

A Systematic Review on Achilles tendon Injuries Prevalence

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Submitted: 2021-08-17; Accepted: 2021-12-16; Doi: <https://doi.org/10.22037/jcpr.v7i1.35107>

Abstract

Introduction: The aim of this study was to present and discuss the knowledge gathered on various Achilles tendon injuries and to highlight the clinical implications for the evaluation and treatment of Achilles tendon injuries about the factors of Achilles tendon injuries. Study design: Systematic review. **Materials and Method:** A search of 5 databases including; Science Direct, Google scholar, PubMed, Ovid Medline, Scopus and Medline was performed using keywords related to Achilles tendon injury factors and a review of all usable manuscripts (the search was undertaken between 1980 to 2021). **Result:** One hundred and fifteen articles met the inclusion criteria. Among all the independent variables that were analyzed including age, obesity, athletes and normal people, professional or amateur sports, men and women, and Achilles tendon treatment methods were examined. Conclusion: Comparison of the prevalence of Achilles tendon injuries in athletes and non-athletes showed that the risk of Achilles tendon injuries were higher in 16-25 years old male than women, Also, the onset of injury in collision sports had the highest percentage.

Keywords: Biomechanics; Injury; Review; Tachiles

Please cite this paper as: Fatahi A, Alizadeh R, Yousefian Molla R. A Systematic Review on Achilles tendon Injuries Prevalence. J Clin Physio Res. 2021; 7(1): e53. Doi: <https://doi.org/10.22037/jcpr.v7i1.35107>

Introduction

Achilles injuries can occur in many incidences, but the most common area is at the muscle-tendon junction the area where the calf muscles join with the tendon (1-3). Most of the time injuries in this part of body was held automatically, but based on shortage of blood supply, this process may counter many problems (4). Athletes in running sports have a high incidence of Achilles tendon overuse injuries. About 75% of total and the majority of partial tendon ruptures are related to sports activities usually involving abrupt repetitive jumping and sprinting movements (5). Tendonitis might be due to overuse or damage to the area of heel (6) which can cause pain down the back of leg and around heel (7). in that condition because of tendonitis tendon are getting thicker, and hardening (8). There are 2 main types of tendonitis:

Non-insertional Achilles tendonitis; in this type of tendonitis small tears in the middle fibers of tendon start to break it down

which causes pain and swelling, This type of tendonitis usually affects active, and younger adults (8).

Insertional achilles tendonitis; in this type of tendonitis, damage occurs at the point where the tendon meets the heel bone. Bone spurs (extra bone growth) are often caused by this type of tendonitis (7). This type of tendonitis can occur at any age, even in people who are not active. Another cause of this type of tendonitis is damage caused by tearing. Tearing of the tendon fibers can cause a complete or partial rupture (or rupture) of the tendon, often resulting in a "pop" sound that sounds like it is coming from the back of the heel or lower leg (9).

About 43% of sports injuries are related to the lower torso, which is the most common injury in the Achilles tendon. A review on the related research on achilles tendon injuries presented a paucity on different aspects of mentioned important injury in atheltes, so the aim of the present study was to investigate a systematic review on achilles tendon injuries in various calassifications.

Table 1. Achilles tendon injuries articles

Researchers	Purpose	Results
Tomlinson et al. (9)	The effect of obesity and aging on tendon function in men	The risk of Achilles tendon rupture increases with age and weight gain
Lindemann et al. (10)	Investigation of mechanical differences in Achilles tendon at different ages	As you age, the mobility and function of the Achilles tendon changes, which provides the ground for injury
Mildren et al. (11)	The effect of gender on Achilles tendon rupture	Women in their 40s and 60s are more at risk
Ebrahimi et al. (12)	Investigating the differences in Achilles tendon loading at different ages	In adults, due to neuromotor dysfunction, the load is weak and causes injury
Shamrock and Varacallo (13)	Examination of Achilles tendon rupture	Achilles tendon rupture has the highest percentage in group sports
Lieberthal et al. (14)	Achilles tendon pathology in male endurance runners	Almost half (46%) of these asymptomatic distance runners had at least one abnormal tendon
Caldwell and Vosseller (15)	Maximize return to exercise after injury	Organized physiotherapy and exercise can help treat Achilles tendon injury
Janssen et al. (16)	Investigation of the onset of injury in runners	Achilles injury was more common in endurance runners
Nicholas J. Lemme et al. (17)	This study was to determine the incidence and risk factors for AT ruptures in the US.	Achilles tendon rupture in young male patients
Jandacka et al. (18)	Investigating the effect of Achilles rupture on running mechanics	Injury to the Achilles tendon causes runners to stretch their knees, causing damage to this area
Byrne et al. (19)	Non-surgical repair of Achilles tendon athlete	The 36-year-old male athlete competed in an international competition after 18 weeks of training without tendon surgery
histen et al. (20)	Investigation of the prevalence of injuries in professional and beginner runners	Injuries are more common in beginners than in professionals
Toshito et al. (21)	Use scar tissue to repair the Achilles tendon	Scar tissue is a suitable and cost-effective alternative for repairing Achilles tendon injuries
Maffulli et al. (22)	Evaluation of Achilles tendon rupture in women 30-40 years old	Achilles tendon injury can be prevented in obese women by strengthening the gastrocnemius muscles during weekly exercises.
Arverud et al. (23)	The effect of aging on Achilles tendon injury	According to the present study, people over the age of 40 are more at risk for Achilles tendon injury
Docking et al. (24)	Evaluation of structural integrity in individuals with unilateral tendinopathy	Both Achilles tendons are structurally compromised in patients with unilateral Achilles tendonopathy
Neill et al. (25)	The effect of centrifugal exercises on Achilles tendonopathy	These exercises provide a new mechanism by which plantar flexor muscles may protect the Achilles tendon.
Turna et al. (26)	Evaluation of different age differences in Achilles tendon disorders	Achilles tendon stiffness in the elderly showed that the risk of injury was higher in the elderly
Liu et al. (27)	Evaluation of the effect of open semen technique for Achilles tendon rupture	Our results showed that combined mini-open and percutaneous repair is an effective treatment for professional athletes
Kaniki et al. (28)	Evaluation of the efficacy of platelet-rich plasma as part of non-surgical treatment of acute Achilles tendon rupture	The results show that it has no benefit in treating Achilles injury
Wearing et al. (29)	Obesity study in male athletes	Obesity puts a lot of pressure on the lower torso and eventually damages the Achilles tendon
Jallageas et al. (30)	Assessing the improvement of Achilles injury in athletes and non-athletes	According to the present study, Achilles tendon healing occurs faster in athletes than in normal individuals
Waugh et al. (31)	Evaluation of Achilles tendon stiffness with age	Immobility and stiffening of the Achilles tendon cause damage with age
Vestergaard et al. (32)	Evaluation of topical administration of growth hormone to stimulate tendon collagen synthesis in older men	Local injection of collagen in older men had little effect on Achilles tendon regeneration
Abate et al. (33)	The effect of inactivity in people with type 2 diabetes on the tendon	This disease has a very dangerous and irreversible effect on the Achilles tendon of the elderly
Herbort et al. (34)	Evaluation of Achilles tendon rupture in the elderly	Aging causes tendon stiffness and inflexibility, which causes tendon damage

E Gaida <i>et al.</i> (35)	Was to determine whether fat distribution is associated with asymptomatic Achilles tendon pathology in men and women.	Asymptomatic Achilles tendon pathology was more evident in men (13%) than women (5%)
MFSEM <i>et al.</i> (36)	Investigation of Achilles injury in ballet dancers	These people suffer from severe rupture due to excessive pressure and frequent rotations of the Achilles tendon
Shirzad <i>et al.</i> (37)	Investigation of tendon injury of professional footballers	Only two-thirds of the players are able to return to the game after treatment and away
Oztekin <i>et al.</i> (38)	Check for foot and ankle injuries	The results show that the Achilles tendon injury is very common among football players
Ginckel <i>et al.</i> (39)	Identify dynamic gait-related risk factors for Achilles tendinopathy (AT) in a population of novice runners.	According to the present study, due to lateral rotation of the foot, Achilles tendon injury is more common in novice runners
Abrahámová <i>et al.</i> (40)	The effect of age on postural responses to bilateral vibrations of the Achilles tendon with 10 seconds	The findings showed that the responses of the trunk and pelvis angle to the stimulation of administrative sense are greater in young people
Sankey <i>et al.</i> (41)	Investigation of Achilles tendon injury in rugby players	Offensive players have the most ankle injuries and Achilles tendon ruptures
Strauss <i>et al.</i> (42)	Evaluation of complications and repair of Achilles tendon after surgery	Open repair and end of acute Achilles tendon rupture provide long-term functional results with good to excellent results
Lee <i>et al.</i> 2007 (43)	Evaluation of Achilles tendon repair with cell proliferation	Cellular tissue injection at the American Orthopedic Center showed that it takes 20 to 30 months for the repair to be complete
J. L. Cook <i>et al.</i> (44)	The effect of menopause on the Achilles tendon	Highly active and postmenopausal women have stronger Achilles tendons than their counterparts
Trojian <i>et al.</i> (45)	Evaluation of anterior cruciate ligament rupture with competition in women's professional basketball	Anterior cruciate ligament rupture rate for European American white players 0.45 for non-white European American players 0.07
Goren <i>et al.</i> (46)	Evaluation of isokinetic resistance and endurance after repair of Achilles tendon rupture	Functionally, the biomechanical outcomes of open surgery and percutaneous repair are both effective for acute Achilles tendon rupture.
Rettig <i>et al.</i> (47)	Investigation of Achilles injury in sports including acceleration and explosion	The results of Achilles tendon repair with an early weightbearing and an early range of motion rehabilitation program are good
See <i>et al.</i> (48)	Examining running exercises on the Achilles tendon	Running exercises can improve the rupture strength of Achilles tendons within 30 days of injury
Bruggeman <i>et al.</i> (49)	Evaluation of risk factors for Achilles tendon injury wounds	The risk of infection is very high, especially in people with diabetes
Hansen <i>et al.</i> (50)	Investigating the effect of running on changing the position of the Achilles tendon	After nine months of continuous running training, they found that running did not change the tendon position
Bleakney <i>et al.</i> (51)	Examination of Achilles tendon rupture with multi-month ultrasound	Seven-month ultrasound results from 70 patients after surgery showed that overweight people had mild tears.
Langberg <i>et al.</i> (52)	Check the age-related blood flow around the Achilles tendon	Young people have high blood flow around the Achilles tendon, which causes the damaged tendon to heal quickly
Cooper <i>et al.</i> (53)	Evaluation of Achilles tendon rupture function in the elderly	Achilles tendon rupture reduces lower limb function in patients over 65 years of age, and its complications are common following surgical and non-surgical treatment.

Materials and Method

The current study is a systematic review that was conducted by systematically reviewing the articles published from 1980 to 2021 by using the Science Direct, Google scholar, PubMed, Ovid Medline, Scopus and Medline databases (Table 1). The search keywords were "Achilles tendon", "Achilles injury", "Achilles

injury in sports", "Achilles anatomy", "Achilles", "Achilles tears" and "Achilles tendonitis". A general preliminary search led to about 1958 related articles. After reviewing the titles and abstracts, 500 articles were selected for the next stage. Finally, after reading the full text and considering inclusion criteria such as the effect of excess weight on the Achilles tendon injury, the effect of exercise on the Achilles tendon and considering the date of publication of

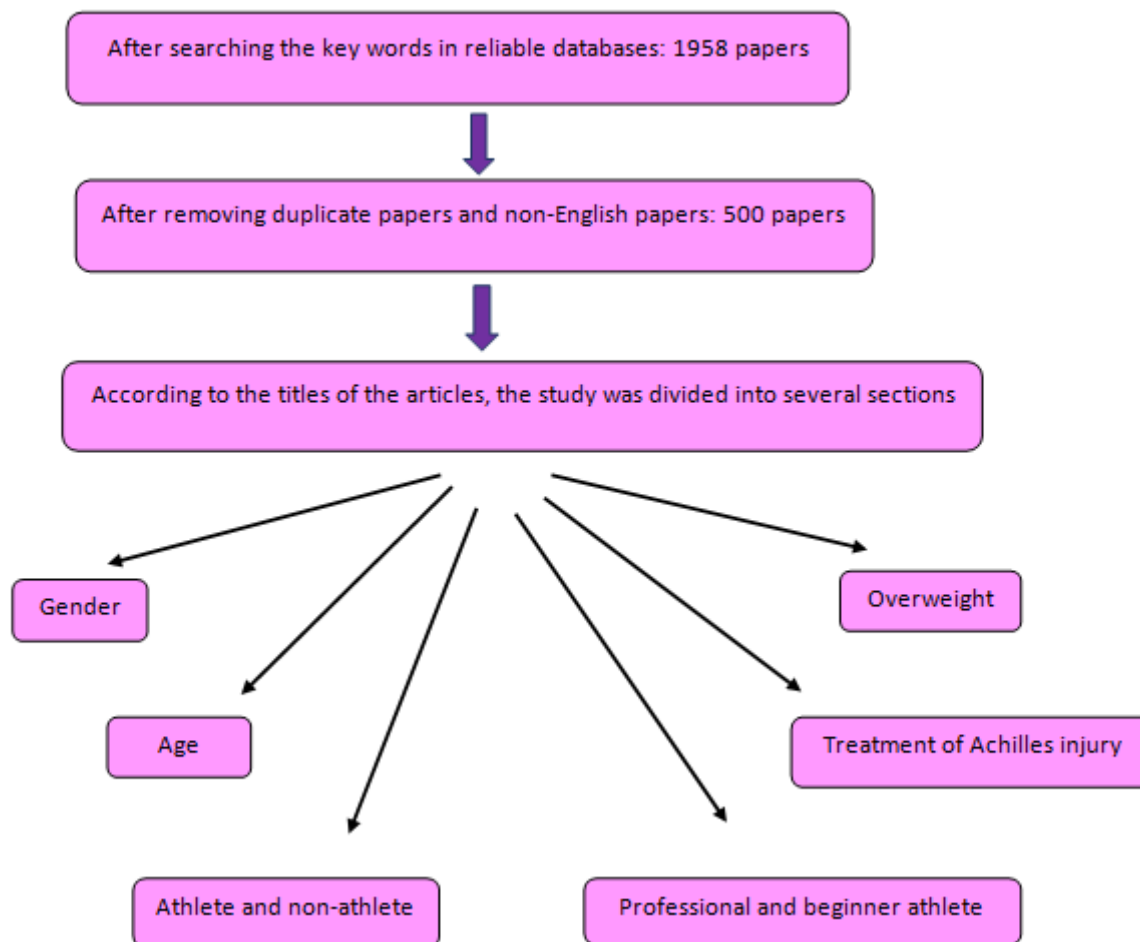


Figure 1. The process of review study

articles in valid databases, the 115 articles was selected for final stage. In final stage 115 articles were entered into the study and are divided into 6 categories about the research done (Figure 1):

Age

Nestorson *et al.* examined the function of the Achilles tendon of 25 patients over 65 years after 1 to 5 years treatment of rupture and found that Achilles tendon rupture in patients over 65 years old reduces lower limb function and its complications (54). Suchak *et al.* examined the Achilles tendon rupture of people of different ages in North America and found that 53% of older people suffered Achilles tendon rupture due to aging and loss of tendon flexibility. of course, 33% of young people under the age of 45 suffer from Achilles tendon rupture due to exposure to diseases such as diabetes, obesity and pregnancy (55). Damuth *et al.* evaluated the effect of fluoroquinolone antibiotics in people over 65 years old with Achilles tendon rupture. Accordingly, fluoroquinolones should be used with caution in patients with urinary tract infections, especially

in patients with risk factors for inflammation include inflammation, including old age and impaired kidney function (56). Strom *et al.* examined the mechanical properties of the Achilles tendon in two groups of young people aged 30-45 years and people aged 60-75 years, which consisted of 30 people in each group. With increasing age, the risk of Achilles tendon rupture increases up to 48%, and its main cause can be inactivity and diseases such as osteoporosis (13).

Nikretnik *et al.* after reviewing the extent and results of Achilles tendon rupture under surgery in the elderly over 65 years in two care centers that included 108,668 people, after a ten-year study of their medical records, they announced that 7.6 Achilles tendon rupture In every 100,000 people, Achilles tendon rupture is a rare injury in the elderly, and surgical treatment can be successful with (57). Maffulli *et al.* studied the Achilles tendon rupture repair in 35 patients over the age of 65 with acute Achilles tendon rupture. The patients were examined within 45 months of rupture and percutaneous repair was indicated (13).

In the study of Mikashima *et al.* after a 2-year follow-up, five patients aged 65-70 years with rheumatoid arthritis reported that they had a spontaneous rupture of the Achilles tendon without any trauma or pressure to the Achilles tendon (58, 59).

Studying the effect of spastic Cerebral Palsy (CP) on muscle properties and the Achilles tendon in young adults, Barber *et al.* reported that the spastic individuals with CP had 33% active torque of plantar ankle movement across the existing range of motion of the ankle joint, partly by 37% smaller Gastrocnemius muscle and 4% antagonistic simultaneous contraction, and the length of Achilles tendon relaxation was 10% longer too. This study confirms that young adults with spastic CP have tendon-muscle mechanical properties (60). Neugebauer *et al.* studied and identified the factors associated with stress, strain and stiffness of the Achilles tendon before and after 6 months healing in 20 boys and 22 girls aged 10-14 years. Gender presented no significant effects on the Achilles tendon injuries. In general, the present individuals showed that the peak of Achilles tendon stress is of mechanical properties and physical activity, and GR is significantly different after 6 months, which is a change from Achilles tendon injury in this Ages prevent. In general, the present individuals show that e, the peak of AT stress is of mechanical properties and physical activity, and GR is significantly different after 6 months, which is a change from Achilles tendon injury in this Ages prevent (61). Stenroth *et al.* by evaluating the amount of Achilles tendon collagen in people of different ages who were randomly selected announcing an increase in type III collagen can thin collagen fibers, reduce tensile strength, and ultimately lead to complete tendon rupture. This issue increases with age (62). According to the study of Pifersi Young people are also at risk of Achilles tendon injury, but the proportion of injuries in young people is lower than adults. Based on this study tendon tissue maintenance and repair it may decrease in the elderly and may help explain why the risk of injury increases with age (63). However, according to the study of Cheng *et al.* among the sports injuries in 30 million children and adolescents in the United States, the Achilles tendon injuries are more common in lower body injuries (64).

Gillett *et al.* conducted a 12-week training program that included 3 to 75 minutes of sessions consisting of 5 strength training exercises. Inferior and 2-3 functional anaerobic exercises in each session reported that exercise and walking did not change the growth and deformity of the Achilles tendon in these individuals (65). Lee *et al.* in the American Foot and Ankle Orthopedic Association studied the soft tissue coverage and skin defects in the elderly who suffered Achilles tendon rupture of the heel and reported that the soft tissue covering the tendon-sheath in the elderly 60 years helps a lot for tendon repair in a group of people (24).

According to the studies conducted in the years before 2005, most of the studies were conducted on people with the age range of 25-65 years, and the reports indicated that the damage started in these people. But from 2005 to 2021, studies on Achilles tendon injuries were conducted on almost all age groups, and the articles were based on differences in the onset of Achilles tendon injuries. Which in the last ten years shows that the elderly are more prone to this injury due to the stiffness and inflexibility of their tendons.

Gender

Prasad *et al.* in a study on an elderly woman with lupus who had bilateral Achilles tendon rupture again after 27 years of Achilles tendon surgery, reported that the drugs used by this patient, such as corticosteroids and anti-autoimmune drugs, It leads to the gradual loss of the tendon fibers of this person, and the person suffers from rupture of his tendons, especially bilateral Achilles rupture (25). Maffulli *et al.* stated in their study that compared to men with overt Achilles tendinopathy, women experience long-term recovery, more complications and a greater risk for surgery, and being a woman is an important risk factor for Achilles tendinopathy. It is considered obvious (26).

According to the study of Finney *et al.* menopause, which often occurs in middle age and causes hormonal changes in women's bodies and leads to overweight in women, also leads to menopausal women being more vulnerable to Achilles tendon damage [27]. Lewis (2009), studying a rare case of ciprofloxacin-induced bilateral Achilles tendon rupture in a 76-year-old woman who developed bilateral Achilles tendinopathy on the fourth day of fluoroquinolone therapy, stated that men are four times more likely to rupture than is female, so a bilateral tear in a 76-year-old woman is rare. Patients receiving fluoroquinolones with tendinopathy should consider dose reduction or discontinuation of fluoroquinolone therapy (28). Hansen *et al.* examined the effect of estrogen on Achilles tendon collagen synthesis, tendon structural properties and biomechanical properties in postmenopausal women. Esther injected these people with estrogen and after two days they started resistance training this observation did not have any significant influence on tendon size However, it was linked to the presence of smaller fibrils and a higher fibril density, which supports the fact that ERT increases tendon collagen turnover. Moreover, the relative stiffness during mechanical loading was lower in ERT users, and this could be related to a relatively higher proportion of immature cross links and thereby a potential reduced tendon strength in women with higher levels of estradiol (66). Fouré *et al.* revealed that Men are reportedly at higher risk of plantar flexor muscle injury and Achilles tendon ruptures than women. Biomechanical parameters are thought to play a role in the higher frequency of injury to males (67).

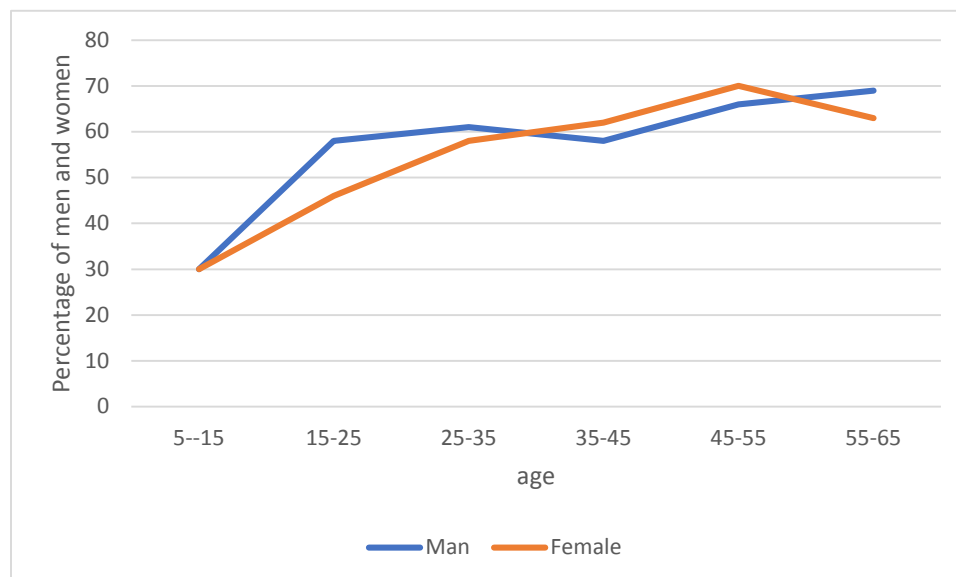


Figure 2. Relates to the percentage of gender and age of individuals

According to the study of Giuseppe Longo et al. bilateral Achilles tendon rupture is more common in men than women due to quadriceps muscle shape and muscle differences (68).

Suchak et al. studied the Achilles tendon rupture in 100,000 people in the city of Edmonton, Alberta, Canada in the spring and summer, aged 30 to 39 and 40 to 49, stating that 34.53% of women and 42.46% of men Achilles tendon ruptured (55). Gwynne et al. compared the results of a selective approach to surgical and non-surgical treatment using the same rehabilitation program with functional bracing in Freeport, North America in 2011 and 2012. In the mentioned category, there is a prevalence of Achilles tendon rupture among women due to netball and it leads to injuries at a younger age than previously reported. Our results support surgery in patients under 40 years of age, especially men, if contraindications are not used Overall, 73% of young women and 37% of men have Achilles tendon rupture in this area (69, 70).

According to Yoshjeh et al. in a study on older adults in the age range of 60-75, the Achilles tendon in older men is more vulnerable to injury than women at this age due to the greater stiffness of the Achilles tendon (71). Ganse et al. studied young elite male and female athletes in Europe and found that the Achilles tendon injury in competitors is as follows: Superficial injury and swelling in men is 68.2% and in women 31.8%, as well as tendon rupture. Achilles was reported in 18.8% of men and 10.35% of women(72). Huttunen et al. study on acute Achilles rupture and surgical injury between 2001 and 2012 in Sweden. It was 12.0. In 2012, the corresponding values were 55.2 for men and 14.7 for women, which increased by 17% for men and 22%

for women (73).

According to Matthew et al. who examined acute Achilles tendon rupture in active men and women over the age of 18 in Flanders' 25-year medical report, found that in recent years, 42% of men and 55% of women have Achilles injuries (74). Mattila et al. studied the reduction in the rate of surgery for Achilles tendon rupture in men and women and stated that orthopedic surgeons often chose the option of non-surgical treatment for acute Achilles rupture, which results in the same treatment for non-surgical rupture in men and women(74). Wang et al. comparing the treatment of acute Achilles tendon rupture from 2007 to 2011 in the United States with its European counterparts a total of 12570 patients were treated for acute Achilles tendon rupture. The ratio of non-surgical treatment increased from 1.41 to 1.65. Men undergo surgery more than women. There was no significant difference in the short-term interval for surgical treatment (2.1) versus non-surgical treatment (2.4). The proportion of patients treated for acute Achilles tendon rupture increased slightly over a 5-year period, indicating that surgeons in the United States are slower than their European counterparts in performing non-surgical treatment (75).

Cramer et al. studied five hundred and sixteen patients (416 males, 300 females) in Damarak and reported that patients 40 to 65 years of age in men and women with a lower mean than patients 65 years of age and older had Achilles tendon rupture, but in Among patients over 65 years of age, men with 68.8% and women with 53.6% had Achilles tendon rupture (76).

Generally according to the study of science and review articles, damage to the tendon is five times more common in

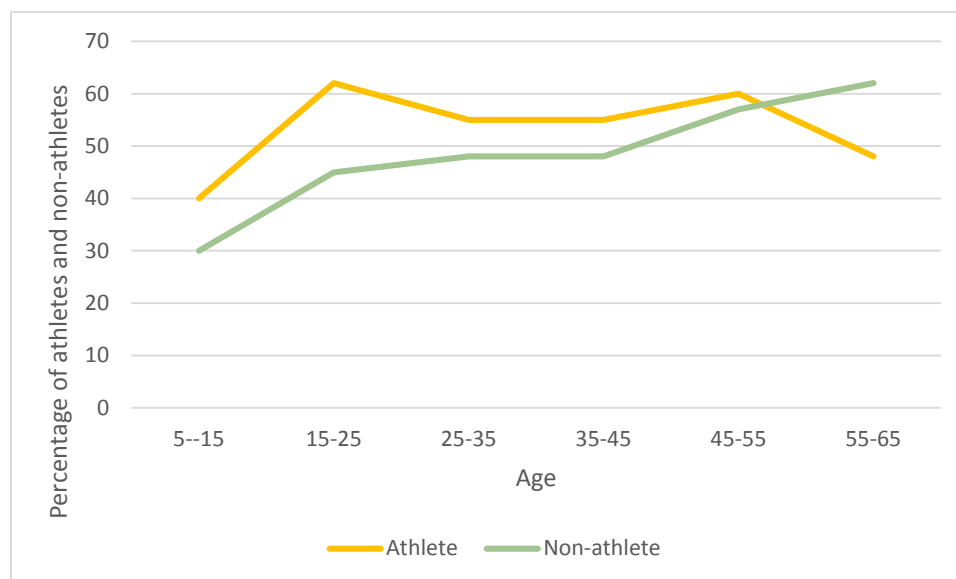


Figure 3. Relates to the percentage of athletes and non-athletes and the age of individuals

men than women(77-82). According to researchers, in the last twenty years, men are more likely to suffer from an Achilles tendon than women of course, in the age range of 35 to 55 years, women are ahead of men due to overweight and menopause, and according to the present studies, except for the age range mentioned, the rate of harm is higher in men (Figure 2).

Athlete and non-athlete

Al-Ferdows *et al.* reported that in the last five years, 44% of badminton players suffer from Achilles tendon pain and injury in this area, which middle-aged players experience in most competitions (83). Moraly *et al.* during a five-month trial sedentary and non-athletic people who were about 44 years old reported that they developed Achilles tendon pain due to inactivity after light walks and light physical exercises(84).This injury is also seen in normal people who are not athletes who suffer from Achilles tendon injury due to strain, trauma or illness (85-89). According to the study of Emerson *et al.* male gymnasts cause more damage to their Achilles tendon in jumping and landing movements compared to female gymnasts (53).

According to the study of Notarnicola *et al.* the incidence of Achilles Tendinopathy in young female gymnasts is very high, which is 69.5% in the group of artistic gymnasts (67.1%) compared to the group of rhythmic gymnasts(90).Several other studies of acrobatic exercise are consistent with previous reports that the Achilles tendon injury in these athletes is also one of the most common injuries (90-93). Ververidis *et al.* reported that it is true that athletes are more prone to injury, but due to the muscle strength resulting from high mobility in them, the injury

heals faster and the person can almost return to previous movements faster than any normal person. [58]. Several other studies have shown that athletes are more at risk for Achilles tendon injury (94-99). A study of the effect of Achilles tendon rupture on professional basketball athletes showed that basketball players sometimes experience Achilles pain in pre-match training, but suffer during the match due to collisions and improper landings. Severe ruptures of the Achilles tendon, which can sometimes cause a person to become incapacitated to compete (100). Salnzman *et al.* Also studied the injuries caused in baseball during five years and reported that in the lower body injuries of these athletes, the Achilles tendon rupture has the highest percentage (101). And there are several other studies on group exercise and treatment in line with previous studies that the prevalence of Achilles injury in the lower torso of these athletes was higher (102-105).

In general, compared to the rate of onset of injury in normal people and athletes, according to reports, athletes are more prone to injury, but due to mobility and muscle strength, injured people in athletes are treated faster than normal people(8, 106-108) (Figure 3).

Professional and recreational athletes

Fouré *et al.* examined the effects of plyometric training on stiffness and Achilles tendon loss properties in novice athletes after 14 weeks of training on 19 soccer volunteers in the control group and 20 athletes in the non-training group. 47.28% plyometrine exercises are effective in preventing Achilles tendon injury in novice athletes (109). According to Morsi *et al.* during a study on the treatment of tendonitis in professional football athletes, due to

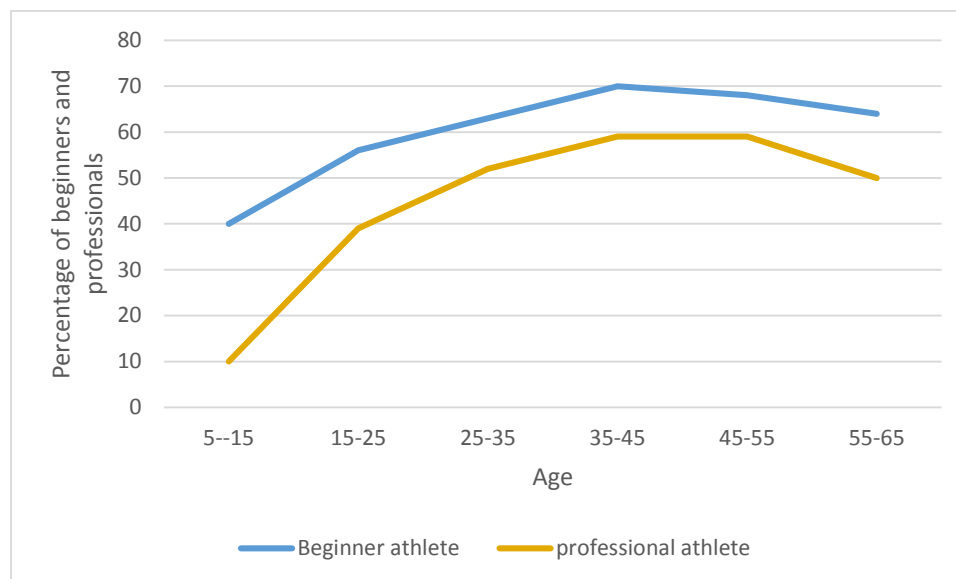


Figure 4. relates to the percentage of novice and professional athletes and the age of individuals

the thickness of the Achilles tendon, most injuries in athletes tend to be undetectable and associated with chronic pain, which can be relieved with a few sessions of light exercise. People with severe tendonitis can be compensated by a few weeks of rest and the start of light exercise (110). Abate *et al.* examine the high prevalence of patellar and Achilles tendonopathies in the U.S. youth futsal team during three sports seasons. 9.7 tendons were observed and at the end of the season a total of 10 athletes (55.5%) at the end of the season showed tendon damage which according to the present study shows a high prevalence of tendinopathy in professional futsal athletes, often with denervation (111).

Hutchison *et al.* regarding the treatment of Achilles tendon rupture using a specific management program in professional athletes in different disciplines on 215 male athletes who suffered Achilles tendon rupture stated that lower body strength training in a sports program and a regular treatment period of 1 to 2 years can help athletes return to sports fields [76]. Smith's *et al.* Also reported that in novice runners during the six-week program, 78% of the 185 athletes developed Achilles tendonitis due to not attending six-week training sessions (112). Lima *et al.* investigated the effect of neuromuscular shock on muscle strength, range of motion and pain intensity of the glenohumeral joint in professional handball athletes. Damage in the glenohumeral joint causes deviation of the hip and ankle angle, which causes stretching and tearing of the Achilles tendon and over time causes pain in this part of the athletes (78).

According to Kimler *et al.* which looked at the onset of injury in skilled and novice runners over a four-year period, novice runners began to complain of Achilles pain after a week of

training (113). According to the reports of Jason Brumit *et al.* injuries in beginner and novice basketball players are more likely to rupture the Achilles tendon during the game due to imbalance and injury prevention (80). Dillon *et al.* examined lower extremity isometric muscle torque and dorsiflexion range of motion with foot tendon injury in 342 novice runners and found that mild tears in novice runners caused 68% of Achilles tendon injuries. Acute rupture also accounts for 43.5% of injuries (81).

According to studies, Achilles tendon injury is more common in novice athletes than professional athletes (114-117). According to his study, both beginners and professional athletes are prone to injury, and between these two professional athletes, they undergo a shorter treatment period than novice athletes (100, 118-122) (Figure 4).

Overweight

Barton *et al.* who surveyed 6.4 million patients at the health center, said that one of the main reasons for Achilles tendon rupture was overweight, especially the presence of fat in the lower body (123). Vittorio and Valon (2014) said a common cause of non-traumatic tendon rupture is local penetration of corticosteroids, This injury is more common in overweight people (124). Klein *et al.* Examining the relationship between BMI and Achilles tendon injury in 944 patients at a physiotherapy center from 2002 to 2011 and reported that women with a BMI of 27-30 and men with a BMI of 32-29 had mild ruptures, but Both men and women in BMI of 35 and older who were obese had more severe ruptures treated with surgery (125). Hunt *et al.* in order to implement a weight loss and healthy lifestyle program with sexual sensitivity for obese men in the Scottish Premier League football club,

randomly selected 747 athletes with an average age of 65-35 years and divided them into two control and experimental groups. They did 355 people were in the control group and 374 people were in the experimental group, who lost weight during 12 months of exercise and proper diet. Hunt reported that weight loss in these subjects reduced the risk of Achilles tendon rupture by 52.67% compared to control subjects [94].

According to Heyward *et al.* Overweight due to overload on the lower torso of novice runners causes damage to the Achilles tendon in obese people (126).

According to several similar articles to previous articles on the impact of overweight on Achilles tendon injury it can be stated that due to the anatomy of the Achilles tendon, which is located in the lower part of the body and bears the body's weight, obesity can be an important cause of Achilles tendon injuries (127-131).

Concussion

In conclusion, based on many articles, maybe we can say that, by increasing age, the incidence of Achill tendon injuries will increase (132-141) Athletes, especially runners, are more exposed to Achill ruptures (142-146) Also men will suffer more from Achill's disease (147, 148) and exercise therapy and physiotherapy can help people who suffer from these problems (143, 149, 150) In everyday life and in all sports, the legs bear the entire weight of the body, so they are the most vulnerable part of the body, and Achilles tendon injury is one of the most common injuries to the lower torso, which accounts for more than 42% of all lower injuries.

Of course, factors such as age, gender, athlete hood, and non-athleticism also affect the onset of injury. Such as rheumatism and osteoporosis that occur in old age, but in women who suffer from menopause, pain and damage to the Achilles tendon has also been reported.

Also, among athletes, especially sports that focus on the legs, such as running and football and sports such as this, Achilles injury statistics are significant. Of course, acrobatic and group sports and dealing with this injury are not safe from pain, swelling and even Severe Achilles tendon ruptures have also been reported in these sports. As mentioned, injuries have been reported in normal individuals due to the anatomy of the Achilles tendon and body bearing.

Physicians and sports coaches have come up with many ways to treat and prevent this injury. Superficial injuries, pain, and swelling can usually be treated without surgery with the help of inexpensive tools, but severe Achilles tendon ruptures can be treated with surgery and long courses of treatment and

physiotherapy. Follow your former professional sport.

Acknowledgment

None

Conflict of interest:

None

Funding support:

None

Authors' contributions:

All authors made substantial contributions to the conception, design, analysis, and interpretation of data.

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