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Prevalence and Risk Factors of Low Back Pain Among Professional Male Track and Field Athletes

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Abstract

Background: Chronic non-specific low back pain is extremely common in the general population. Athletes are often at special risk for more serious associated factors of low back pain, which are often sport-specific in their etiology.

Aim: The purpose of this study was to investigate the epidemiology and associated factors of chronic non-specific low back pain in male athletes of track and field in the national league.

Materials and Methods**:** A total of 63 individuals were randomly selected to enter the study. The mean age of the subjects with the standard deviation was 25.2±4.5. To investigate the disability due to chronic non-specific low back pain, Oswestry questionnaire was used. For the evaluation of the pain perception, the Visual Analog Scale (VAS) was employed. Statistical analysis was performed using chi-square (χ^2), spearman correlation and multiple linear regression at a significance level of 0.05. All statistical calculations were done using SPSS-21 software.

Results: Out of 63 subjects, 32 individuals (50.8%) had chronic non-specific low back pain. Of these, 29 subjects(46%) had low disability and 3 subjects (4.8%) had moderate disability due to low back pain. None of the participants had severeor very severedisability. Pain perception measured using the VAS, had a mean of 35.4%. The most frequent cause of Chronic non-specific low back pain in track and field athletes was high-intensity training (26.7%, n=24), followed by training and activity location (21.1%, n=19) (x^2= 64.88, p=0.000). The regression analysis showed a significant relationship between high-intensity training and Chronic non-specific low back pain among the mentioned athletes ($p \leq 0.05$).

Conclusion: The results of this study shows a high epidemiology of Chronic non-specific low back pain in male track and field athletes, which requires serious attention. Additionally, high-intensity training and the location of training and activities were identified as key associated factors in Chronic non-specific low back pain.

Keywords: Epidemiology, Low Back Pain, Track and Field, Male Athlete, Professional Track and Field

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1. Introduction

Athletics (track and field) is an Olympic sport, practiced all over the world. It is governed at the international level by World Athletics, which has 214 affiliated countries or territories. This makes Athletics an intercultural sport involving athletes of different sexes, ages, ethnicities, and socioeconomic backgrounds. Athletics consists of different disciplines, including sprints, hurdles, jumps, throws, combined events, middle- and long-distance running, and race walking[1].

Severe sports injuries can sometimes eliminate the athlete from competitions or sports life. To keep the participants active in sports, these injuries must be recognized and reduced through implementation of preventive strategies [2]. A systematic review by Drew and Finch (2016) found an association between high training loads and subsequent injury across various types of sports. As such, physical activity may contribute to development of low back pain in some elite athletes[3]. Prevalence research, particularly in sports, is one of the essential methods for identifying injuries, and informing prevention strategies. [2]. Meanwhile, track and field is one of the most significant, popular, and medal-winning sports that has drawn the attention of researchers, athletes, and audiences [2, 4, 5]. Although running is considered one of the most effective ways to achieve a good state of health and fitness, recent studies indicate that it also involves a relatively high risk of associated injury.[6]. Track and field athletes suffer from various sports injuries, the most important of which occurs in the lower body, particularly the lumbar spine (vertebrae) [2, 6].

Trainor reported a 30% prevalence of low back pain among athletes in 2004 [7]. Track and field can potentially cause back injuries in athletes due to extreme training and various movement patterns, such as running, jumping, and throwing [2]. In clinical practice, low back pain is a common complaint among athletes. [8]. In 90% of the cases, low back pain is considered non-specific due to the absence of identifiable pathoanatomical causes [9]. Some research has considered the sudden pressure on the back as the most vital cause of low back pain [10], which can be abundantly found in track and field. However, there is a lack of research on the prevalence of low back pain among professional and amateur track and field athletes in Iran. Many studies have been conducted on the prevalence of sports or low back pain injuries in various occupations or groups. For instance, Abdinejad et al. (2002) studied low back pain in different occupations in Iran. They reported that the average low back pain among Iranian men is 27.8%, with 41% in workers, 37% in farmers, 27% in employees, 21% in nurses, and 13% in businessmen [11]. However, the research samples were mainly the general population and not the track and field athletes.

Low back pain is the most common musculoskeletal condition with a lifetime

prevalence of more than 80% in the general population [8]. it is a major healthcare challenge ,affecting 7.5% of people worldwide, and is responsible for an estimated 69 million years lived with a disability (i.e. healthy years lost) [12]. The prevalence of chronic low back pain among recreational runners was reported as high as 13.6% in the United States., with low back injuries accounted for about 7% of all running injuries[13].

Unlike normal people, track and field athletes expose their backs to considerable pressures for a longer time and frequent positions, leading to fatigue and excessive use of the lower back [14]. Moreover, employed individuals and general population report lower back pain less frequently, due to compensation for occupational injuries and resting. On the other hand, track and field athletes are reluctant to report or follow up on the lower back pain due to potential resultant problems, such as being excluded from the team, losing contracts, or missing practice time and games. As a result, these issues are underreported. [15]. In this regard, Ong et al. (2003) examined the waist disc issues in the Sydney 2000 Olympic Games using MRI. They found that waist disc issues are more prevalent and severe among professional athletes than in the general population [14].

Pagliano and Jackson found a 1.1% incidence of low back pain in adult runners [14]. Moreover, Rossi reported a 22.5% incidence of low back pain in track field athletes. According to the research, there is a significant inconsistency in the results. Furthermore, no research has been conducted on this issue in Iran.

Due to the injuries, athletes may be sidelined for days or months, which is not cost-effictive for the club and the athlete in terms of maintaining a preparedness level and occupational point of view [16]. Furthermore, these injuries can impose enormous healthcare costs on the clubs, insurance companies, and athletes [17]. Thus, preventing these injuries should be considered the most significant goal for any club or organization [17, 18]. It is often mentioned that understanding the prevalence of sports injuries plays a pivotal and influential role in injury [19, 20]. In a model by Van Michelen et al. (1993) on the prevalence and Injury prevention studies, the primary and fundamental step in drafting the preventive strategies is the prevalence studies [21]. Therefore, to prevent injuries and low back pain, the associated factors must be identified and studied. Many studies were conducted on the prevalence and cause of low back pain in societies, particularly in different occupational situations. However, the prevalence and cause of low back pain in the track field have not yet been explored in Iran. As a result, the present research aims to investigate the prevalence and associated factors of low back pain in the professional male track and field athletes in the premier league in Iran

2. Methods and Materials

The current study was a descriptive-retrospective study. Data was collected using a

survey research method. The research sample included all professional male runners in Iran's track and field premier league in 2021(Sprinter 41.3%, Long-distance 34.9%, Thrower 4.8%, Jumper 12.7%, Decathlon 6.3%) . Among these, 63 athletes were selected using a random sampling method to fill the research questionnaire. The computer-generated block randomization was performed in a 1:1:1 allocation ratio through the website https:// www.sealedenvelope.com. The main investigator was responsible for participant enrollment. They also generated the random allocation sequence. The sample size was determined using Morgan's table. Professionalism status was determined based on whether track and field was the athlete's primary source of income and profession. Low back pain was not the selection criterion; however, based on the research method, low back pain was considered the vital variable. The age range of the samples was 16 to 36 years old.

2.1. Oswestry Questionnaire

The Oswestry Low Back Pain Disability Questionnaire [22] was utilized to asses low back pain. It served as the primary tool for assessing both performance limitations and the disability caused by low back pain. The questionnaire has ten 6-point sections (ranging from 0 as the minimum to 5 as the maximum) to assess the patient's ability level in tolerating pain, personal care, lifting objects, walking, sitting, sleeping, social life, traveling, and changing the angle of the waist. The greatest disability is scored as 5 in each section, and the total scores from all ten sections can reach 50. In other words, the disability is calculated by multiplying the total score of each section by 2. In fact, Oswestry Low Back Pain Disability Questionnaire or ODI[1] (Oswestry Disability Index) measures disability on a scale from 0 to 100. Therefore, zero indicates being healthy and without pain, 0-25 indicates minimal disability, 25-50 shows moderate disability, 50-75 represents acute disability, and 75-100 means very acute disability [22]. The validity and reliability of the ODI were reported as 0.75 and 0.91, respectively, in Iranian cases reported by Mokhtarinia et al. (2018) [23].

2.2. Visual Analogue Scale

The Visual Analogue Scale (VAS) was used to measure pain intensity. it consists of a 10 cm line with two endpoints: 0 indicates no pain, and 10 represents the worst possible pain. The ruler has both qualitative and quantitative sides. The VAS ruler has both a qualitative and a quantitative side. The athlete marks the qualitative side to indicate their pain. The researcher then flips the ruler and records the corresponding value from the quantitative side. This value represents the athlete's pain level.This scale has been the most valid system used in pain-related research for scaling pain intensity and comparing different periods [24]. The validity and reliability of this scale were

[1] Oswestry Disability Index

reported by Begum et al. (2019) [25] and Shojaldin and Ghasemi (2014). The Intra-Class Correlation Coefficient (ICC) of this scale is 91% [24]. A report form, including the associate factors of low back pain, and personal information, including the sports field, age, height, weight, sports experience, occupation, and best rank, was distributed among samples

2.3. Statistic

A chi-square test at a significance level of ($P<0.05$) was used to analyze the data. Moreover, Multiple Linear Regression was utilized to determine the correlation between the prevalence of low back pain and age, height, weight, Body Mass Index (BMI), and sports experience of samples. SPSS 21 software was employed for all the statistical calculations.

3. Results

A total of 63 male athletes participated in this research. Their demographical characteristics are represented in Table 1.

As shown in Table 2, 32 athletes (50.8%) reported low back pain. Among them, 29 (46%) had minimal disability, and 3 (4.8%) had moderate disability.No cases of severe or very acute disability were reported. The average pain intensity using VAS was reported 35.4 with a standard deviation of 17.8. A chi-squared test was to examine the associated factors of low back pain (see Figure 1).

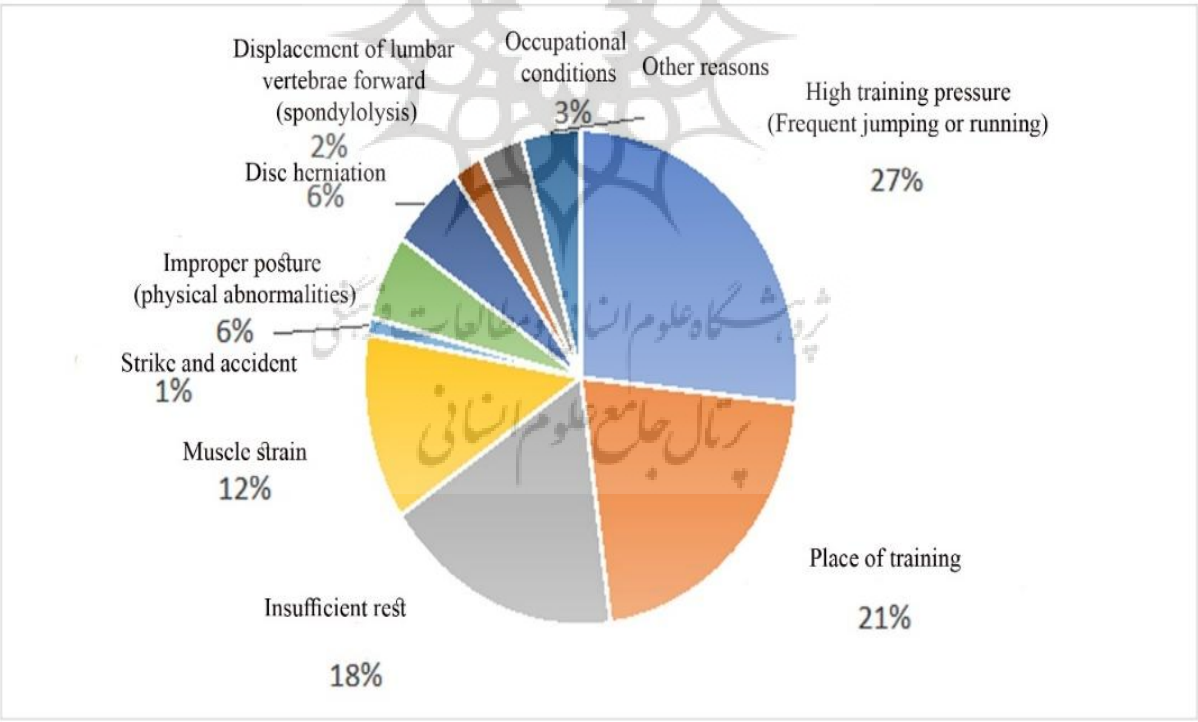

Figure 1. Associated Factors of low Back Ppain in the Samples of The Current Research.

Table 1. The Statistical Indicators of Age, Height, Weight, BMI, Sports Experience of The Participants (63 samples)

Indicator	Minimum	Maximum	Average	Standard of Deviation
Age (years)	16	36	25.2	4.5
Height (Centimeter)	168	200	182	7.3
Weight (kg)	59	124	74.6	12
BMI (km^2)	17.8	36.2	22.1	3.2
Sports Experience (year)	1	18	8	4.1

Table 2. Disability Caused By Low Back Pain (ODI) in Research Samples

Scale	Qualitative Scale	Number	Percentage
0	Healthy	31	42.2
1-25	Minimal Disability	29	46
26-50	Moderate Disability	3	4.8
51-75	Severe Disability	0	0
76-100	Acute Disability	0	0

Table 3. Results of Multiple Regression Analysis Between Low Back Pain and Variables

Variable	Predictive Variables	B Value	Beta Coefficient	T-Value	Significance Level
Low Back pain	Age	-0.34	0.70	-0.49	0.62
	Height	1.40	0.55	2.53	0.01
	Weight	-0.52	0.44	-1.18	0.24
	BMI	1.19	1.23	0.96	0.33
	Sports Experience	0.87	0.73	1.18	0.23

As figure 1 shows, the maximum frequency of the associated factors for low back pain in the track and field athletes was high training pressure, accounting for 26.7%, followed by the place of practice at 21.1% (000/0p =64/88, χ^2=). Lack of sufficient rest (17.8%) and muscle strain (12.2%) were the next most associated factors for low back pain (000/0p =64/88,χ^2) Multiple linear regression was conducted to predict low back pain based on selected variables (Table 3). The results showed a significant relationship between height and low back pain (p = 0.01). This suggests that height may be a predictive factor. No other variables showed significant associations (p > 0.05).That is to say, the height can be considered a predictive factor of low back pain in the field trackers of the research (p=0.01). However, there was no significant relationship between the other variables (p>0.05).

4. Discussion

This study examined the prevalence and associated factors of chronic non-specific low back pain among male track and field athletes. The results indicated that 50.8% of the samples had chronic non-specific low back pain - a relatively high rate. Few studies have been conducted on this topic. This contrasts with earlier studies by Pagliano, Jackson, and Timothy, who reported a lower prevalence of low back pain in runners [26]. The inconsistency in results could be attributed to the gender of the samples as these studies included both male and

female athletes while the current research had only examined male athletes. Additionally, training intensity has increased over the years, possibly contributing to the higher prevalence observed here. The current results are more consistent with findings among gymnasts and divers [27].

Pain intensity, measured using the VAS, averaged 35.4%, similar to Zwingerberger et al. (2014), who reported 40% in athletes. Moreover, the ODI (Oswestry Disability Index results showed that 46% of the samples had minimal low back pain while 3% had experienced moderate back pain. No cases of severe low back pain were reported.

Unlike the general population, track and field athletes expose their backs to considerable pressures for extended periods and in frequent positions, leading to fatigue and excessive use of the waist [14]. The spine transfers forces between the upper and lower body, and without proper flexibility and strength, the risk of injury increases [28]. Michael and Wood compared the low back pain caused by disc issues in athletes and non-athlete, reporting that 48% of the low back pains were caused by discopathy in normal people while it was 11% in the athletes [29]. This finding is in line with the results of the present study.

The most common associated factors were high training pressure (26.7%) and place of practice (21.1%). Risk factors in running were divided into two groups: 1. anatomical problems, and 2. training errors. The most common training errors in running include transitioning to a harder training surface, sudden increasing of the distance by more than 10% per week, sudden increasing of running intensity, uphill running, running on uneven roads, insufficient rest, and previous injuries [30]. The risk of injuriydue to sudden increases of training pressure can be controlled by a gradual increase in training load.

Track and field athletes are divided into two general groups: sprinters and long-distance runners. Anterior pelvic tilt occurs in sprinters [31], while posterior pelvic tilt happens in long-distance runners [32, 33]. An increase in lumbar lordosis due to anterior pelvic tilt changes the distribution of the forces on the vertebrae and pushing them out of their optimal alignment [34, 35]. Such a state increases the shear forces, raising the possibility of spondylolisthesis or fracture of transverse appendages. Unlike anterior pelvic tilt, the compressive forces on vertebrates will increase, and, as a result, there will be a high risk of facet joints injury, ultimately leading to low back pain[35].

Furthermore, insufficient rest with the frequency of 16 (17.8%) and muscle strain with 12.2% ranked next as associated factors for low back pain (000/0p =64/88$^{z^2}$).

In the general population, 95% of the low back pain is caused by sprain and strain of the back. Athletes suffer from low back pain due to high pressure placed on their muscles and ligaments [36]. One of the most notable factors associated with low back pain, as reported by the participants, was the excessive pressure and

extreme fatigue. Fatigue contributes to injury through psychological and physiological mechanisms. It reduces concentration, increases muscle tension, and disrupts neuromuscular control—raising the risk of injury [37]. Second, from a physiological point of view, fatigue disrupts the nervous system and disturbs muscles from taking commands, leading to muscle tension and a higher possibility of injury. Intense competitions schedules and rigorous training plans without the required time for recovery increases the risk of injury [37].

The lumbar spine endures various pressures regarding any particular sport or movement pattern. Analyzing the forces and mechanisms affecting the lumbar spine is one of the most significant methods for identifying and preventing in the future [38, 39]. For instance, in jumping sports, the competitor runs fast, and, after stomping their feet on the jumping board and jumping into the air, lands on the crash mat. Upon landing, the force of the weight of the body hits the ground with pressure, and the body experiences a ground reaction force equal in magnitude but opposite in the direction [40]. Jumping generates ground reaction forces that travel from the feet to the spine, placing sudden stress on the pelvis and back. This increases the risk of pain and injury [41].

Riberio et al. (2023) suggested that extreme and frequent practices in sports lead to hypertrophy, reduced range of movement, and decreased flexibility. Moreover, it results in an imbalance between the contralateral and agonist muscles, causing a change in the body state of the athletes. The researchers identified a direct relationship between the posture change and the prevalence of injuries in the effected areas.

Professional athletes are less prone to lower back injuries than non-professional athletes [42]. The ratio of the strength of extensors to flexors of the back is 1.3 to 1 [43], which can be disrupted and lead to low back pain in athletes due to the excessive use of a part of the body or frequent movements [44]. Postural issues have been frequently observed in many individuals with low back pain. This issue is associated with postural fluctuations, which is due to the disruption in the proprioception, disruption in paraspinal muscle spindle, delay in muscle response, and subsequent disorders in the strength, coordination, and paired function of the back and hip muscles [45, 46]. For example, individuals with hyperlordosis (high prevalence in sprinters and jumpers) experience increased postural anterior-posterior fluctuations [47]. Changing body posture imposes excessive mechanical force on the soft tissue of the joint, increasing the potential for injury [48]. Hence, the aforementioned must be considered in designing the preventive plans to reduce the low back pain in field trackers and fix it in case of any abnormality.

Due to the unique biomechanical requirements of this sport, managing lower back pain in track and field athletes is a complex challenge for healthcare providers. Lower back pain is a common issue among athletes, often caused by

intensive training, competition pressure, and the biomechanical effects of running and field events[49]. The results of the regression analysis showed that there was a significant relationship between height and low back pain in the male runners.Height can be considered a predictive factor in the low back pain of the track and field athletes in the present research (P=0.01), aligning with findings by Manchikanti (2000).However, Han et al. found no such relationship in non-athletes, suggesting that biomechanical factors in elite athletes may alter outcomes. [50], which was not in line with the results of the present research. It is noteworthy that their samples included unprofessional and non-athlete individuals. Thus, it can be argued that taller individuals have more torso torque, which is directly imposed on the vertebrate in sports, causing pressure and low back pain [30]. Nikolaos Malliaropoulos pointed out that in addition to common causes such as intervertebral disc herniation, lower back pain in runners may also be caused by lower limb and leg problems. This type of lower back pain caused by leg length differences may occur during running, and if there is a functional or anatomical difference of 3 to 6cm in leg length, it may lead to lower back, buttocks, or leg pain. Differences between the inside and outside gyri of a single or double foot, as well as other leg dysfunction, may lead to joint dysfunction and lower back pain[51].

5. Conclusions

Therefore, it can be concluded that male field trackers had a higher prevalence of low back pain, highlighting the need for preventive strategies. According to the model by Van Mechelen et al. (1992), which focuses on epidemiological studies and injury prevention, the first and fundamental step in designing and implementing preventive strategies is conducting epidemiological research. Furthermore, the most significant associated factors of low back pain, as reported by particiants, were excessive training pressure, place of training, insufficient rest, muscle strain and height.

Conflict of interest

The authors declared no conflicts of interest.

Authors' contributions

All authors contributed to the original idea, study design.

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Ethical considerations

The author has completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc.

This study was approved by the Ethics Committee of Sport Sciences Research Institute

(Ethics Code: IR.SSRC.REC.1402.186 All participants have signed informed consent prior to enrolment in the study. The link of ethical code should be enclosed at this section.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

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