced by multifactorial elements beyond the examined demographic and training variables. Additionally, the impact of knee pain on functional performance was generally mild. While this preliminary study found a high prevalence of knee pain, the small sample size limited our ability to detect significant associations with potential risk factors. The findings suggest that knee pain is multifactorial, and future, larger-scale studies are needed to reliably identify contributing factors in this population.

CONTRIBUTION TO THE ADVANCEMENT OF KNOWLEDGE

At this stage, the primary contribution of this study is to highlight the extent of the problem and underscore the need for more robust research in this population. As a pilot investigation, the findings may inform the design and methodological considerations of future, larger-scale studies.

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DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the authors used ChatGPT to identify and correct grammatical errors, as well as to suggest improvements for clarity and conciseness. The authors subsequently reviewed, revised, and approved all content, and accept full responsibility for the final manuscript.

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