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Ankle sprain injury prevalence, risk factors and current prevention interventions among amateur male soccer players in Umkhanyakude district, Kwa-Zulu Natal.

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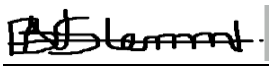
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A dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfillment of the requirements for the Masters of Science in Physiotherapy.

Johannesburg, 2022

Declaration

I Bongumusa Sicelo Tembe declare that this Research Report is my own, unaided work. It is being submitted for the University of the Witwatersrand, Johannesburg, South Africa for a degree of Masters in Physiotherapy. It has not been submitted before for any degree or examination at any other University.

Bongumusa Sicelo Tembe 

Name of candidate Signature of candidate

31 day of October 2022 in the University of Witwatersrand, Johannesburg South Africa

Dedication

I dedicate this to my mother…Thank you Ndlovukazi

Abstract

Background: Soccer is one of the most played sports globally, with different levels of participation including amateur and professional levels. Participation in sports has health benefits such as prevention of cardiovascular and chronic diseases and general body health and fitness. The soccer players encounter different injuries including the ankle sprains, which burden the health sector and cut players' career trajectory short. This study aims to determine ankle sprain injury prevalence, risk factors and current prevention interventions in Kwa-Zulu Natal male soccer players.

Methods: A cross-sectional design was used to conduct this study from eighty four soccer players that were playing in six different teams. All teams were registered in Umkhanyakude South African Breweries (SAB) league under Jozini municipality. Data was saved in Excel and exported to statistical package for social science (SPSS) tool version 27 for analysis. Fisher's test was used to test the associations between risk factors and prevalence of ankle sprain.

Results: Eighty four players were included in this study. Fifty percent of the players had ankle sprain injuries. Direct contact and previous ankle sprain were associated with prevalence of ankle ($p<0.001$), while body mass index (BMI), playing position, limb dominance and cleat type were not found associated with ankle sprain prevalence ($p>0.05$). There was no injury prevention intervention program that soccer teams were practicing to reduce injury occurrence.

Conclusion: Ankle sprain injuries are prevalent in amateur soccer players. Direct contact and previous ankle sprain are significantly associated with ankle sprain injuries. Proper injury prevention intervention is not practiced in amateur soccer players. Therefore, prevention intervention is needed in amateur soccer players to reduce the prevalence of injuries.

Keywords: Ankle injury, sprain, prevalence, risk factors and prevention.

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List of abbreviations

ADT	: Anterior Drawer Test
ATFL	: Anterior Talofibular Ligament
BMI	: Body Mass Index
CDC	: Centers for Disease Control
CFL	: Calcanofibular Ligament
FAOS	: Foot and Ankle Outcome Score
FIFA	: Federation Internationale de Football Association
HREC	: Human Research Ethics Committee
KZN	: Kwa-Zulu Natal
LOVE	: Load, Optimism, Vascularization and Exercise
PEACE	: Protection, Elevation, Avoid anti-inflammatories, Compression and Education
POLICE	: Protection, Optimal loading, Ice, Compression and Elevation
PSL	: Premier Soccer League
PTFL	: Posterior Talofibular Ligament
RICE	: Rest, Ice, Compression and Elevation
ROM	: Range Of Motion
SAB	: South African Breweries
SAFA	: South African Football Association
SPSS	: Statistical Package for Social Sciences

Chapter 1: Introduction

1.1 Background

Soccer is considered to be one of the most played sports across the world with approximately more than 265 million soccer players in the world (Henry et al., 2016). People engage in soccer for different reasons, such as pleasure or hobby, social interaction, healthy living and as an employment (professional soccer players). Federation Internationale de Football Association (FIFA) classifies soccer players as either professionals or amateurs. Professional players have a signed contract with their teams and are getting paid, while amateur players have no contracts and do not receive salary. Playing at either professional or amateur level improves health and is promoted by medical doctors and sports scientists to prevent cardiovascular and other chronic diseases that affect peoples' health (Fong et al., 2009). Despite the mentioned health benefits of involvement in sport, players encounter different injuries, which become a burden to health sectors. The injuries also cut the career trajectory of amateur soccer players to professional level.

Ankle injury is one of the major injuries that soccer players sustain more in amateur level compared to professional level (Vareijken, 2012). Globally, soccer related injuries occur mostly in lower limbs (76.6%) and ankle joint injuries being more prevalent (49.9%) (Lam et al., 2017). The study conducted by Lievers and Adamic (2015) in soccer players also reported high prevalence of ankle injuries in all lower limbs' soccer injuries. There are limited studies that have been done in Africa continent that look at the epidemiology of soccer injuries. One study that was done in Nigeria, on the prevalence of soccer injuries reported 81.6% soccer related injuries, with the ankle joint being the most affected body part (25%) followed by the knee joint (20%) (Azubuike et al., 2008).

The most reported ankle injuries are ligament sprain injuries, which are caused by the damage of the passive ligamentous structures of the ankle joint and in most cases this damage happens when the ankle joint is forceful planta-flexed and inverted at the same time, which results in lateral ankle sprain injury (Hubband-Turner et al., 2010). There are intrinsic and extrinsic factors that predispose players to ankle sprain injuries. Intrinsic factors, are factors that occur inside the person's body such as limb dominant, playing position, previous ankle sprain, increased or decreased body mass index (BMI), age, ankle joint laxity and balance or proprioception (Fousekis et al., 2012. While extrinsic factors include direct contact with the opponent, playing ground and soccer boot cleats (Engebretsen et al., 2009; Fousekis et al., 2012). Ankle injury leaves players out

of play for many weeks and some players do not recover fully, it is therefore important to examine the predisposing factors to the ankle injuries in order to inform prevention interventions.

The prevalence of ankle sprain injuries in soccer or football players is relatively high and that raises a question about the practice of ankle injury preventive interventions. According to Owoeye et al., (2018) preventive interventions should be developed from the possible injury risk or predisposing factors. The most popular ankle injuries preventive interventions are prophylactic taping, proprioceptive training or exercises, ankle braces, strengthening of evertor muscle and other legs muscles (Schiftan et al., 2014). The FIFA 11+ prevention programme which comprises of warm-up strategies is widely used by many soccer teams, but there is limited information on the up-take of this programme in amateur soccer teams. In order to develop targeted interventions, there is need to understand prevention strategies by soccer players to prevent and manage ankle injuries.

1.2 Problem Statement

Ankle injuries have been reported to be the most prevalent injuries in soccer players, however most of the studies were done in high income countries and in professional soccer players. There is limited research on the prevalence and soccer injury preventive strategies in low to middle income countries. The few studies that were conducted in African countries, were conducted in urban areas, which leaves a gap in understanding the extent of this problem in rural areas, like the rural part of Kwa-Zulu Natal (KZN) province (Umkhanyakude district). Rural areas have limited resources such as training materials, team medical staff and good condition training grounds.

1.3 Aims and Objectives

This study aims to determine ankle sprain injury prevalence, risk factors and current prevention interventions in Kwa-Zulu Natal male soccer players.

Objectives

1.3.1 To determine the demographic profile of players.

1.3.2 To determine the prevalence of ankle sprain injuries among Kwa-Zulu Natal amateur male soccer players

1.3.3 To determine ankle sprain injury risk factors among Kwa-Zulu Natal amateur male soccer players.

1.3.4 To determine the association between the prevalence and the factors influencing ankle sprain in amateur male soccer players.

1.3.5 To determine current ankle sprain injury prevention interventions.

1.4 Significance

The results and findings of this study will help us understand the extent of ankle sprain injuries in amateur soccer players and modifiable ankle injury risk factors. In addition, the findings will inform the development of a programme that prevents ankle injuries. Lastly it will help the physiotherapy department in planning and better management of the ankle injuries.

1.5 Outline of this Research Report

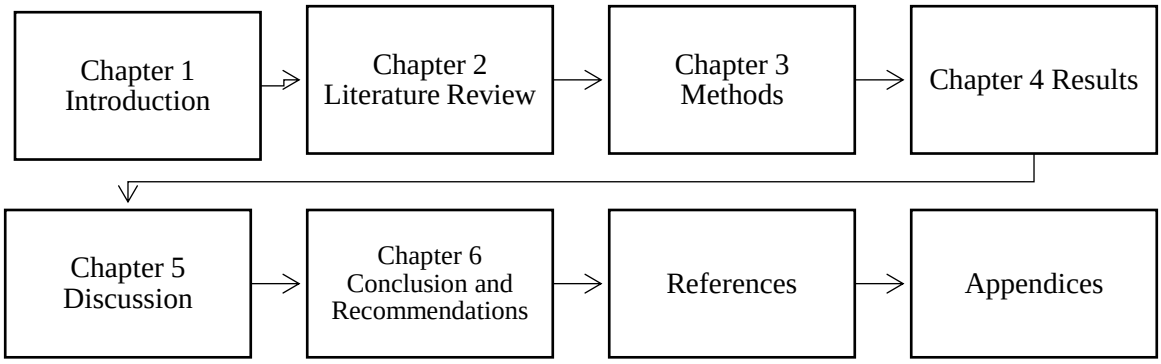


Figure 1.1. Outline of the research report

Chapter 2: Literature review

2.1 Introduction

In this chapter, research that has been conducted on the ankle sprain injury prevalence, risk factors and prevention interventions in male soccer players will be reviewed. Literature review synthesises evidence and looks at possible gaps where more research is still needed (Snyder, 2019). This review will cover the following topics: Ankle joint anatomy, sprain injuries and management, prevalence, risk factors and prevention interventions. The databases used include Google scholar, Pubmed, PeDro, SPORTDiscuss and clinical key to search pieces of literature from 2010 up to date. The key words that were used include ankle injury, sprain, prevalence, risk factors and prevention.

2.2 Ankle joint anatomy

The ankle (figure 2.1) is a synovial (hinge) joint made up of lower leg and foot. It allows the lower limbs to interact with the ground and is significant for gait and activities of daily living (Brockett et al., 2016). The ankle joint is complex with three sub-joints, namely tibiotalar (talocrural), talocalcaneal (subtalar) and transverse-tarsal (talocalcaneonavicular) joints (Fong et al., 2009). The articulation of these sub-joints allows the ankle joint to move to different directions and have more movements such as dorsiflexion (upward movement of the foot), plantarflexion (downward foot movement), inversion (inward foot movement) and eversion (outward foot movement).

Dorsiflexion and plantarflexion occur in the tibiotalar joint, which is formed by the articulation of the lower tibia and fibula with the talus. The superior part of the tibiotalar joint is formed by the tibia in medial aspect and fibula laterally and the talus fits inferiorly. The combination of the tibia and fibula superiorly forms the inverted U-shaped space called mortise where the talus fits in (Medina et al., 2019). This ankle's sub-joint has good stability compared to the subtalar joint. Inversion and eversion occur in the talocalcaneal joint, which is formed by the articulation of talus, calcaneus and two tarsal bones (Medina et al., 2019).The stability of the ankle joint is maintained by the lower end of the tibia and fibula (mortice) and talus bone, ligaments and muscles attached to ankle bones (Fong et al., 2009).

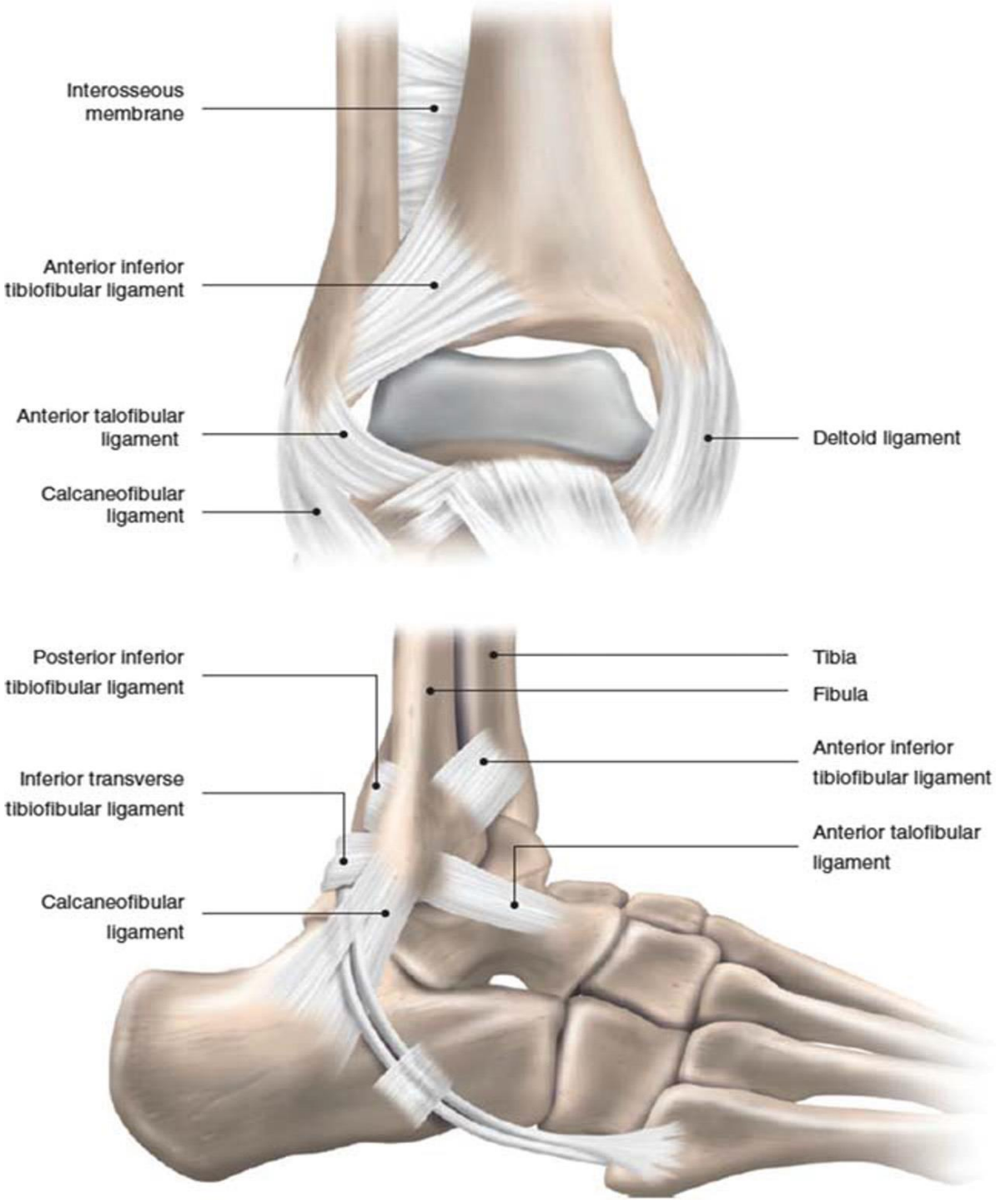


Figure 2.1: Ankle joint anatomy (D'hooghe and Alkhelaifi 2020)

2.2.1 Ligaments of ankle joint

The ankle joint has two complexes of ligaments, namely lateral and medial (deltoid) collateral ligaments. These two ligaments add to the ankle joint stability. The lateral collateral complex is located on the lateral joint aspect and adds stability to the lateral joint. The medial collateral is located medially, adds medial stability of the joint and consists of a multi-fascicular group of ligaments, which are divided into deep and superficial groups of fibers (Golano et al., 2010). This review will focus more on the lateral collateral ligament complex (figure2) as it appears to be the most affected or injured in all ankle sprains (Kabayoshi et al., 2016, Wever and McCollum 2018 and Hossain et al., 2019).

The lateral collateral ligament (figure 2.2) is made up of the anterior talofibular ligament **(**ATFL), calcanofibular ligament (CFL) and the posterior talofibular ligament (PTFL). The three ligaments differ in strength and stability that they provide to the ankle joint. The ATFL is flat and originates from the anterior part of the fibula bone and runs anteromedially to insert to the lateral part of the talus bone (Golano et al., 2010 and Van de Bekerom 2012). It is the weakest of three lateral collateral ligaments and most injured (Kelikian 2011, Wever et al., 2016 and Halabihi and Hassabi 2020). ATFL kinetically limits anterior slide, inversion and internal rotation of the talus in relation to the tibia bone (Kelikian 2011). The CFL ligament is a cord-like ligament that originates from the lower part of the anterior malleolus and inserts to the posterior part of the lateral surface of the calcaneus (Kelikian 2011). It runs obliquely downward and backward on its way to attach to the calcaneous when the ankle joint is in a neutral position (Golano et al., 2010 and Van de Bekerom 2012). The CFL limits excessive ankle inversion movement when the ankle is dorsiflexed and is the second most injured ligament in ankle lateral sprain injuries (Hababchi and Hassabi 2020). The PTFL originates from the malleolar fossa, located on the medial surface of the lateral malleolus and runs horizontally to insert in the posterior-lateral talus (Golano et al., 2010 and Van de Bekerom 2012). It is the strongest of three lateral ankle ligaments and rarely gets injured with lateral ankle sprains (Kelikian 2011).

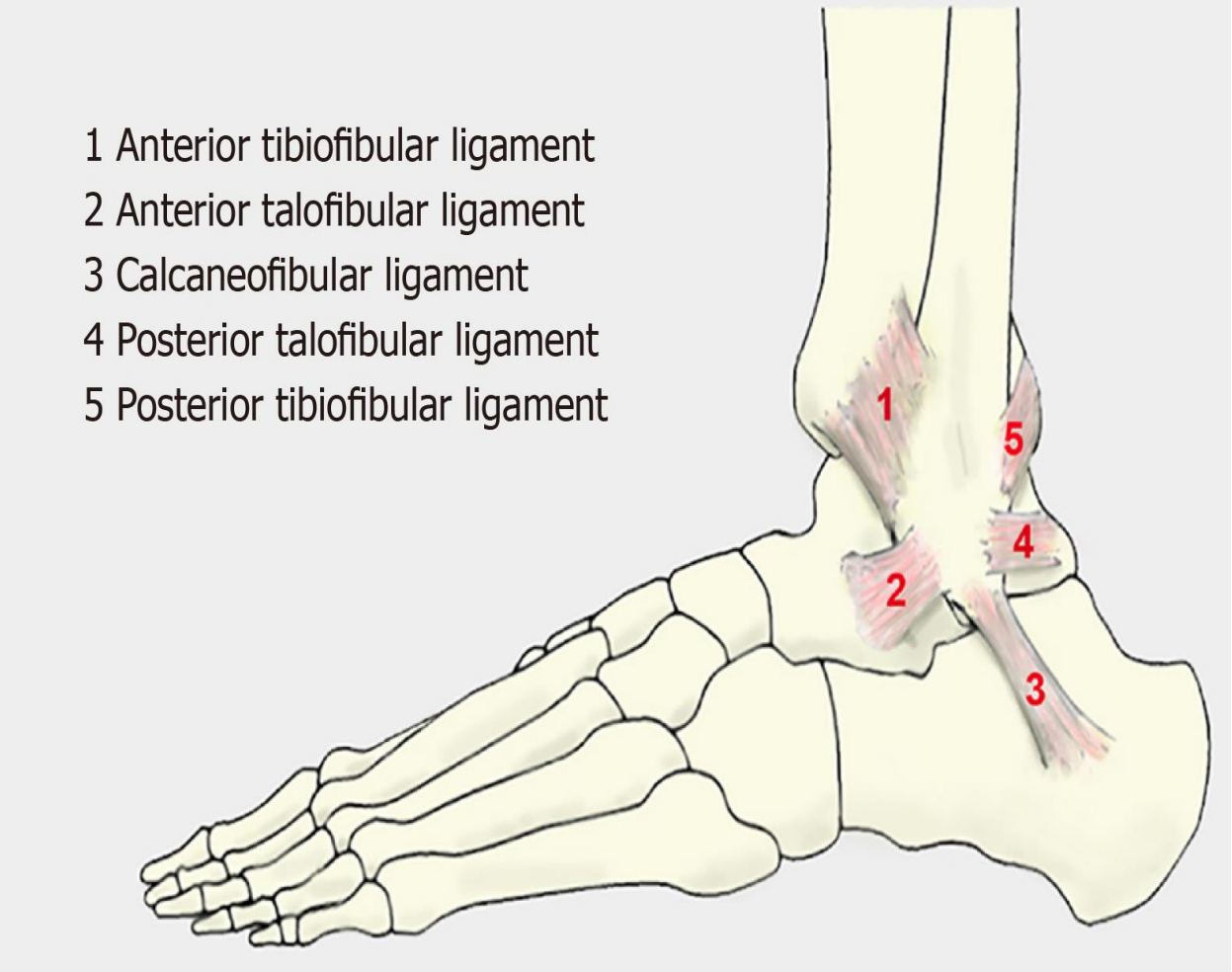


Figure 2.2: lateral ankle ligaments complex **(**Halabchi and Hassabi 2020)

2.3 Ankle joint injuries

Several types of injuries can occur on the ankle joint depending on the mechanism of injury, anatomical structures involved and the position of the joint and foot. The major ankle injuries include sprains, fractures, avulsion and tendon tear (Gulbrundsen et al., 2019). Ankle sprain injury is the damage or rapture of one or more passive ligamentous structures of the ankle joint. This damage or rapture usually occurs when the load to the ligament is increased while the ligament is stretched or in a stretched position (Halabihi and Hassabi 2020). The ankle sprain mostly occurs on the lateral ligamentous complex of the ankle (McCollum 2018). The anterior talofibular ligament (ATFL) is mostly affected (Wever et al., 2016, McCollum 2018 and Halabihi and Hassabi 2020). The lateral ankle sprain normally occurs when the ankle joint is forcefully plantarflexed and inverted at the same time (Turner et al., 2010 and Delahunt et al., 2018).

The ankle sprain injury is graded according to the severity and quantity of ligament fibers involved (Fong et al., 2009 and Halabchi and Hassabi, 2020). This grading scale includes grade 1, grade 2 and grade 3. Grade 1 and 2 are most prevalent and usually managed conservatively (Wever and McCollum, 2018).

Grade 1: Mild, minimal tear or damage of ligament fibers. Joint stability remains intact and there is no loss of function (Fong et al., 2009 and Halabchi and Hassabi, 2020).

Grade 2: Moderate, partial tear or damage to more ligament fibers and there's notable swelling and tenderness. Has little or no effect on the stability of the joint and there may be some loss of function (Fong et al., 2009 and Halabchi and Hassabi, 2020).

Grade 3: Severe; there is a complete tear or rupture of the ligament and the presence of significant instability of the ankle joint. There is significant loss of function (Fong et al., 2009 and Halabchi and Hassabi, 2020).

2.3.1 Diagnosis of ankle joint injuries

Diagnosis is the initial process of managing the injury. The ankle injury diagnosis is confirmed with physical examination and using a variety of imaging techniques including Xray, ultrasound, MRI and arthrography (Schneiders and Karas, 2016). However, imaging is not always indicated. Xray imaging can be done when the fracture is suspected and the clinician has subjectively and objectively assessed the client or injured athlete and followed the Ottawa ankle rule (figure 2.3) (Halabihi and Hassab, 2020).

2.3.2 Ankle Joint Injury Examination

Proper examination and diagnosis of injury improve and affect the injury management, recovery and return to play. Hababchi and Hassab, (2020) stated that the assessment of ankle injury should include both history taking (subjective) and physical examination to inform clinical diagnosis. History taking assists clinician to obtain the demographic data, mechanism of injury, weight-bearing status immediately after injury, history of previous ankle injury, symptoms and nature of the injury. The history aids in hypothesizing and identifying the cause of injury, anatomical structure/s involved and severity of injury by the clinician (Fong et al., 2012 and Delahunt et al., 2018). After taking thorough history, physical examination follows to confirm the hypothesis and clinical diagnosis.

Physical examination of the ankle joint injury confirms the clinical diagnosis. Kerkhoffs et al., (2011) and Van den Bekeron et al., (2012) stated that delayed (4-5 days) ankle injury physical assessment gives more accurate results than assessment that is done immediately after ankle injury. This is due to the diffused location of pain and swelling post injury. Kerkhoffs et al., (2011) further outlined the sensitivity of 96% and specificity of 84% for delayed ankle injury assessment. However, the accuracy of delayed assessment does not take away the importance of initial assessment immediately after ankle injury as it is imperative for providing initial first aid care and protecting or avoiding further injury to an athlete (Van den Bekerom et al., 2021).

The initial step of physical assessment is to exclude the fracture of the bones of the ankle joint and foot using Ottawa ankle rule (figure 2.3). This rule is highly recommended for all acute ankle injuries and reduces the cost of referring patients for imaging unnecessarily (Kerkhoffs et al., 2011 and Hoorntje et al., 2018). Therefore, clinicians should apply this rule when assessing acute ankle injuries.

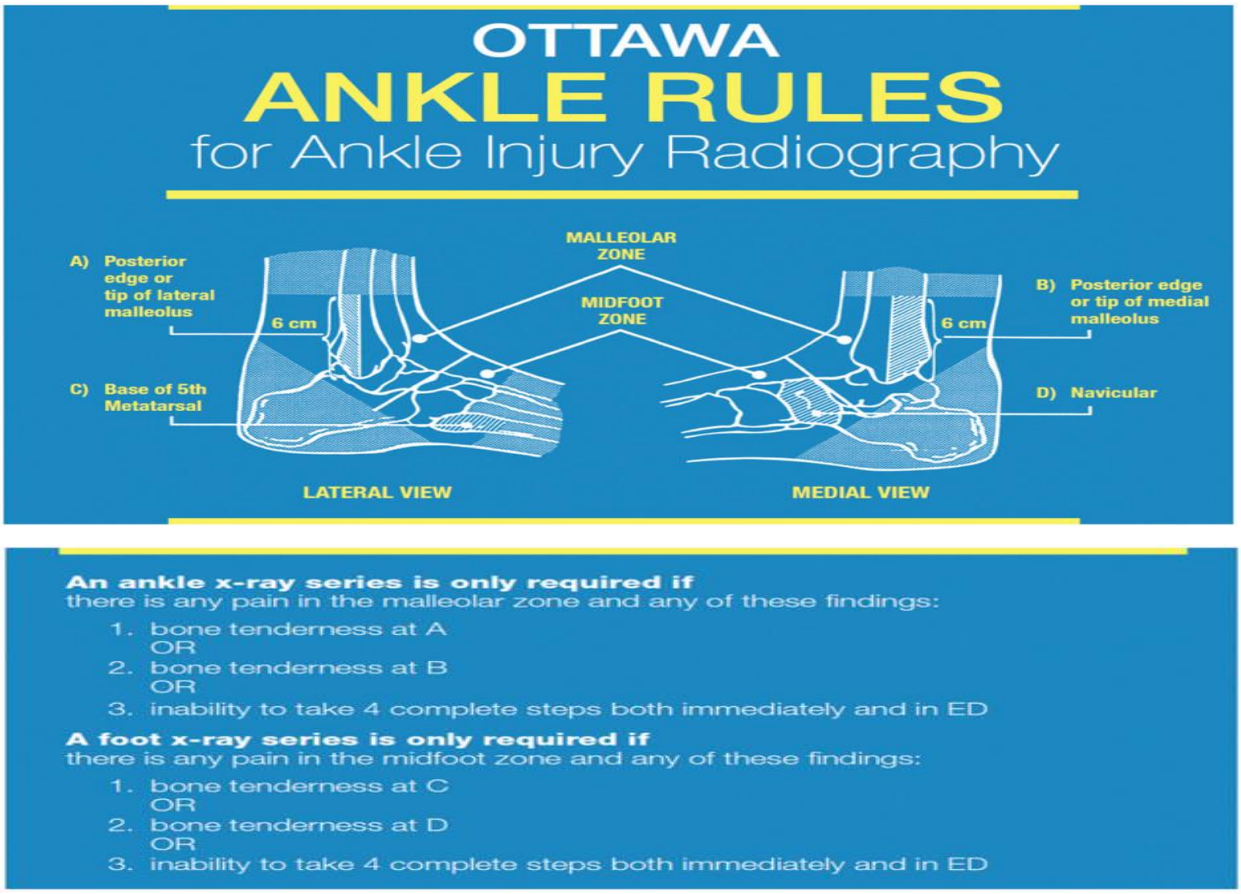


Figure 2.3: Ottawa ankle rules (Jonckheer et al., 2016)

The Ottawa ankle rules (figure 2.3) was developed to assist clinicians to exclude fractures of the ankle bones and foot when assessing patients or athletes with acute ankle injury (Kerkhoffs et al., 2011). To apply Ottawa ankle rule, clinician asks patient about the weight bearing status, palpates the base of fifth metatarsal, navicular bone and 6 cm distal end of both tibia and fibula as well as medial and lateral malleoli (Kerkhoffs et al., 2011 and Halabchi and Hassabi, 2020). In case the patient says or struggles to weight bear four steps im mediately after the ankle injury or in emergency room and reports tenderness on either malleoli or base of the fifth metatarsal imaging is required to exclude or confirm fracture (Delahunt et al., 2018 and Halabchi and Hassabi, 2020). Ottawa ankle rule has high sensitivity of 94.6% -100% and variable specificity of up to 79% in detecting fractures in both adults and children that present with acute ankle injury (Hababchi and Hassab, 2020). Furthermore, ligament laxity, muscle strength, ankle joint range of motion (ROM) and proprioception need to be evaluated to conclude the clinical diagnosis

The evaluation of ligament laxity of the lateral ankle involves the use of provocative and integrity tests. Anterior drawer test (ADT) and talar tilt are mostly used. ADT tests the integrity of ATFL, while talar tilt tests CFL integrity (Hababchi and Hassab, 2020 and Van den Bekerom et al., 2021). Van den Bekerom et al., (2021) further stated that positive ADT with combination of palpable pain on the ATFL confirms the ATFL injury with a sensitivity of 98% and specificity of 84%. However, the laxity tests can give false positive results in the initial assessment due to the dominance of pain and swelling. Delahunt et al., (2018), suggested that these tests should be conducted between 4-6 days post ankle injury in order to avoid false positive results.

2.4 Prevalence of ankle injuries

Ankle injuries have been reported to be the most prevalent lower limb sport-related injuries in athletes (Halabchi and Hassabi 2020). The ankle sprain injuries account for 16-40% of all sports-related injuries (Halabchi and Hassabi 2020). In 2010, ankle sprain injuries were the most prevalent injuries compared to other lower limbs injuries in the FIFA soccer world cup tournament that was held in South Africa (Dvorak et al., 2011). Some players could not finish the tournament due to ankle sprains. In the United States, an estimated 2 million people each year sustain ankle sprain injuries (Schneiders and Karas, 2016). The highest prevalence of ankle injuries in male soccer players was also reported in Saudi Arabia, with 63.8% being lower limbs injuries (Amer and Mohamed, 2020). This shows that ankle sprain injuries are a global concern in soccer.

Studies on the prevalence of ankle injuries in soccer players in African countries are scarce. In Nigeria, ankle injuries (25%) and knee injuries (20%) were the prevalent soccer-related lower limbs injuries (Azubuike et al., 2008). Most South African sports injury research focuses on rugby, hockey, cricket, netball and with limited focus on soccer. One study that was conducted in South African Premier Soccer League (PSL) showed that the ankle joint is the most common body part experiencing injuries (Calligeries et al., 2015). In addition, another study in South Africa conducted, a retrospective review of the medical record of patients treated in the outpatient department and reported 122 soccer-related injuries and most of them were ankle soft tissue injuries (Goga and Gondal 2003). More research needs to be conducted locally in both professional and amateur soccer players in South Africa.

2.5 Ankle injury risk factors

There are intrinsic and extrinsic risk factors related to ankle sprain injuries (Engebretsen et al., 2009). Intrinsic occurs inside a person's body, for example, limb dominance, previous ankle injury, increased body mass index (BMI), age, ankle joint laxity and balance and proprioception. Extrinsic factors include the players' playing position, direct contact with the opponent, playing field and the type of soccer boot cleats.

2.5.1 Limb dominance

There is mixed evidence related to the association between the risk for ankle sprain and leg dominance. A study conducted by Fousekis et al., (2012) found that non-dominant leg is more vulnerable to injury. On the contrary, Maulder (2013) reported that the dominant limb is a risk factor for lower limb injuries due to increased demand that athletes put on it leading to a functional asymmetry in motor ability. In soccer, the dominant and the non-dominant legs have different roles increasing the risk for injury. In soccer, the dominant leg is often used for kicking and running with the ball, which makes it more likely to be in contact with an opponent. While the non-dominant leg is often used for balancing, landing, pivoting, planting and is more likely to sustain injuries from landing. Understanding the biomechanics and leg dominance is very important as part of a prevention strategy.

2.5.2 Previous ankle sprain

Ankle sprain affects the agility of the ligaments increasing the risk for injury if not managed adequately. A cross-sectional study by Amer and Mohamed (2020) in Saudi Arabia found that the

presence of a previous ankle sprain increases the risk for future ankle sprains. There is a high rate of recurrent ankle sprain injury in soccer players (Kobayashi et al., 2016). The increase in recurrent injury could be due to the changes in joint biomechanics, dynamic stabilization and neural control that led to another injury of the joint (Thomas et al., 2019). This highlights the importance of prevention and adequate management of ankle injuries in soccer players.

2.5.3 Body Mass Index (BMI)

Increased body mass index (BMI) is one of the known predisposing factors of the ankle sprain. BMI is calculated by dividing the body weight (kilograms) by square height (meters), BMI scores lower than 18,5 is considered underweight, 18,5-24,9 is normal weight and 25-29,9 is referred to be overweight (Okorodudu et al.,2010 and Omair et al., 2017). A systematic review study by Kobayashi et al., (2016) concluded that BMI is one of the leading risk factors for ankle sprain injury. The case-control study on 606 football players found that more players who sustained ankle sprain injuries had higher BMI compared to the uninjured players (Gribble and Terada 2016). This could be due to the demand that soccer players must be able to rapidly change speed, but with high BMI the ability to rapidly change speed is reduced and greater force above stability of an ankle is required, which results in ankle sprain injury (Amoaka et al., 2017). Therefore it is important for athletes, coaches and trainers to monitor BMI and promote a healthy lifestyle.

2.5.4 Playing ground and cleat of soccer boots

Wearing appropriate soccer boots is important for injury prevention and protection of the foot. Different types of cleats and soccer boots are used when playing based on the field type and condition. Weather and field conditions influence the selection of soccer boots one can use for training or competition games (Galbusera et al., 2013). There is no recent study on the relationship between soccer boot cleat type and the risks for ankle injuries in soccer players.

2.6 Prevention strategies

Prevention of diseases and injuries is core to enhancing health and wellbeing for the soccer player. Prevention of diseases seeks to address the risks that can cause injuries and minimize further disability (Cohen and Swift 1999). Prevention can be at primary, secondary and tertiary levels (Pal et al., 2020)

2.6.1 Primary prevention

Primary injury prevention focuses on addressing the risk factors to avoid the initial injury from happening (Barelds et al., 2018 and Pal et al., 2020). Schiftan et al., (2014), highlighted that prophylactic taping, proprioceptive training or exercises, use of ankle braces and strengthening of ankle evertor muscles are the most popular ankle injury preventive interventions.

2.6.1.1 Prophylactic taping and usage of ankle brace

Prophylactic taping and braces can be used to prevent ankle injuries. Braces provide external support to the joint and are widely used by athletes with ankle instability. A study by Wong and Bellows (2018) reviewed the effect of bracing on the incidence of ankle sprain injuries. The review revealed that the use of braces reduces the risk of ankle sprain by 64% in athletes (Wong and Bellows 2018). However, this study reviewed only two articles indicating limited evidence on the use of braces to prevent ankle sprain injuries. Taping as an external support is used to improve proprioception of the ankle joint. A study by Bailey and Firth (2016) did not support the use of taping in improving proprioception in healthy soccer players, but encouraged to previously injured players. More research is needed on the use of prophylactic taping ankle brace to prevent ankle injuries.

2.6.1.2 FIFA 11+ injury prevention exercise program

The FIFA 11+ injury prevention exercise program was developed in 2006 to reduce soccer-related injuries among players. This program consists of different exercises for core stabilisation, neuromuscular control and balance and strength. The systematic review by Sadigursky and Braid et al., (2017) found the FIFA 11+ injury prevention program effective to reduce injuries in soccer players. However, this review only included one article from Africa. Another study that investigated the effectiveness of FIFA 11+ injury prevention program was conducted in Nigeria (Owoeye et al., 2014). The study showed how the FIFA injury program improved the reduction of injuries among soccer players by 41%. Therefore, the use of this program is effective, but more studies are still required in South Africa to determine the effectiveness of this program and to investigate whether this program is being applied by amateur soccer teams that have no medical staff.

2.6.2 Secondary prevention

Secondary sport injury prevention involves early assessment, diagnosis and treatment after the injury has occurred (Pal et al., 2020). This level of prevention aims to reduce the complications of the occurred injury and avoid disability (Barelds et al., 2018). For ankle sprain injury, this level of prevention is achieved by properly managing the injury and applying researched injury treatment protocols and rehabilitation strategies involving exercises for strength, balance and proprioception, wearing ankle braces and gradually returning to sports.

2.6.3 Ankle Joint Injury Management

Management planning for the ankle injury begins during assessment and continues after finding the clinical diagnosis, based on the type and grade or severity of injury, phase of healing and the player's level of participation. Ligament injury has three phases of healing namely inflammatory (first phase), proliferation (second phase) and remodeling or maturation (D'Hooghe, Cruz and Alkhelaifi, 2020). Most ankle sprains are treated conservatively, but surgical management is still an option for severe ankle sprain injuries (grade 3) in elite athletes (D'Hooghe, Cruz and Alkhelaifi, 2020).

The popular protocol that guides conservative treatment for soft tissue injuries includes Rest, Ice, Compression and Elevation (RICE). This protocol has been modified to Protect, Optimal loading, Ice, Compression and Elevation (POLICE) based on the research and the fact that an injured tissue needs to be protected to avoid further damage (D'Hooghe, Cruz and Alkhelaifi, 2020). Dubois and Esculier, (2019) proposed another soft tissue injury management protocol called PEACE and LOVE (figure 2.4).



Figure 2.4. PEACE and LOVE treatment protocol (Dubois and Esculier 2019)

The description of the PEACE and LOVE (figure 2.4) acronym is as follows:

Protection: It is important to protect the injured tissue or body part in the first few days after injury (acute phase) in order to avoid further injury (Dubois and Esculier, 2019). Movements and activities that provoke the pain should be avoided in the acute phase. The protection can be achieved by resting, use of protective equipment like a brace and moon-boot. For lower limb ligament sprains, muscle strain, using walking assistive devices like crutches is effective for protection and reduction of weight-bearing on the injured ligament/s.

Elevation: The injured part or limb should be elevated higher above the heart level to promote fluid flow and reduce swelling. Swelling occurs in the acute phase of injury and affects the somatosensory input to the central nervous system, (Delahunt et al., 2018)

Avoid anti-inflammatories: Anti-inflammatory drugs should be avoided in the acute phase, as it disturbs the natural healing of the tissue or ligament. Natural healing is crucial for repair of a damaged tissue (Dubois and Esculier, 2019).

Compression: This is achieved by applying external mechanical pressure using bandage or taping to limit intra-articular oedema and tissue haemorrhage, (Dubois and Esculier, 2019). Applying bandage or tape or strapping helps to reduce swelling after a ligament injury.

Education: Educating the athletes on injuries, natural healing, avoiding passive treatment and load management improves compliance to effective rehabilitation principles and protocol (Dubois and Esculier 2019). Education can minimize overtreatment and unnecessary injections or surgeries (Dubois and Esculier 2019). Involving other practitioners in this stage of rehabilitation is vital.

Load: As the tissue heals and pain starts to subside gradually, loading must be introduced. This is achieved by applying resistance, stretching and free movement exercises and it is important for repair, remodeling and build tissue tolerance to load, (Dubois and Esculier, 2019).

Optimism: Rehabilitation of an athlete should not only focus on physical and cardiovascular fitness. Recovery can be negatively affected by psychological factors such as fear, catastrophisation, depression, fear and beliefs (Dubois and Esculier 2019). Therefore all these factors should be addressed during rehabilitation to improve the recovery and return to participation or play.

Vascularisation: Blood flow to the injured structure is needed to improve the healing process. Pain-free aerobic exercises are recommended to be started as early as possible. Aerobic exercises improve cardiovascular function, which is important in participation and performance in sport. Early mobilisation with aerobic exercises improves physical function and reduces the need for pain medication in musculoskeletal conditions (Dubois and Esculier 2019).

Exercise: Exercise is recommended to start as soon as the patient can tolerate it after ligament injury. It aims to restore muscle strength and flexibility, mobility, proprioception, cardiovascular, agility and improve performance (Dubois and Esculier 2019). Exercises should be progressed based on the stages of healing, adaptation and the athletes' level of fitness to prevent overuse injuries (Impellizeri et al., 2020).

This protocol has been backed up by the fact that it guides the conservative treatment for soft tissue injury from the acute phase until the injury heals and the athlete returns to function or play. Research on the effectiveness of PEACE and LOVE treatment protocol is limited and thus more research needed in this area.

2.6.4 Tertiary prevention

This prevention level focuses on trying to reduce and correct the existing disability caused by disease or injury (Pal et al., 2020). For ankle sprain injury, this prevention level is achieved by ankle injury rehabilitation strategies involving exercises for strength, balance and proprioception and wearing of ankle braces with the aim of correcting disability and gradually returning to sport.

2.6.5 Spectrum of prevention

The spectrum of prevention should always be comprehensive and multifaceted. The spectrum of prevention of injury was proposed by Cohen and Swift (1999) as a multi-layered approach to addressing risk factors. The spectrum of prevention includes strengthening individual knowledge and skills, promoting community education, educating providers, fostering coalitions and network, changing organizational practices and influencing policy and legislation, (Cohen and S. swift 1999). None of the studies that were reviewed in this literature review chapter focused on prevention strategies that included fostering coalitions and networks, changing organizational practices and influencing policy and legislation development. There is a need for research applying the spectrum of prevention in ankle sprain injuries.

2.7 Conclusion

There is a high prevalence of ankle sprain injuries among lower limb injuries in male footballers globally. There is limited research in the African continent. There are many risk factors that can increase vulnerability to ankle sprain injuries. Prevention of ankle sprain injuries can be at a primary, secondary and tertiary level. Most studies were done in professional soccer teams or players, which leaves a big gap in understanding the prevalence and risk factors of ankle sprain at the amateur level globally and locally.

Chapter 3: Methods

3.1 Introduction

This chapter discusses how the data was collected. It will outline the study design and setting, participants, sample size and selection, instrumentation and outcome, pilot and main study. Data analysis and ethical consideration are also part of this chapter.

3.2 Study Design

The researcher used a cross-sectional study design. This type of design enabled the researcher to measure the outcome and analyse the associations between the variables (Setia, 2016).

3.3 Study Setting

The study was conducted in Jozini Municipality under Umkhanyakude district, which is located in the Northern part of Kwa-Zulu Natal (KZN), South Africa. According to Umkhanyakude district municipality profile and analysis development model (2020), this district has a population size of 689090 with 35.2% unemployed youth younger than 25 years and more than 70% of unemployment among the population younger than 35 years of age with a poverty rate of 71.1 %. This district is dominated by IsiZulu speaking population. The rate of unemployment is a big challenge to youth, but participation in sports, especially soccer helps them to stay away from crime and abusing drugs. However, there are poor sports participation facilitators such as training facilities and medical support to prevent and manage sports-related injuries.

3.4 Study participants

The study participants were amateur soccer players that were registered and playing in Umkhanyakude South African Breweries (SAB) League under Jozini cluster (stream B). Umkhanyakude SAB league had thirty registered teams and were divided into four (clusters) based on their locations within the district. Seven teams in Hlabisa municipality (stream A), eight teams in Jozini municipality (stream B), nine teams in Umhlabuyalingana municipality (stream C) and six in Umtubatuba municipality (stream D). Each team had an average of twenty two players with age ranging from sixteen to thirty seven years.

The study population consisted of eight teams from Jozini Municipality that were registered and playing in Umkhanyakude district SAB league under the province of Kwa-Zulu Natal.

3.4 Source of Participants

Participants were recruited from Jozini Municipality soccer teams that were registered to play in Umkhanyakude district SAB League. List and particulars of the teams and players were obtained from Umkhanyakude Sport and Recreation office located at Hluhluwe area with consent from South African Football Association (SAFA) office under Umkhanyakude region. A total of thirty teams were registered with 660 total number of registered players to play in Umkhanyakude district SAB League. Jozini municipality (cluster B) had eight teams with a total of 178 registered players.

3.5 Sample Size

The Naing et al, sample size calculator was used to calculate sample size at 95% level of confidence, based on the prevalence of ankle injuries in Nigeria (25%). The purposive sampling method was used to recruit participants and those that met inclusion criteria participated in the study. Researcher explained to all participants that only players with age of eighteen and above are allowed to participate. Players with acute lower limbs fractures were also restricted to participate in the study.

3.6 Sample Selection

Table 3.1 Inclusion and exclusion criteria of the participants

Inclusion criteria	**Exclusion criteria**
Registered teams and players from Jozini Municipality	Players with acute lower limbs fractures
Players aged 18 and above	Players with neurological disease or any other conditions, such as cerebral palsy and congenital lower limbs deformity.

3.7 Instrumentation and Outcome Measures

A questionnaire (appendix E) written in both English and IsiZulu languages was developed by a researcher based on previous studies on soccer player injuries (D'Hooghe et al., 2020 and Alamur and Mohamed, 2020). Three Isizulu and English speaking physiotherapists assisted to edit and

translate the questionnaire to IsiZulu language as the population is dominated by IsiZulu speaking people. The questionnaire face and content validity was also done by the three physiotherapists.

3.7.1 The questionnaire

Part A included demographic data (age, place, playing experience and position). Part B consisted of questions from the Foot and Ankle Outcome Score (FAOS) (Mani et al., 2013), FIFA injury report form (Fuller et al., 2006) and risk factors for ankle injuries in soccer. Part C included injury prevention strategies that the soccer players were applying during training sessions and match day.

3.7.2 Foot and Ankle Outcome Score (FAOS)

The FAOS is a patient-reported questionnaire that gives information on the variety of problems related to ankle and foot, such as pain, symptoms and sport, functional or recreation activities (Seldentuis et al., 2013). It consists of forty two questions which are divided into five different subscales. The score is calculated by summing the scores of the five different subscales, which is recorded into 0-100 scale. The scale of 100 represents full function with no pains and symptoms (Negahban et al., 2010 and Seldentuis et al., 2013).

The FAOS was used in the study that was conducted by Seldentuis et al in 2013. The study consisted of eighty nine participants that had undergone different ankle surgeries and hallux valgus correction. The internal consistency of FAOS was found to be high (0.90- 0.96) using Cronbach's alpha. The acceptable Cronbach's alpha was between 0.70 and 0.95 (Seldentuis et al., 2013). The FAOS has been shown to have high reliability with interclass correlation coefficient (ICC) of 0.92-0.96. (Negahban et al., 2010)

3.7.3 FIFA injury report form

The FIFA injury report form provides information about how the player was exposed to the injury and circumstances that surround that sustained injury. It must contain the team and player's reference number, date and nature of injury and should be completed immediately after injury to ensure that all relevant information is valid (Fuller et al., 2006).

3.7.4 Weight scale and stadiometer for Body mass index (BMI)

BMI is a commonly used anthropometric method to diagnose obesity. It is calculated using a person's weight in kilograms divided by the height in meters squared (Okorodudu et al 2010). This formula to calculate BMI had been found to be reliable (Peterson et al., 2016). Weight scale was

used to measure participants' weights in kilograms, which was used with height in meters to calculate BMI. Participants' heights were measured using a stadiometer.

3.8 Study procedure

3.8.1 Pilot Study

The pilot study commenced after ethical clearance (appendix D) was obtained from the Human Research Ethics Committee (HREC) of the University of the Witwatersrand (WITS) and permission to conduct the study from Umkhanyakude district Sport and Recreation. The purpose of conducting a pilot study was to examine the feasibility of the study design or approach of the main study. A pilot study was conducted from two teams that were recruited from Ingwavuma domestic league. A Total of eighteen players participated in the pilot study.

The researcher visited each team from their respective fields, COVID 19 precautions were adhered to: maintained social distancing, ensured that all participants were wearing masks and researcher and players' hands were sanitized before issuing the information sheets, questionnaire and blank ink pens. The procedure for completing the questionnaire was explained by the researcher before participants started to fill the questionnaire. Weight and height were measured by the researcher using a scale measure and stadiometer.

3.8.1.1 Pilot study findings

The study design and tools for main study were piloted in soccer players and found to be feasible. The results were not included in the main study data analysis.

3.8.1.2 Pilot study challenges

The main challenge that the researcher encountered when conducting pilot study was that the participants (players) were not keeping the meeting time and some of them were hesitant to participate in the study. Team managers explained the study information to players during the training before the researcher arrived. The questionnaire extracted all relevant and required information. Nothing was added and changed in the questionnaire for the main study.

3.8.2 Main Study

The main study followed the same procedure as the pilot study, but it was done in the teams and players that were playing in Umkhanyakude SAB league under Joizini Municipality cluster. Ethical clearance (appendix D) from the Human Research Ethics Committee (HREC) of University of the Witwatersrand (WITS) and permission (appendix C) to conduct the study in

Umkhanyakude SAB league was obtained before the main study commenced. The main study commenced on 18 June 2021 until 01 July 2021. The researcher visited one team per afternoon before they started training to ensure that all players were available to participate. Only those that met inclusion criteria participated in the study. Eighty four players participated in the study, fifty players were excluded as they were under eighteen years old and forty four were not available to participate.

3.8.3 Main study data analysis

The collected data was initially recorded and saved in Microsoft Excel, before it was exported to statistical package for social science (SPSS) tool version 27. All variables were analysed for normality. Only age in demographic profile of players was found numeric, while other variables were categorical type of data. Descriptive statistics were conducted and Fisher's test was used to establish associations between the variables. Significance as set at $p<0.05$ for analysis.

Table 3.2. Statistical tests and tools used in this study

Objectives	**Type of data**	**Statistical tests**
To determine the demographic profile of players.	Numerical Categorical	Mean and standard deviation Frequencies and proportion
To determine the prevalence of ankle injuries among Kwa-Zulu Natal amateur male soccer players	Numerical	Frequencies and proportion
To determine ankle sprain injury risk factors among Kwa-Zulu Natal amateur male soccer players.	Categorical	Fisher's test
To determine the association between the prevalence and the factors influencing ankle sprain in amateur male soccer players.	Categorical	Fisher's test
To determine current ankle sprain injury prevention interventions.	Categorical	Fisher's test

3.9 Ethical Considerations

Ethical clearance (appendix D) from Human Research Ethics Committee (HREC) of University of the Witwatersrand and permission (appendix C) from Umkhanyakude sports and recreation was obtained before the study was conducted. Information sheet (appendix A) was given to each participant, which clearly stated that participation was voluntary, participants had a right to withdraw at any given time and that their results will be kept confidential and will not be used against them. The confidentiality and anonymity of the participants were ensured. Participants did not include their personal particulars, therefore, the questionnaire or results cannot be linked back. Data is saved in a password protected computer and only the researcher and supervisor have access to data. Completed questionnaires will be stored in a locker for a period of five years and thereafter will be destroyed.

In this chapter, the study methodology was discussed, the next chapter will outline the results of this study.

Chapter 4: Results

This chapter will outline the results addressing the objectives of this study. The objectives were as follows:

1. To determine demographic profile of players.
2. To determine the prevalence of ankle injuries among KZN amateur male soccer players.
3. To determine ankle sprain injury risk factors among KZN amateur male soccer players.
4. To determine the association between the prevalence and the factors influencing ankle sprain in amateur male soccer players.
5. To determine current ankle sprain injury prevention interventions.

4.1 Study participants

Participants (soccer players) were recruited from eight teams that were based in Jozini Municipality under Umkhanyakude district in Kwa-Zulu Natal and played in South African Breweries (SAB) league. A total of eighty four amateur soccer players met the inclusion criteria and participated in the study.

4.2 Demographic profile

All players were recruited from eight different teams that were located from six different places including Gugulethu, Ingwavuma, Mathayini, Ndumo, Othobothini and Shemula within Jozini Municipality, which is under Umkhanyakude district in Kwa-Zulu Natal. The highest number of players were coming from Shemula (39.29%) and the lowest were from Ndumo (5.95%).

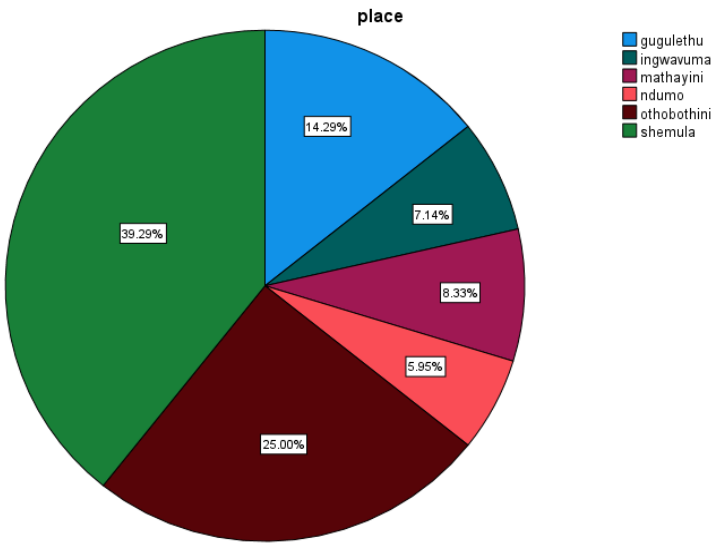


Figure 4.1: Pie chart outlines the location of teams and players

Table 4.1 outlines the demographic profile of participants. The majority of players had more than ten years playing experience (54.8%), with 18-36 years of age range and a mean age of 22.49 years. The highest number of players played in defensive position (39.3%) and there were few goalkeepers (7.1%).

Table 4.1: demographic profile of participants (n=84)

Demographic		T001 n(%)	T002 n(%)	T003 n(%)	T004 n(%)	T005 n(%)	T006 n(%)	T007 n(%)	T008 n(%)	Total n(%)
		n=20	n=12	n=13	n=13	n=5	n=6	n=8	n=7	n=84
Playing Experience	<10 yrs	6(30)	7(58.3)	7(53.8)	6(46.2)	2(40)	1(16.7)	4(50)	5(71.4)	38(45.2)
	>10 yrs	14(70)	5(41.7)	6(46.2)	7(53.8)	3(60)	5(83.3)	4(50)	2(28.6)	46(54.8)
Age	range	18-36	18-24	18-26	19-37	18-28	18-28	19-23	19-21	18-36
	mean	24.10	20.50	20.69	25.92	24.80	21.33	20.75	19.57	22.49
	Standard deviation	5.271	2.153	2.213	6.075	3.962	4.502	1.581	0.976	4.500
Playing positions	Defender	7(35)	7(58.3)	5(38.5)	6(46.2)	2(40)	0(0)	4(50)	2(28.6)	33(39.3)
	Goalkeeper	3(15)	1(8.3)	1(7.7)	0 (0)	0(0)	0(0)	0(0)	1(14.3)	6(7.1)
	Midfielder	6(30)	2(16.7)	6(46.2)	4(30.8)	1(20)	5(83.3)	2(25)	2(28.6)	28(33.3)
	Striker	4(20)	2(16.7)	1(7.7)	3(23.1)	2(40)	1(16.7)	2(25)	2(28.6)	17(20.2)

n: total number of participants in each team

4.3 Prevalence of ankle sprain injuries

The prevalence of ankle sprain injuries among Kwa-Zulu Natal amateur male soccer players was marked by previous or current ankle sprain injuries and was not being compared to other body parts' injuries. The results (figure 4.2) showed a prevalence rate of 50%. Forty-two participants had a history of previous or current ankle sprain injuries

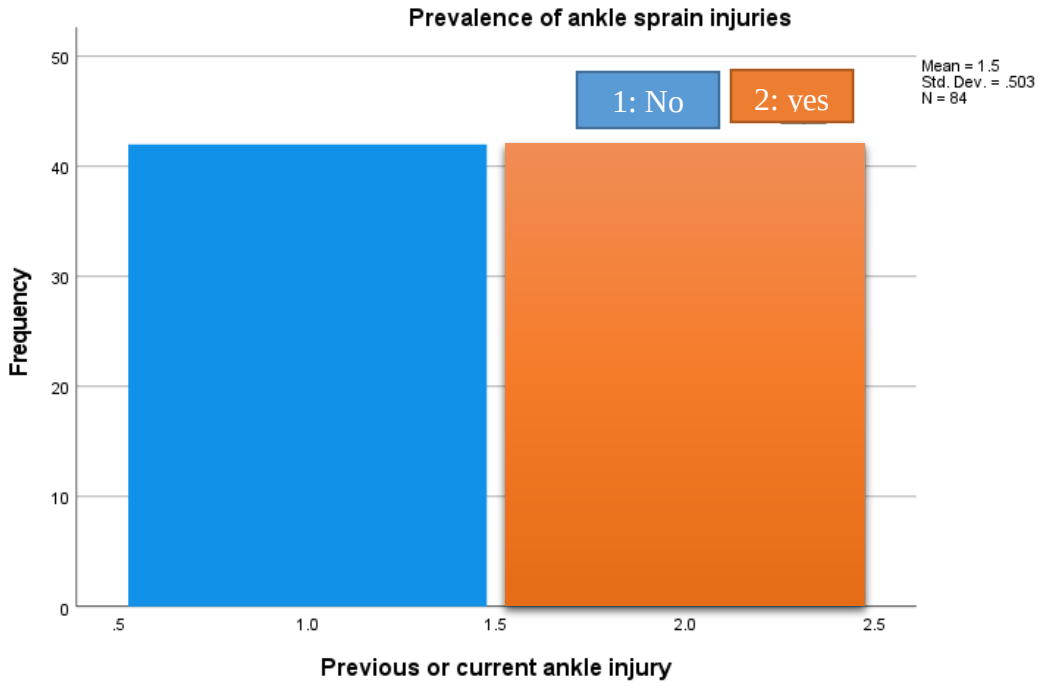


Figure 4.2: Prevalence of ankle sprain injuries

4.4 Risk factors for ankle sprain injury

Table 4.2 outlines the risk factors for ankle sprain injuries in all the teams. The majority of the soccer players who had ankle sprain injuries were right dominant players (78.7%) and played defender position (40.48%). Other risk factors with a high percentage included direct contact (54.76%) and the use of round cleat type (64.29%). A third of the players with injuries had a previous ankle sprain (38%). The majority of the players with ankle sprain injuries had a healthy BMI (71.43%). All teams were using a grass playing surface. However, all fields were not in good condition.

Table 4.2: Ankle sprain risk factors for each and all teams

Risk Factors		T001 (n=12)	T002 (n=8)	T003 (n=5)	T004 (n=5)	T005 (n=3)	T006 (n=3)	T007 (n=0)	T008 (n=6)	Total n=42
		Yes n(%)	Yes n(%)	Yes n(%)	Yes n(%)	Yes n(%)	Yes n(%)	Yes n(%)	Yes n(%)	Yes n(%)
Previous ankle sprain		3(25)	1(12.50)	2(40)	3(60)	2(66.66)	2(66.66)	0(0)	3(50)	**16(38.10)**
Direct contact		8(66.6)	5(62.50)	2(40)	4(80)	1(33.33)	1(33.33)	0(0)	2(33.33)	**23(54.76)**
BMI	Underweight (<18.5)	0(0)	2(25)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(4.76)
	Healthy weight (18.5- 24.9)	3(25)	5(62.50)	4(80)	2(40)	1(33.33)	2(66.66)	0(0)	6(100)	**30(71.43)**
	Overweight (25- 29.9)	0(0)	1(12.50)	1(20)	3(60)	2(66.66)	1(33.33)	0(0)	0(0)	10(23.81)
Playing position	defender	3(25)	5(62.50)	4(80)	2(40)	1(33.33)	0(0)	0(0)	2(33.33)	**17(40.48)**
	goalkeeper	2(16.66)	1(12.50)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	3(7.14)
	Midfielder	4(33.33)	0(0)	1(20)	2(40)	1(33.33)	2(66.66)	0(0)	2(33.33)	12(28.57)
	striker	3(255)	2(25)	0(0)	1(20)	1(33.33)	1(33.33)	0(0)	2(33.33)	10(23.81)
Limb dominant	left	2(16.66)	6(75)	2(40)	2(40)	0(0)	1(33.33)	0(0)	0(0)	9(21.43)
	right	10(83.33)	2(25)	3(60)	3(60)	3(100)	2(66.66)	0(0)	6(100)	**33(78.57)**
Cleat type	round	8(66.66)	6(75)	3(60)	2(40)	3(100)	2(66.66)	0(0)	3(50)	**27(64.29)**
	sharp	4(33.33)	2(25)	2(40)	3(60)	0(0)	1(33.33)	0(0)	3(50)	15(35.71)
Playing surface (grass)		12(100)	8(100)	5(100)	5(100)	3(100)	3(100)	0(0)	6(100)	42(100%)

n: number of participants with previous or current ankle sprain

4.5 Association between the prevalence and the factors influencing ankle sprain in amateur male soccer players.

The table 4.3 shows the results of the association between the prevalence and factors influencing the ankle sprain injuries in Kwa-Zulu Natal amateur soccer players. There is no statistically significant difference between ankle sprain injury prevalence and BMI, playing position, limb dominant and cleat type. There was a significant association ($p<0.05$) between ankle sprain prevalence and previous ankle sprain and direct contact.

Table 4.3: The association between prevalence and factors influencing the ankle sprain injuries

Factors		Previous or current ankle sprain (prevalence)	P-value
		Yes n(%)	**0.000**
Previous ankle sprain		16(38.10)	
Direct contact		23(54.76)	**0.000**
BMI			0.378
Playing position	defender	17(40.48)	0.972
	goalkeeper	3(7.14)	
	midfielder	12 (28.57)	
	striker	10(23.81)	
Limb dominant	left	9(21.43)	0.061
	right	33(78.57)	
Cleat type	round	27(64.29)	0.818
	sharp	15(35.71)	

4.6 Ankle sprain injury prevention Intervention

Tables 4.4 outlines the injury prevention intervention that the teams were practicing during the training. Participants were asked about the warm-up program during the training or match and whether they used any ankle protection such as ankle brace and taping. The majority of the players (71.43%) ran in the training field for less than ten minutes as their form of warm-up and injury prevention. Very few players (10.71%) wore ankle braces or used taping as a form of ankle injury prevention.

Table 4.4: Ankle injury prevention intervention

Prevention intervention	**Duration (minutes)**	
	Less than 10 minutes n(%)	More than 10 minutes n(%)
Running in the training field	60 (71.43%)	24 (28.57%)
Using brace/ taping	**Frequency**	
	Yes n(%)	No n(%)
	9(10.71)	75(89.29)

n: number of participants

In this chapter, the results were outlined. The next chapter will discuss the results in relation to previous studies on ankle sprain injuries.

Chapter 5: Discussion

5.1 Introduction

This chapter will discuss the results related to the study's aim and objectives. The study aimed to determine ankle sprain injury prevalence, risk factors and current prevention interventions in Kwa-Zulu Natal male soccer players.

5.2 Demographic profile of players

This study had eighty four participants recruited from eight different teams located in six different places within Jozini Municipality under Umkhanyakude district in Kwa-Zulu Natal (KZN). The majority of players (39.29%) that played in Umkhanyakude South African Breweries (SAB) league in stream B were from Shemula area, which had two different teams (T001 and T004) that participated in the league. Ndumo area had the least number of players (5.95%) and only one team (T005) participating in the SAB league.

The SAB league aims to promote the inclusion of young players in the league to get promoted to professional South African male football second division (Glad Africa Championship) and first division (DSTV premiership). The mean age of the players in the Umkhanyakude SAB league was 22.49 years ranging from 18 to 36 years. The mean age (22.49 years) for players aligns with the Glad Africa Championship's rule, which says all participating teams should have at least five under twenty three year old players in the team sheet and minimum of two players from each team must be on the field all times during the match. The majority (54.8%) of players in this league had more than ten years experience in playing football. This shows that their playing skills have developed and they are capable of competing at a professional level, where they can earn a salary. An opportunity to play professionally can reduce poverty and unemployment rate in Umkhanyakude youth population, which was reported to be high in the Umkhanyakude district municipality profile and analysis development model (2020).

The highest number (39.3%) of players played in the defender position and midfielders (33.3%) were the second highest. There were few goalkeepers (7.1%). This tasks teams' managers and the coaches to work more in developing goalkeepers and strikers to balance the number of players in all different playing positions, which may assist to improve the performance of the teams.

5.3 Prevalence of ankle sprain injuries

Fifty percent of soccer players in Umkhanyakude SAB league had ankle sprain injuries. The prevalence rate in this study was higher than 11.2 % to 20.8% reported in a systematic review study by Noronha et al (2019). However, the prevalence was similar to the studies conducted by Lam et al (2017) and Amer and Mohamed (2020) that reported high prevalence of ankle sprain injuries among all lower limbs injuries. Lam et al (2017) examined lower limb injuries among male amateur soccer players in Hong Kong and found ankle sprain most prevalent with 49.6 %. While Amer and Mohamed (2020) looked at the prevalence and risk factors for ankle sprain among male soccer players in Saudi Arabia and found 63.8% ankle sprain injury rate. The high prevalence found in this study points to the need to strengthen prevention care for ankle injuries. Therefore it is imperative for researchers, sports management and clinicians in the sports field and the public sector to research and implement changes, early intervention and injury prevention programs at an amateur soccer level to reduce injury prevalence and improve the career trajectory of young soccer players.

5.4 Ankle sprain injury risk factors

There are intrinsic and extrinsic factors that predispose soccer players to sustain ankle sprain (Engerbretsen et al., 2009). The investigated intrinsic and extrinsic risk factors in this study were previous ankle sprain, direct contact, body mass index (BMI), playing position, cleat type and playing field. The majority of the soccer players who had ankle sprain injuries were right dominant players (78.7%), played the defender position (40.48%). Other risk factors with a high percentage included direct contact (54.76%) and the use of round cleat type (64.29%). A third of the players with injuries had a previous ankle sprain (38%). Future studies in ankle injuries among amateur soccer players must include other risk factors that were not included in this study, such as ankle range of motion (ROM) and muscle strength (Martin et al., 2021).

From the analysis, only direct contact and previous ankle injuries were significantly associated with ankle injuries ($p<0.05$). These results are similar to the findings from the systematic review study conducted by Wikstrom et al (2021) that evaluated the association between previous lateral ankle sprain and new ankle injury and reported that there was association between previous lateral ankle sprain and new ankle sprain. A systematic review study by Kobayashi et al (2016), reported that more than 40% of the ankle sprains in soccer players resulted from previous ankle sprains. A

possible reason for ankle sprain injuries among soccer players with previous ankle injury could be linked to the physiological changes in the ligaments and joint biomechanics, dynamic stabilisation and neural control (Thomas et al., 2019). These changes in the joint can be reversed with rehabilitation if prevention interventions are adhered to.

Direct contact is another risk factor for ankle sprain injuries that had a significant association (Fousekis et al., 2012). Ankle sprain due to direct contact injury happens when there is a direct tackle between players on the medial aspect of the lower leg or ankle while the foot is planted on the ground (Walls et al., 2016). This causes forced ankle inversion and stretching of the ankle lateral ligament complex. The current study finding corresponds with the results reported by Walls et al (2016) that investigated ankle and foot injuries in professional soccer players. They found that 59% of ankle sprain injuries were sustained due to direct contact (Walls et al 2016). The implementation of sportsmanship and fair play in players through education can assist to reduce injuries caused by direct contact.

The body mass index (BMI) is another risk factor for ankle sprain injuries in soccer players (Gribble et al., 2012 and Kobayashi et al., 2016). The majority of the players in this current study with ankle sprain injuries had a healthy BMI (71.43%) and 23.81% were overweight. However, there was no significant association between ankle sprain injuries and BMI. This study's findings are contrary to the findings from Kobayashi et al (2016) study, which found a significant correlation between ankle sprain injury and increased BMI in soccer players. Amoaka et al (2017), stated that increased BMI reduces the player's ability to rapidly change speed and direction as required in soccer, which can increase the risk for ankle sprain injury. Therefore, dietary education, health promotion and weight reduction programs should be part of training in soccer players in order to reduce the risk of ankle sprain injuries.

Playing position has been highlighted to be a risk factor for ankle sprain (Kofotolis et al., 2007). The majority of players in both defender (40.48%) and striker (28.57%) playing positions presented with ankle sprain injuries compared to other soccer positions. However, there was no association between ankle sprain injuries and playing position in soccer players. Striker playing position requires players to be quick to change position, accelerate and always closer to the defender, making them more vulnerable to injuries. There is no recent study that investigated the relationship between ankle sprain injuries and playing position. However, a study based in Greece

conducted by Kofotolis et al (2007) in amateur soccer players reported the highest incidence of ankle sprain injuries in defenders. The lack of new evidence linking ankle sprain injuries and playing position points to a need for more research to investigate these variables.

It was surprising that foot dominance had no association with ankle sprain injuries even though more ankle sprain injuries (78.57%) were evident in right dominant soccer players. A study by Engerbretsen et al (2009), showed that foot dominance increases the risk for soccer players to sustain ankle sprain injuries. However, this study did not specify which side increases the risk for ankle sprain injuries. Delong et al (2020), conducted a study among soccer players to investigate whether the dominant leg is more likely to get injured. The study found that the player's dominant limb has 1.6 times greater risk for injury. The increased risk could be due to overuse (to kick and tackle). Proper strengthening exercises involving lower limbs and core with adequate recovery period should be part of the injury prevention program.

The type of soccer boots the players use was also investigated in this study to find whether it increases the risk for ankle injuries. This study found no association between the soccer boots type and ankle sprain injuries ($p>0.05$). Silva et al (2017) Gabusera et al (2013), studied the effect of the type of soccer boot worn by players and found that soccer boot type should be selected based on the playing surface and weather conditions. Unfortunately, players in this league used one type of soccer boots (either round or sharp studs) for the different playing surfaces and weather conditions, due to poor affordability. Although there was no association found between the type of soccer boots and ankle injuries, there is a need to engage the department of sports and recreation and the South African Football Association to invest more sports resources to develop young soccer players.

5.5 Prevention intervention

Prevention of ankle sprain injuries is a necessary investment into the well-being of soccer players. In this study, the majority of teams had no injury prevention program that was used and practiced daily during the training, and none of the teams knew about FIFA 11+ injury prevention program. The FIFA 11+ injury program is used as an injury prevention program and consists of exercises for core stabilization, neuro-muscular control and balance and strength. FIFA 11+ program has been found to be effective to reduce injuries in soccer players by 30% to 41% (Owoeye et al., 2014

and Sadigursky et al., 2017). The FIFA 11+ program should be introduced to the soccer teams and all the coaches should be encouraged to practice it in their training sessions.

All teams were found not practicing proper injury prevention interventions. The form of warm-up or injury prevention program that majority of the teams and players were found using, was running in the field for more or less than ten minutes. This prevention intervention does not adhere to FIFA 11+ injury prevention program as it does not involve core stabilisation, neuro-muscular control and balance and strength as per FIFA+ injury prevention. Matthew et al (2017), conducted the systematic review study that investigated the effectiveness of proprioceptive training for ankle sprain prevention and found 35% ankle injury risk reduction in athletes with no history of ankle injuries and 36% reduction in the athletes with previous ankle injuries. Therefore, ankle injury prevention exercises that involve proprioception, core stabilisation and strength should be integrated in daily training routine for soccer players.

There were few players (10.71%) that used taping and ankle braces to prevent ankle injuries. The study by Bailey and Firth (2016) supported the use of taping to athletes with previous ankle sprain. While the systematic review study by Barelds et al (2018) looked at the effectiveness of the ankle bracing on acute ankle injury primary and secondary prevention and found the ankle bracing effective to reduce the ankle injury occurrence. Another study conducted by Wong and Ballows (2018) looked at the effect of using ankle braces for ankle injuries and found 64% reduction of ankle sprain in players that wore braces. Therefore the use of ankle braces and taping should be encouraged in soccer players. However, the poor socioeconomic factors in this area will not afford these players the opportunity to buy ankle braces and tape.

Conclusion

In this chapter, the study results were discussed in relation with the previous studies on the ankle injuries. This study found a high prevalence rate of ankle sprain injuries in amateur soccer players. The prevalence can be linked to the poor practice of ankle injury prevention by the majority of the teams that participated in this study. Previous ankle sprain and direct contact were found to be significantly associated with the ankle sprain injuries. The next chapter outlines the conclusion and recommendations.

Chapter 6: Conclusion and recommendations

6.1 Conclusion

This study aimed to determine the ankle sprain injury prevalence, risk factors and current prevention interventions in Kwa-Zulu Natal male soccer players. The ankle sprain injury was found to be prevalent in amateur male soccer players. This could be due to poor practice of ankle sprain injury prevention, as the majority of the teams were not familiar with proper ankle injury prevention programs. None of the teams practiced the FIFA 11+ injury prevention program, which had been reported to be effective in reducing ankle sprain injuries in soccer players (Owoeye et al., 2014 and Sadigursky et al., 2017). There is a need to facilitate and promote the practice of injury prevention programs.

Both intrinsic and extrinsic ankle sprain injury risk factors including limb dominance, previous ankle sprain, body mass index (BMI), playing position, direct contact, playing field and cleat type were investigated in this study. Only previous ankle sprain and direct contact that were found significantly associated with ankle sprain injuries in amateur male soccer players.

6.2 Limitations of the study

Few limitations in the study were noted. The majority of the study participants were high school learners. Thus this limited access to school going soccer players. The researcher could not investigate all ankle injury risk factors that had been stated in previous studies, due to the precaution measures for COVID-19. The risk factors that were not investigated involved ankle range of motion and lower limbs muscle strength, because the researcher was limiting contact with participants to reduce the spread of COVID-19.

6.3 Recommendations for future studies

There is a need for studies on ankle injuries in both amateur and professional levels that will include full assessment of the players and assessment of the playing field. Future implementation research on injury prevention strategies is needed. The screening tool to exclude any neurological condition when conducting the similar study is needed and recommended. In addition rural and low income areas are not being considered in many studies, this also limits the understanding of injury concerns in low income areas. More studies are recommended to be conducted in low income and rural areas.

6.4 Clinical recommendations

Physiotherapy roles include health promotion and prevention care. Out-reach campaign focusing on soccer players is needed in this district. Health promotion and prevention intervention can be developed to promote soccer players fitness, living healthy and basic exercise principles.

Soccer player coaches should also be educated on the ankle sprain injuries and the importance of preventing ankle sprain injuries through proper warm up exercises, bracing, a healthy diet and the FIFA+11 program. Soccer injury prevention interventions and dietary programs should be part of the daily training program in soccer teams and at all levels (primary, secondary and tertiary) of prevention must be practiced. The dietary program or education should be facilitated by someone with proper knowledge in diet such as dietician or sport nutritionist.

6.5 Policy recommendations

There is a need for FIFA and the South African Football Association to monitor soccer teams that are affiliated to amateur soccer leagues to assess compliance to the FIFA+11 program. The stakeholders in the department of sports and recreation need to be engaged to provide more resources for amateur soccer teams and players

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Appendices

Appendix A: Information sheet



Information Sheet

Study title: Ankle sprain injury prevalence, risk factors and current prevention interventions among amateur male soccer players in Umkhanyakude district, Kwa-Zulu Natal.

I, Bongumusa Sicelo Tembe, physiotherapist registered for Masters in Physiotherapy (sport physiotherapy) at WITS University, currently undertaking a research, which is process of seeking new knowledge. This study will be looking at the ankle injuries prevalence, risk factors and prevention intervention that is used by soccer players in Umkhanyakude district. There are few studies that have been done in this continent and none in South African rural areas that look at ankle injuries and its risk factors and prevention in amateur soccer players. It is important to do this study with the purpose of developing prevention intervention or program that will be specific and targeted to local teams and players. After completing this study, result will be presented to Kwa-Zulu Natal Sport and Recreation office and teams by the researcher. In addition this study will improve the understanding and extent of the problem in rural areas and amateur players.

The study will be conducted in Jozini Municipality under Umkhanyakude district, located in the Northern part of Kwa-Zulu Natal province, South Africa. It is classified as one of the rural areas in the province. The researcher will meet with players and managers in their respective soccer field and conduct the study. The field will permit the practice of social distancing as a precaution to prevent the spread of Covid 19. All people are requested to wear mask when coming to the field. The sanitising agents will be brought by researcher and everyone will be requested to sanitise.

The study will start in February and end in May 2021. Each team will be done in one day as planned with teams' management. Researcher will hand in hard copies of questionnaire to each player and will be there to assist with clarity. The expected time to answer all questions is 15 to 20 minutes. The questionnaire written in English and IsiZulu languages, contains question about demographic profile, history of ankle injuries and the prevention program that is used.
Participation in this study is voluntary meaning that there will be no payment for participation. Those who pay for travelling, their travel costs will be covered by researcher. All participants have a right to withdraw at any time without penalty. Confidentiality and anonymity will be maintained throughout the whole study. There are no physical or psychological risks involved in this study.

This study has been checked and approved by the Human Research Ethics Committee (HREC) (Medical) of University of Witwatersrand, Johannesburg. This committee guides the right and dignity of all human subjects who agree to participate in the research project.

Thank you for reading this Study Information Sheet

If you have any concern please feel free to consult Medical Wits Human Research Ethic Committee, research supervisor or researcher on the following details:

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Administrative officer: Mr Rhulani Mnkasi

Tell: 0117171234/ 2700

Email: Rhulani.Mnkasi@wits.ac.za or HREC-Medical.ResearchOficce@wits.ac.za

Supervisor

Mrs Sonti Pilusa,
Tell number: 0117173715 and

Email address: Sonti.Pilusa@wits.ac.za

Researcher

Mr Bongumusa Tembe

Cell number: 0792327592

Email; sceebtembe@gmail.com / 2118186@students.wits.ac.za

Appendix B: Consent form

Consent form



This form serves to request your consent to terms and conditions of the study titled **Ankle Sprain injury Prevalence, Risk Factors and Current Prevention Intervention Among Amateur Male Soccer Players in Umkhanyakude District, Kwa-Zulu Natal**

Researcher's contact information:

Researcher's name: Mr Bongumusa Sicelo Tembe,

Contact number: 0792327592

Email address: sceebtembe@gmail.com

Supervisor: Mrs Sonti Pilusa,

Tell number: 0117173715

Email address: Sonti.Pilusa@wits.ac.za

Terms of study

- I confirm that researcher has informed me about the content and aim of the study.
- I understand the whole procedure of the study.
- I confirm that the researcher has explained that my participation is completely voluntary.
- I consent to provide correct and accurate information.
- I understand that I can contact researcher at any time when I have a concern.
- I understand that my information will kept confidential between researcher and supervisor.

Consent

I (name and surname),_____accept the above mentioned terms of the study and agree to participate.

Appendix C: Consent letter from SAFA

Lot 284, Old Main Road
Hluhluwe
3960
Tel: 0825885799
Email: msaphos@webmail.co.za

SOUTH AFRICAN
FOOTBALL ASSOCIATION

UMKHANYAKUDE REGION

Box 236
Hluhluwe
3960
Fax 086 770 5300

DATE :13 January 2021

PERMISSION TO PERFOM SAFA STUDIES.

Dear Sir/Madam

SAFA UMKHANYAKUDE is here by given a permission to Mr Bongumusa Tembe to conduct his studies on our SAB League clubs under stream B Jozini.

We have 10 clubs there located in the areas such as Ingwavuma,Endumo,Jozini and Mkuze.we believe you will notify SAFAUMKHANYAKUDE with report finding.

Your Faithful

Mr S Ntuli

SAFA UMKHANYAKUDE REO.

SAFA
UMKHANYAKUDE REGION
PLOT 284, OLD MAIN ROAD
HLUHLUWE, 3960

Appendix D: Ethical clearance

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R49 Mr B Tembe

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200840

NAME: (Principal Investigator)	Mr B Tembe
DEPARTMENT:	School of Therapeutic Sciences Department of Physiotherapy Medical School University
PROJECT TITLE:	*Ankle sprain injury prevalence, risk factors and current prevention interventions among amateur male soccer players in Umkhanyakude district, Kwa-Zulu Natal*
DATE CONSIDERED:	2020/08/28
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Ms S Pilusa
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2021/02/16

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **«Missing mail merge field»** and therefore reports and re-certification will be due in the month of **«Missing mail merge field»** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator Date

Appendix E: Questionnaire



Questionnaire

Title: Ankle sprain injury prevalence, risk factors and current prevention intervention among amateur male soccer players in Umkhanyakude district, Kwa-Zulu Natal

Demographic Information

Team's code/ *ikhodi leqembu lakho* :

Age (years)/ *Iminyaka yakho* :

Place/ *indawo ohlala kuyo* :

Height/ *ubude bakho*: Weight/ *isisindo*: BMI:

What is your playing position/ *udlala kuyiphi indawo?* (Tick on the box/ *khetha ibhokisi*)

Goalkeeper/*unozinti* □

Defender/ *udlala emuva* □

Midfielder/ *udlala esiswini* □

Striker/ *umgadli* □

What is your dominant leg/ *usebenzisa luphi unyawo?* (Tick on the box *khetha ibhokisi*)

Right/ *unyawo lwesokudla* □

Left / *unyawo lwesobunxele* □

How long have you been playing soccer/ *usudlale ibhola isikhathi esingakanani?* (Tick on the box*/ khetha ibhokisi*)

Less than 10 years/ *ngaphansi kweminyaka eyishumi* □

More than 10 years/ *ngaphezulu kweminyaka eyishumi* □

Risk Factors/ *Izimbangela zokulilama*

Do you have any previous ankle injury/ *wake walimala iqakala ngaphambilini?* Yes□ /No□

If **yes** which side/ *uma uthi **yebo** kuluphi uhlangothi?*

Left/ *kwesobunxele* □

Right/ *kwesokudla* □

How many times/ *sewulimale kangaki?*

One/ *kanye* □

More than one/ *kaningi* □

When did the injury occur/ *ulimale ngasiphi isikhathi?*

Match/ *udlala imeshi* □

Training/ *uzilolonga* □

Mechanism of injury/ *indlela olimale ngayo* (Tick on the box*/ khetha ibhokisi*)

Tackled by an opponent/ *wakhahlelwa* □

Twisted while landing/ *wabhinyika uqeda ukugxuma* □

Twisted while running/ *wabhinyika ugijima*□

Twisted while turning/ *wabhinyika uphenduka* □

What type of your soccer boots' cleat/ *uhlobo olunjani ikhokho lakho ngaphansi?* (Tick on the box*/ khetha ibhokisi*)

Round/ *oluyindilinga* □

Sharp/ *olucijile* □

Prevention strategies/ *izindlela zokuvikela ukulimala*

Do you use any form of ankle protection/*ngabe lukhona yini uhlobo lokuvikela iqakala olusebenzisayo?* Yes □ /No □

If **yes**, what form/ *uma uthi **yebo**, usebenzisa luphi uhlobo*?

Tape/ *okusabhandishi* □

Brace/ *ibrasi*□

In which side/ *kuluphi uhlangothi*?

Left/ *kesobunxele* □

Right/ *kwesokudla* □

Do you do any form of warm-up before training or match/ *kukhona enikwenzayo ukufudumeza umzimba ngaphambi kokuba nidlale noma nizilolonge*? Yes □ /No□

If **yes**; what warm-up program/ *uma uthi **yebo** yini eniyenzayo*?

Specify/ *Cacisa:*_____

How long do you warm-up/ *nithatha isikhathi esingakanani uma nifudumeza umzimba?*
*(*Tick on the box*/ khetha ibhokisi*)

5 minutes/ *imizuzu emi5* □

10 minutes/ *imizuzu eyi10* □

15 minutes/ *imizuzu eyi15* □

15+ minutes/ *imizuzu engaphuzulu kweyi15* □

Functional, sports and recreation activities (adapted from Ankle and Foot Outcome Score). The following questions ask about higher functional level (like playing sport), it should be answered thinking of what degree of difficulty you have experienced during the last 5 months due to your foot/ ankle. *Phendula ngobunzima obhakane noma ohlangabezane nabo ezinyangeni ezi5*

Squatting/ *ukuqoshama* (Tick on the box*/ khetha ibhokisi*)

None/ *lutho* □

Mild/ *kancane* □

Moderate/ *kakhudlwana* □

Severe/ *kakhulu* □

Running/ *ukugijima* (Tick on the box*/ khetha ibhokisi*)

None/ *lutho* □

Mild/ *kancane* □

Moderate/ *kakhudlwana* □

Severe/ *kakhulu* □

Jumping/ *ukugxuma*(Tick on the box*/ khetha ibhokisi*)

None/ *lutho* □

Mild/ *kancane* □

Moderate/ *kakhudlwana* □

Severe/ *kakhulu* □

Twisting/ pivoting on your injured foot/ ankle/ *uphenduka ngonyawo owalimala kulo*(Tick on the box)

None/*lutho* □

Mild/ *kancane* □

Moderate/ *kakhudlwana* □

Severe/ *kakhulu* □

To be filled by researcher/ *kugcwaliswa umcwaningi*

Playing surface/ *indawo okudlalwa kuyo*

Grass/ *inotshani* □

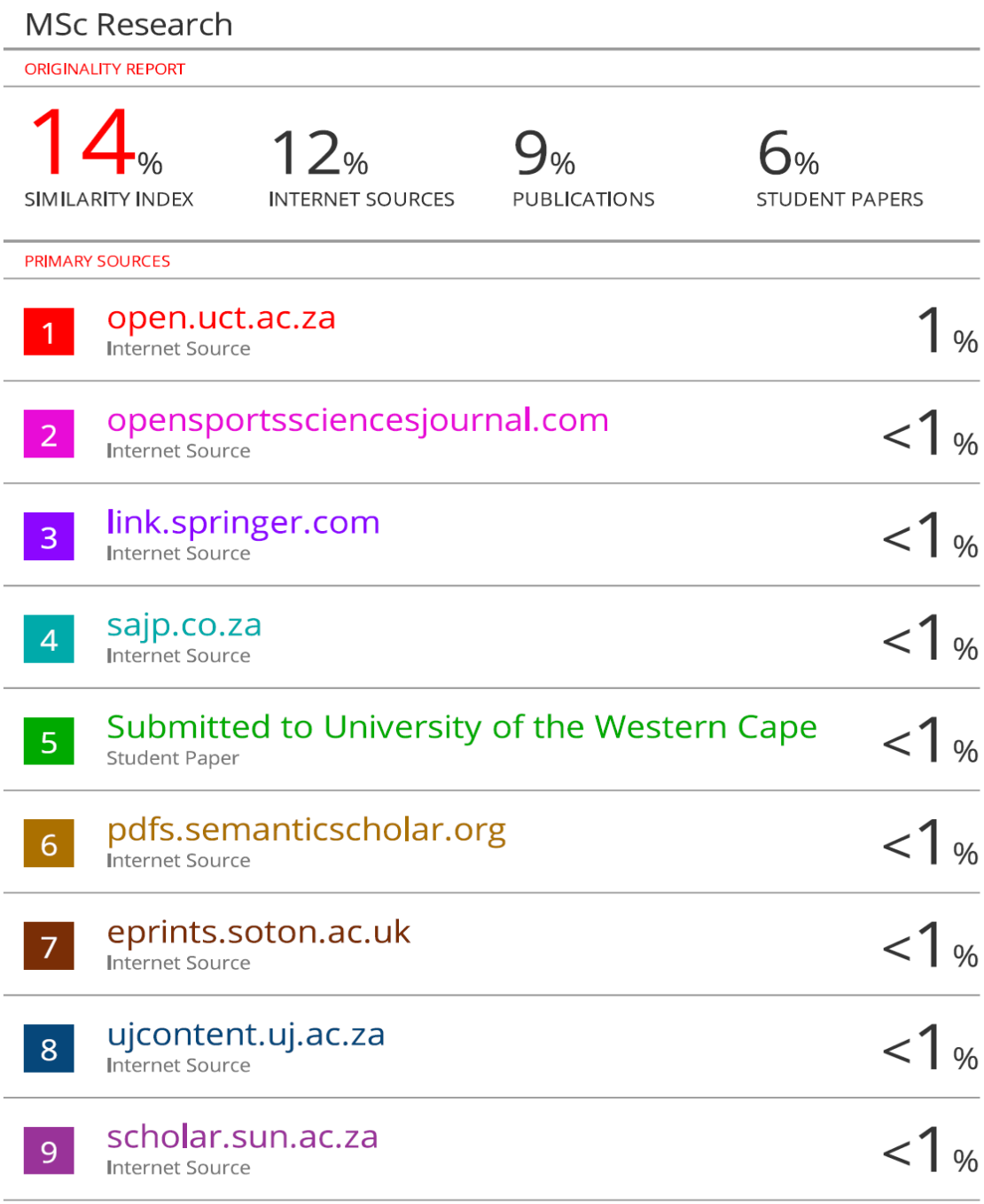
Turf □

Field condition/ *isimo sendawo okudlalwa kuyo*

Good/ *ikahle* □

Bad/ *ayikho kahle* □

Appendix F: Turnitin Report



MSc Research

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