

**PATTERN AND INITIAL CARE OF SPORTS INJURIES
AMONG HIGH SCHOOL RUGBY PLAYERS IN
ELDORET, KENYA**

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**Thesis submitted in partial fulfillment for the award of
Masters of Medicine in Orthopaedics Surgery of Moi
University School of Medicine**

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DECLARATION

Declaration by the Candidate

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DEDICATION

Dedicated to the sports men and women of our beloved country Kenya, more so the upcoming ones in schools and their coaches.

ACKNOWLEDGEMENTS

I wish to thank my supervisors Dr. Ayumba B.R. and Dr. Muteti E. for their contributions, tireless corrections and advice given to enable successful completion of this thesis. I also wish to acknowledge Mr. Keter Alfred and Dr. Mwangi Ann of biostatistics department for their invaluable assistance. Finally to my family for the support and encouragement they accorded me.

ABBREVIATIONS AND ACRONYMS

ACL Anterior Cruciate Ligament

AE Athletic Exposures

BMI Body Mass Index

ED Emergency Department

KSSA Kenya Secondary Schools Sports Association

MCL Medial Collateral Ligament

MTRH Moi Teaching and Referral Hospital

NCAA National Collegiate Athletics Association

RICG Rugby Injuries Consensus Group

SD Standard Deviation

RISUS Rugby Injuries Surveillance study in Ulster Schools

DEFINITION OF TERM

Sports injury

The definition that was used for this study was that by the rugby injury consensus group (RICG) “Any physical complaint, which was caused by a transfer of energy that exceeded the body’s ability to maintain its structural and/or functional integrity, that was sustained by a player during a rugby match or rugby training that results in time-loss of more than one day from rugby activities (Fuller et al., 2007).

Injuries were classified as minor (2–3 days), mild (4–7 days), moderate (8–21 days), severe (>21days) (Fuller et al.,2007).

ABSTRACT

Background: Every year millions of teenagers participate in high school sports. Rugby is a team sport involving contact and collision of players and consequently has a high injury rate. Many studies on injuries in rugby have concentrated on professional players leaving out the high school players. Therefore, this study purposed to establish the different patterns of sports injuries in rugby playing high school students in Eldoret, and the initial care given.

Objective: To find out the pattern and initial care of sports injuries among High school rugby players in Eldoret.

Methods: The study was conducted in four public secondary schools within Eldoret town, using the prospective descriptive study design for eight months: September 2015 to April 2016. The study population was composed of high school students who participated in rugby. Eldoret town was selected due to its proximity. Only four schools participated in rugby and hence all were included. IREC formally approved the proposal to conduct the study. The study subjects signed informed consent/assent to participate. Census method was used due to the low numbers participating in the sport. Questionnaires used in data collection were validated instruments which were interviewer administered. Physical examination was done for all injured players. Data analysis was done using R: A language and environment for statistical computing version 3.3.1, and presented in diagrams and prose so as to make detailed interpretations.

Results: A total of 123 male high school rugby players were recruited into the study: 69 forwards and 54 backs. The average age, weight, height and BMI was 17.6 years, 68.7kgs, 177.2cm and 22.1kg/m² respectively. Fifty three players (43.1%) were injured, with 47 recording one injury and 6 recording two injuries making a total of 59 injuries. The backs recorded 53% of injuries while the forwards recorded 47% of injuries. The anatomic distribution of injuries was: lower limbs 24(41.7%), upper limb 22(37%), trunk 5(8.5%), and head and neck 14 (13.6%). Thirty two injuries (54%) occurred as a result of contact with another player. The tackle recording 28 injuries (48%) and the scrum recorded 9 injuries (15%). Seventy one percent of the injuries occurred in the second half with the first half recording 29%. Minor and mild injuries constituted 68% of all injuries, while 32% were moderate and severe injuries. All the injured players were given initial care on the field involving use of icepacks, bandaging, topical analgesics, rest and massage by fellow students or coach. Twenty two (37%) of the 59 injuries reported were referred to a health facility with the rest receiving first aid on the field. Increase in weight was associated with increase in risk of injury to the participant $p=0.038$.

Conclusion: The pattern showed that majority of the injuries occurred on the lower limbs mainly on the knee. The initial care was first aid on the field offered by fellow students or coach.

Recommendation: In view of the high injury rate; there is need for continuous surveillance of risk factors associated with rugby injuries and ways to mitigate such risks.

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CHAPTER ONE: INTRODUCTION

1.1 Introduction to the Chapter

This chapter covers the background of the study, problem statement, justification, research questions, objectives of the study and conceptual framework.

1.2 Background of the Study

Rugby union also known as rugby is a team sport involving contact and collision of players running at fast speeds. Rugby is a physically demanding sport characterized by massive physical contact, collisions, and physical aggression because contesting for possession of the ball is one of the basic characteristic of the game (Duthie, Pyne, & Hooper, 2003), and consequently has a high injury rate (Bathgate et al., 2005).

Rugby was introduced in Kenya in 1909. Initially it was played by the whites till mid 1970s. Today rugby in Kenya is almost exclusively played by indigenous players. Rugby 15s was admitted as a formal sport in secondary schools in 1990, while rugby 7s was introduced in 2004. Out of 4600 players of rugby in Kenya 3000 are in schools i.e. primary and secondary schools (Njororai, 2016).

The rugby fifteens team is made up of fifteen players 8 forward and 7 backs. The forward positions are one loose head prop, one tight head prop, two locks, one hooker, one blindside flanker and one open side flanker, and number eight. The back positions are: two half backs (scrum half and fly half), one inside center, one outside center, one right wing, one left wing and one full back. Forwards: Focus on carrying the ball and moving forward counter-attacking towards the opponent's goal zone. Backs are adept at attacking on the flanks and fringes. Hooker and Half-backs are skilled at distributing the ball and connecting play. Rugby league is played in 80 minutes

divided in to two halves lasting 40 minutes each with a maximum 10 minute break. The ball used in rugby union, usually referred to as a rugby ball, is a prolate-spheroid essentially elliptical in profile. Traditionally made of brown leather, modern balls are manufactured in a variety of colors and patterns. A regulation ball is 28–30 cm (11–12 in) long and 58–62 cm (23–24 in) in circumference at its widest point. It weighs 410–460 g (14–16 oz) and is inflated to 65.7–68.8 kPa (9.5–10.0 Pounds per square inch). Balls of smaller sizes may be used for matches between younger players. Permissible uniform for rugby play includes a jersey, shorts and underwear, socks and boots. The sleeve of a jersey must extend at least half-way from the shoulder point to the elbow. Additional clothing include: washable supports made of elasticized or compressible materials, shin guards, ankle supports worn under socks, not extending higher than one third of the length of the shin and, if rigid, from material other than metal, Mitts (fingerless gloves) and shoulder pads (International Rugby Board, 2018).

Rugby league is played on a field 112–122 by 68 meters; its surface is made entirely of grass and should be of even ground. The playing field is defined as the area bounded by, but not including, the touch lines and dead ball lines: the longer boundary lines are touch lines, while the shorter boundary lines are dead ball lines. The distance between the two goal posts is 5.6m. The crossbar is placed between the two goal posts so that its top edge is 3.0m from the ground. The minimum height of the goal posts is 3.4m. When padding is attached to the goal posts the distance from the goal line to the external edge of the padding must not exceed 300mm. A corner post is placed at the points where each touch line meets each goal line. The post must consist of non-rigid material and should be at least 1.25 meters in height.

The phases of play in rugby include the scrum, lineout, tackle, maul and rucks. A tackle in rugby is defined as a player being brought to the ground by an opposing player. A ruck occurs when the ball is on the ground and players from the opposing team fight for possession. Mauls are characterized by a ball carrier being held by opposing players, with other players joining the tackle. Scrums occur after penalties and are an organized way for teams to form opposing tunnels. When the scrum is set to begin, the ball is placed in the created tunnel and the teams push each other in attempts to gain possession. Lineouts occur if the ball has left the field of play: Players are lifted in the air in order to attempt to catch the ball. There are several ways to score points: A try - five points are awarded for touching the ball down in your opponent's goal area, a conversion - two points are added for a successful kick through the goalposts after a try and a goal kick - three points are awarded for a penalty kick or drop goal through the posts. (International Rugby Board, 2018).

The rules of the game: Before the start of the match, the referee tosses a coin to decide which team will kick off the match. The captain of the team that wins the toss gets to decide which end he wants to attack first, or whether his side or the opposition will kick off. The game is started by a place kick or a drop kick from the middle of the halfway line. The ball must travel forwards at least 10 meters from the kick-off. If it does not, the opposition gets the choice of a scrum or line-out on the halfway line, with the advantage of the feed or throw. If a penalty or drop goal is scored during the game, play is restarted with a drop kick from the halfway line. The team that has conceded the points takes the kick. The rules have some variations in each nation and vary between the amateur and professional leagues. The rules are dynamic always being reviewed to mitigate against injuries on the field e.g. the scrum has really

changed, due to numerous alterations in the laws in a bid to make it safer for players, and to try and reduce the time spent at scrum time which was slowing the game down, causing frustration for players and fans alike. The potential dangers associated with tackles are recognized by the International Rugby Board, and specific actions, such as a tackler charging without attempting to hold the ball carrier, tackling above the line of the shoulders and tackling when the ball carriers' feet are off the ground, should be penalized. The most recent law changes seem to have further improved the process, giving more of an advantage to the attacking team whilst reducing the number of reset scrums (Patricios, 2014).

1.3 Statement of the Problem

Moi Teaching and Referral Hospital is a referral hospital for Western Kenya and other parts of Kenya. Among the young patients, sports injuries form a large number of injuries presenting to accident and emergency department, at Moi Teaching and Referral hospital. Rugby anecdotally contributes to high percentage of these injuries, the exact number is however not known.

The patterns of occurrence of the sports injuries at the school level is also not known, the occurrence may be higher than what is recorded at the hospital level and it is important to know the exact number of those injured. The pre-hospital treatment has not been documented and it would be of help to know the initial care given.

1.4 Justification of the Study

There has been an increased interest in rugby globally as seen from the increased number of rugby players and fans. The Sepetuka sevens: a part of the rugby sevens annual league is held annually at the Eldoret sports ground. High schools form a large number of players that end up playing for university, local and even national clubs.

Knowledge on the injury pattern in rugby will help in future identification of means of early treatment and rehabilitation for the players injured during play. Due to varying patterns according to age and skill, a local study is of value. The study will provide information on the occurrence of sports injury in rugby and thus compare this with the global trend. This will help the coaches, parents and the students prepare for care of such injuries. The study will also help the schools to forecast on the nature of injuries and hence will help the school management prepare for such eventualities financially and psychologically. The study aims to assist the ministry of medical services, ministry of sports and youth affairs and ministry of education to strategize on how to handle such sport injuries.

The study thus intends to establish the pattern of injuries in rugby among high school students in Eldoret, the severity and their initial care as there appears to be limited studies on this subject in the country.

1.5 Research Question

What is the pattern and initial care of sports injuries among high school rugby players in Eldoret?

1.6 Objectives of the Study

1.6.1 Broad Objective

To find out the pattern and initial care of sports injuries among high school rugby players in Eldoret.

1.6.2 Specific Objectives

1. To find out the pattern of the injuries among high school rugby players in Eldoret.
2. To document the initial care of sports injuries among high school rugby players in Eldoret.

1.7 Conceptual Frame Work

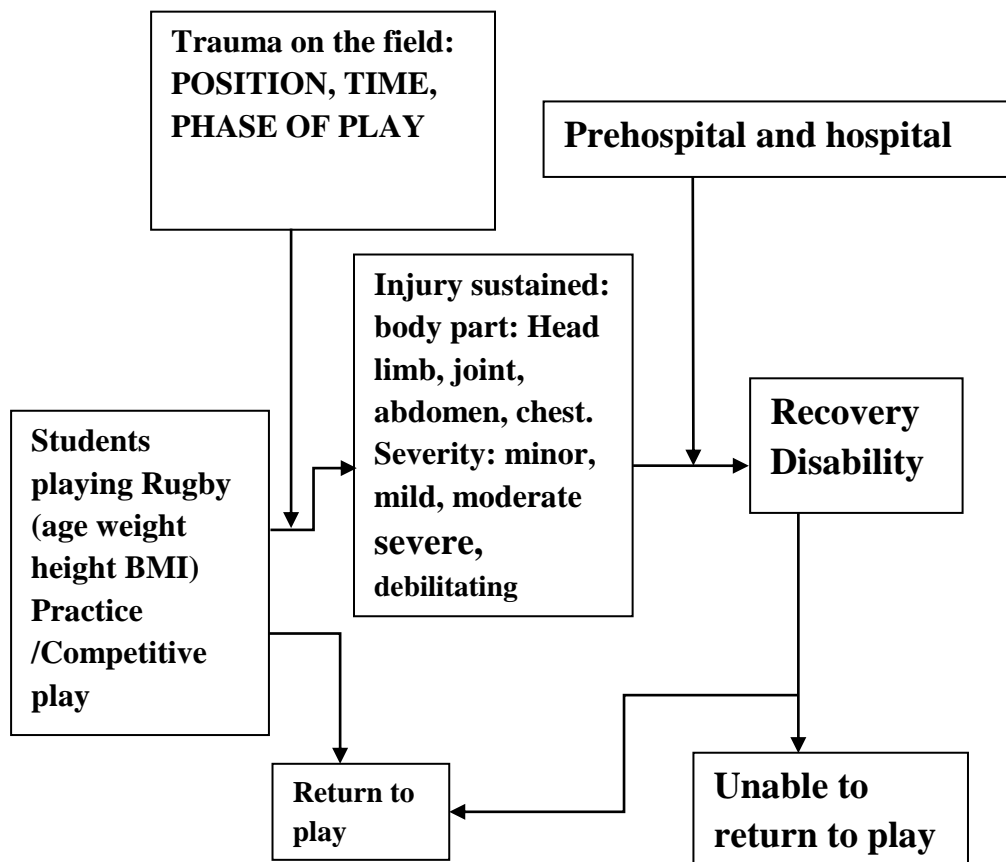


Figure 1.7.1: Conceptual Framework (Source: Candidate)

In the figure the relationship between independent and dependent variables has been illustrated. The former i.e. predictor or explanatory variable includes the students participating in the sports, the position played the number of hours put in practice or competition, the injuries sustained and the care offered. The latter i.e. the outcome or dependent variable includes the return to play or inability to return to play.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter covers the information gathered from previously published articles on injuries in Rugby.

2.2. Incidence

Sports-related injuries constitute nearly 40% of all nonfatal, unintentional injuries among high school youth treated in emergency departments in the United States More (Rechel, Yard, & Comstock, 2008). Sports-related non-fatal injuries are treated in hospital emergency departments than any other type of unintentional injury. These injuries lead to the youth dropping out of recreational sports, some young athletes discontinue sports completely. Some athletes may drop out of one sport and still participate in other sports, hence there is a relationship between continued injury and continued sports participation (Maffulli, Longo, Gougoulas, Loppini, & Denaro, 2009). With a greater emphasis on training for strength, speed and stamina, increase in size, speed and power, and improvement in rugby skills over the years; injury rates are high (Freitag, Kirkwood, Scharer, Ofori-Asenso, & Pollock, 2015). Many studies have been carried out on rugby injuries; there have however been differences in injury definitions. Differences in the definition of injury in these studies make comparisons of incidence between them difficult. Most incorporate inability to play or practice after the incident as criteria for counting a case. Others identify medical attention as an alternative criterion for inclusion. Injury rates in rugby have been reported in different ways in several studies, some expressed as number of injury per 1000 hours of play, while others number of injuries per 10,000hours of exposure, others as a simple percentage, yet others as number of injuries per 1000 athletic exposure (AE). They are further divided into match injury rates and training injury rates making it

difficult to compare their results (Bleakley, Tully, & O'Connor, 2011; Chiwaridzo et al., 2015; Fuller et al., 2007). The incidence of rugby injuries has been reported as 6% to 96% by different studies (Freitag et al., 2015).

2.3 Aetiology

Rugby players sustain considerably more injuries than players in other sports (Collins et al., 2008), probably as a result of the greater size of the players, the faster pace at which the game is played, and the greater impact forces associated with the game. The multiplicity of factors that contribute to injury in rugby union makes it difficult to identify causality. To adequately condition players, reduce their risk of injury, and treat and rehabilitate rugby injuries appropriately; it is important to gain a better understanding of the nature and causes of rugby injuries, in particular their association with training and age of the player (Quarrie K L et al., 2001).

Common reasons why teens get injured playing sports include: not training or playing properly, training too much, not wearing the right footwear, not wearing the right safety equipment and rapid growth during puberty (Maffulli et al., 2009). In addition, the ligaments of young athletes are two to five times stronger than the cartilage and the bone of the epiphyseal plate to which they are attached. This results in a greater likelihood of fracture of the epiphyseal-metaphyseal junction rather than the ligamentous tears seen in adults (LaBella, Hennrikus, & Hewett, 2014). Sports injuries are often recurrent and there is wide recognition that a subsequent injury of either the same or a different type can be strongly influenced by a previous injury. Reasons for this could include similar mechanisms or risk factors especially intrinsic risk factors involved in injury causation or limited tissue healing from an earlier injury.

2.4 Acute Traumatic Injuries

Acute injuries are caused by a sudden trauma. Examples of trauma include collisions with obstacles on the field or between players. Common acute injuries among young athletes include contusions (bruises), sprains- a partial or complete tear of a ligament, strains- a partial or complete tear of a muscle or tendon, and fractures of different bones in the body. They usually happen after a blow or force like getting tackled in football, scrams in rugby, et cetera (Muma, Saidi, & Githaiga, 2012). The acceptance of violence within the sporting culture may lead to sports related violence leading to injury this includes: hazing, brawling and foul play occurring among youth of all ages and in a variety of different sports more so contact sports such as rugby. A mismatch of physical size and strength between players combined with differences in skill levels creates a situation conducive for injuries (Fields et al., 2010). Most studies have shown that musculoskeletal injuries are the major category of abnormalities leading to restriction from sports activities. The most common musculoskeletal injury that restricts rugby players from activity is an injury to the knee, followed by an ankle injury. In musculoskeletal injuries, the chance of re-injury is high without proper rehabilitation of the players before returning to play. Internationally, a number of studies have been undertaken, using a variety of approaches, to determine the incidence, nature, and circumstances of injury in rugby. These studies have generally focused on premier level men (Muma et al., 2012; Wekesa, Asembo, & Njororai, 1996), though few described injuries to women players (Schick, Molloy, & Wiley, 2008). The increasing popularity of rugby among high school students due to increased global popularity places them at risk of receiving similar injuries (Archbold et al., 2015; Chiwaridzo et al., 2015).

Alcohol and illicit drug use have been associated with increased abrasiveness by players leading to injuries on their opponents. The culture of illicit alcohol has been seen in rugby and American football among high school and college players as the players feel it makes them more masculine and agile (Lisha & Sussman, 2010).

2.5 Overuse Injuries

Not all injuries are caused by a single, sudden twist, fall, or collision. Overuse injuries occur gradually over time, when an athletic activity is repeated so often, parts of the body do not have enough time to heal between playing. Overuse injuries can affect muscles, ligaments, tendons, bones, and growth plates and these have been reported in rugby players (Sobhani, Dekker, Postema, & Dijkstra, 2013).

These injuries are also called chronic injuries, because they happen over time, usually from repetitive training like running and overhand throwing. Overuse injuries can be just as damaging as acute injuries, even though they might not seem serious at first. If they are not treated, they usually get worse. Stress fractures are another common overuse injury in young athletes. Bone is in a constant state of turnover a process called remodeling. New bone develops and replaces older bone. If an athlete's activity is too great, the breakdown of older bone occurs rapidly, and the body cannot make new bone fast enough to replace it. As a result, the bone is weakened and stress fractures can occur most often in the shinbone and bones of the feet (Brenner, 2007).

2.6 Location of Injuries

When all sports are considered, the lower extremities are at an overall greater risk for injury than central (back, neck, and head), upper extremities, and other parts of the body. In rugby the lower limb is the most commonly injured part of the body (Freitag et al., 2015). The lower limb injuries tend to be more acute than chronic. Lower limb injuries occur due to the emphasis of most sports on the lower extremities to provide locomotive power and speed to the entire body (Collins et al., 2008; McManus & Cross, 2004). This emphasis is seen in young athletes' sports participation, regardless of age and sex of the players. For most sports, the knee and ankle are the joints most commonly injured part of the body. The skeletally immature knee anatomically resembles the adult knee; however there are some biomechanical and physiologic differences that result in mild variations of injury patterns, necessitating a different approach to their treatment, diagnosis and outcome. Knee, ankle, hip and foot injuries in adults significantly increase the risk of early development of osteoarthritis. Those who undergo meniscus surgery have knee osteoarthritis associated pain and functional impairment leading to reduced future involvement in physical activity and a less than optimal health in later life (Maffulli et al., 2009).

The open physis in the skeletally immature is the weak link compared with ligaments in the adult. A physeal or avulsion injury is more common in the skeletally immature, whereas an anterior cruciate ligament (ACL) or medial collateral ligament (MCL) injury is more common in adults. Active bone growth precedes muscle and tendon lengthening, requiring each muscle tendon unit to lengthen or stretch out to keep up with the bone growth. The resulting limited muscle and tendon flexibility predisposes to increased overuse injuries in puberty (LaBella et al., 2014).

Growth plate injuries lead to disturbed growth not in the short term but long term follow up. Disturbed physal growth as a result of the injury can result in length discrepancy, angular deformity or altered joint mechanics, and may cause long term disability. Long term outcomes of physal injuries in children and youth sports is however largely unknown (Freitag et al., 2015). The most important factor regarding the anatomic location at risk of injury is not age but rather the specific skill demands of the sport being played. Ligamentous injury to the ankle are the most common injuries occurring, regardless of sport or exposure type (game or practice), a fact supported in the literature. In the National Collegiate Athletics Association (NCAA) survey, ankle ligament sprains were the most common injury over all sports, accounting for 15% of all reported injuries(Waterman, Owens, Davey, Zacchilli, & Belmont Jr, 2010). Serious knee injuries, such as those to the anterior cruciate ligament (ACL) and the menisci are a growing cause for concern (Brenner, 2007). The highest incidence is seen in adolescents playing pivoting sports such as football, basketball, handball, and rugby, the incidence is 3 to 5 times higher in women than men. In Rugby the lower limbs are most injured with the upper limbs being second (Chiwariidzo et al., 2015). Some studies have however reported the head and neck to be the most injured part (Collins et al., 2008; Fuller et al., 2013; Gabbett, 2000).

2.7 Severity of Injuries

Many sports, especially contact sports, have inherent dangers that put young athletes at special risk for severe injuries. Severe injuries put the athlete's life at risk; they also take long to recover leading to loss of play time and also loss of academic time as they are away from school due to the injuries sustained. Young athletes are at the risk of overuse and acute injuries to the spine with back pain being a common complaint;

this may be due to disc degeneration intense physical loading with radiological evidence (Lee et al., 2001). Studies have classified the severity of the injuries as: mild, moderate, severe and debilitating or catastrophic injuries. This is based on the presentation and return to play time using different criteria (Fuller et al, 2007). Catastrophic injuries are any head, neck, spine or brain injury that are life-threatening, or have the potential to be permanently debilitating and result in the emergency admission of a player to a hospital or medical care center. Severe injuries are any sports injuries resulting in loss of play for more than 21 days or that require hospitalization or surgical intervention. This makes the results of such studies not being standardized hence confusing and difficult to interpret. Alexander McManus came up with a standardized tool that can be used in data collection of rugby injury (McManus, 2000), that largely agrees with the RICG agreement on rugby injuries (Fuller et al., 2007). Catastrophic events rarely occur in sport, the long-term consequences and implicit severity of these events make them the most devastating of all injuries to the player, their family and friends. Even with rigorous training and proper safety equipment, high school athletes are at risk for severe injuries to the head and neck with damage to the brain or spinal cord, deaths have also been reported due to these catastrophic injuries. Up until the third decade of life, sport is associated with catastrophic spinal injuries. Of all sports, collision games such as American Football, Ice Hockey and Rugby account for a large proportion of these sport-related catastrophic events. Serious head and neck injuries happen most often in athletes who play contact sports like football or rugby (Banerjee et al., 2004).

Recommendations have been put forward to introduce protective gear such as helmets, face masks and shoulder pads to minimize the number and severity of injuries, which have not been implemented in both junior and senior athletes (Patricios, 2014).

Rugby is currently the most popular collision sport worldwide and thus has many injuries which have been widely researched. Majority of the injuries are due to the high numbers of physical collisions; with tackles such as the scrum, rucks and maul leading to heavy body contact hence putting the player at the risk of musculoskeletal injuries (Palmer-Green et al., 2015). Tackles, scrum, rucks and mauls appear to be the phases of play where majority of reported injuries occur. The tackle has been reported as the phase of play in which most injuries occur (Wekesa et al., 1996). The tackle phase has contributed to a large number of injuries, a study by (Bathgate et al., 2002) recorded 58.7% of injuries to occur during tackle phase of play. Other studies have also posted similar findings to those by Bathgate et al. as per a review on tackle injuries by (Quarrie K L & Hopkins, 2008). The injuries sustained during the tackle may be due to foul play, an issue that is not generally considered in most studies. The high injury causation by the tackle has led to contemplation of its ban. In 2016 Australia ordered for a ban of the tackle phase in high school rugby that was highly contested as it was deemed to make the sport boring and the ban was eventually lifted (O'dowd, 2016; Tucker et al., 2016). Studies investigating general injuries have suggested that increased speed, increased competitiveness and aggression, may be responsible for high incidence of injury. While some injuries occur during open play, foul play also contributes to a large number of injuries. The position played may also have an influence on the nature and incidence of injuries sustained with the backs or defending players having more injuries than the forwards this could be due to the

nature of play required of the defenders. Some studies however have equal injuries for both the forwards and the backs (Chiwariidzo et al., 2015; Collins et al., 2008).

The time of the game has also been documented as a factor on occurrence of injuries with players sustaining more injuries as the game progresses. Studies have shown more injuries to occur in the second half of the game as opposed to the first half. This has been attributable to player fatigue especially if poorly trained with low fitness levels (Bleakley et al., 2011; Muma et al., 2012).

In a study on catastrophic injuries in South Africa the incidence of injuries was higher in senior players than junior players and this was attributable to more competitive play and the larger size of the players in the senior league. The reason for the higher incidence rates at the senior level may in part, have been related to more stringent law variations, in particular with respect to the scrum, at junior levels (Patricios, 2014). Muscular injuries are the most common type of injury sustained by senior rugby league players, while junior rugby league players more commonly sustain fractures (Lee & Garraway, 1996). Injuries are most commonly sustained in tackles, by the tackled player. Thigh and calf strains are the most common injuries sustained during rugby league training, while overexertion is the most common cause of training injuries (Brooks & Kemp, 2008). Player fatigue may influence the incidence of injury, with most sub-elite (amateur and semi-professional) rugby league injuries occurring in the second half of matches or the latter stages of training sessions. The majority of training injuries occur in the early stages of the season, while match injuries occur in the latter stages of the season, suggesting that changes in training and playing intensity may influence the incidence of injury in rugby league. Physiological fatigue has been suggested as a contributing factor to rugby injury and may be

reflected in the time course of injuries within a game. It is argued that more injuries should occur during the second half of a match when players are fatigued (Fuller et al., 2013; Wekesa et al., 1996).

A large percentage of injuries result in long-term employment limitations, increased medical costs and loss of income. Severe injuries can result in psychological stress, missed classes and school days and potential permanent physical disabilities. The injuries also pose a financial burden to the athletes family and on the health care system (Kisser & Bauer, 2012).

2.8 Diagnosis

Diagnosis of the sports injury is done from history, physical examination and radiological examination. Magnetic resonance imaging is the gold standard for the diagnosis of soft tissue injuries, whereas computerized tomography is best used for bone fractures. The most commonly used diagnostic technique in our set up is the plain radiograph which misses out on most of the diagnoses for the common presentations of sports injuries (Brukner, 2012; Norris, 2004).

2.9 Treatment

When players get hurt they should stop playing. Continuing to play or exercise can cause more harm. Treatment often begins with the RICE (Rest, Ice, Compression, and Elevation) method to relieve pain, reduce swelling and speed healing. Other possible treatments include: pain relievers, keeping the injured area from moving, rehabilitation, and sometimes surgery. The use of painkillers and anti-inflammatory medicines allow the players to continue with the game preventing optimal healing of the injury (Patricios 2014). In a study done by Brooks & Kemp, (2008) tears of the

anterior cruciate ligament (ACL) treated conservatively developed a severe instability with poor function of knee at mean follow-up period of 72 months, while patients who underwent ACL reconstruction showed marked improvement in pivot shift and Lachman tests at mean follow up period of 49 months. Treatment of the injured athlete begins on the field and one may or may not be required to be treated at the hospital, at the hospital level where surgery may be required as part of the treatment and later the athlete has to be rehabilitated to return to play safely.

In a study done in Zimbabwe; the first people to attend to the athletes after injury were non medics, a majority of whom did not have training in basic first aid hence exposing the athletes to secondary injuries. The non-medics also could not properly assess the patients who would require further treatment hence exposing them to danger and future complications (Chiwariidzo et al., 2015). Treatment at a health facility for injuries that fail to resolve after initial care on the field forms an integral part of management of injured players, A study in south Africa had 21 percent of players being referred for treatment at a hospital (Constantinou & Bentley, 2015). Preventing sports injury requires players' ability to tolerate repeated exposures to injury risks while being active in their sport. Knowledge of nature of the sports injuries helps to identify the preventive measures to be instituted. Better identification of risk factors leading to an initial injury may help identify strategies for preventing similar subsequent injuries, especially when intrinsic risk factors play a major role. It is also possible that risk factors for a subsequent injury could be implicated in the initial injury, but they were not addressed before the subsequent injury (Swenson, Yard, Collins, Fields, & Comstock, 2010; Van Wyk & Lambert, 2009).

2.10 Return to Play

Return to play refers to the point in recovery from an injury when a person is able to go back to playing sports or participate in an activity at a pre-injury level. One of the goals of sports medicine is to try to get an athlete back into action as soon as possible. Returning too soon; before adequate healing or recovery has taken place, can put one at risk for re-injury and possibly an even longer down time. Returning too early can also lead to development of a chronic problem.

With the right game plan for sports injuries from early diagnosis and treatment to full functional rehabilitation, players can often safely accelerate their return to play. An injured player's symptoms must be completely gone before returning to play. For example: In case of a joint problem, the player must have no pain, no swelling, full range of motion, and normal strength. In case of concussion, the player must have no symptoms at rest or with exercise, and should be cleared by the appropriate medical provider (Brown et al., 2013). However, the game plan is often ignored. The injured player may go back to sport before they are fully healed because of loss of earnings and possible wins for professional players. The high school players may return too soon due to pressure from fellow players, coach or school administration and because of fear of being sidelined or left out (Patricios, 2014)

2.11 Injury prevention

Injury prevention strategies include:

Use of good techniques and practices: Players should be trained to follow the correct techniques for de-powering the scrum at all times. There is need for introduction to tackling progressively for new players, and regular skills training for all the players. The team members should play by the rules to reduce the risk of

injury. Regular re-accreditation and education should be undertaken by coaches to make sure their knowledge is up to date. Accreditation is done by the International Rugby Board (IRB) both online and physical courses are available (International Rugby Board, 2003).

Protective gear: Use of appropriate footwear during play; the correct footwear is essential to absorb the impact of movement as well as provide adequate support for your ankles and feet. Use of injury prevention gadgets e.g. knee and ankle stabilizers, shin pads, helmets and padding at points of contact. Players should wear a mouth-guard at all times during games and training sessions. Mouth-guards should be checked regularly and replaced if they are damaged or broken (Brown et al., 2013; Patricios, 2014).

Environmental safety: The playing surface should be checked and maintained; the playground should be on level ground and free of danger. There should be provision of adequate drainage on the playing ground. Posts should be padded and secured firmly to the ground with no part posing a tripping risk (Patricios, 2014).

Conditioning: Conditioning involves level of fitness, psychomotor, cardio-respiratory and musculoskeletal conditioning. Physical conditioning in rugby is very important in the modern game because the game is becoming faster and players are becoming bigger. Conditioning of players not only enables them to play better rugby but also reduce the risk of injuries. Physical demands of rugby include: strength, power, speed, agility, fitness and large body size and therefore a carefully planned conditioning programme is required to achieve them. Contact injuries may be decreased through strength training. During the off- season players need to develop muscle hypertrophy to increase the players size and strength. In the preseason period

there's need for strength development with a shift towards power development during the second half of the pre- season. Power is the maximal amount of force a muscle can produce over a specific time period hence involve use of lighter weights. During the in- season the main emphasis and goal should be to maintain levels of fitness strength and power achieved during the pre-season. Warm up, stretch and cool down and having a regular stretching program to increase and maintain players flexibility help in reducing injuries (Patricios, 2014; Van Wyk & Lambert, 2009).

CHAPTER THREE: METHODOLOGY

3.1 Introduction to the Chapter

This chapter covers the study site, study population, study design, sample size determination, selection criteria, data collection, data handling, data analysis, data presentation, ethical considerations and limitations of the study.

3.2 Study Site

Public secondary schools in Eldoret that participated in rugby. The schools included: Wareng, UasinGishu, Kamagut and Kapsoya High schools as they were the only schools participating in rugby in Eldoret. The aforementioned schools provided the study site for this research.

3.3 Study Design

The study used a prospective descriptive design, where study participants were selected at the beginning of the season and followed throughout the season. The training injuries were recorded on a daily basis by the trained research assistants who were given prior training and a check list; this was done in conjunction with the principal investigator. The trained research assistants had adequate knowledge on the study and nature of injuries. The competitive games were attended by the principal investigator and the trained research assistant (medical students who were rugby players) at all levels. Analysis was done on weekly basis by the researcher and her trained research assistants.

3.4 Study Population

All high school rugby players participating in practice and competitive games.

3.5 Sample Size Determination

Census method was used in this study. All the study subjects who were available and were willing to participate in the study were included.

An estimated number of 120 was anticipated as follows: The number of students per team in Rugby 15 aside team was 15, approximately two teams per school for the four schools that participated $n = 30 * 4 = 120$. One hundred and twenty three subjects were recruited into the study.

3.6 Data Collection Instruments and Technique

Questionnaires were filled by the respondents for the section on demographic data , the questionnaires were then filled by the researcher and her assistants in case an injury occurred to capture the pattern and initial care given to the injured players. These coaches and research assistants were trained on the aspects of the research before commencement of the study but questionnaires were filled in the presence of the researcher to ensure uniformity. All filled questionnaires were checked for completeness and coded accordingly on daily basis. The data was entered in MS Access at the end of the competition schedule.

3.7. Data Analysis and Presentation

Data analysis was done using environment for statistical computing (Team, 2016). Categorical variables such as presence or absence of injury, position played, and the site of the injury; among others were summarized using frequencies and the corresponding percentages.

Continuous variables such as age, weight, height and BMI summarized using mean and the corresponding standard deviation (SD). Injury rates were calculated as a percentage. Association between categorical variables such as presence of injury and

the position played was assessed using Pearson's Chi square test. Fisher's exact test was used whenever the Chi Square assumptions were violated. Independent sample t-test was used to compare two continuous variables.

3.8 Ethical Considerations

In order to protect and respect the rights of the participants who took part in the study, the following steps were taken.

1. Permission and clearance to conduct the study was sought from the Institutional Research Ethics Committee, Moi University Eldoret, Kenya. (IREC). FAN; IREC 1241.
2. Institutional clearance was sought from the school administration.
3. To ensure confidentiality and privacy of the study subjects, each subject was given a code that was used with a checklist and thus names were not used. The code was only known by the participants and researcher.
4. The participants were minors hence consent from parents/ Guardians was sought which was signed by the teachers on their behalf. The students also assented to the study.
5. Enrolment into the study was on voluntary basis with no monetary or material gain expected.
6. Study subjects had an option to withdraw from the study at any given time if they wished upon communication with the principal investigator.
7. Findings of the study will be disseminated to the county education office, participating schools and published for public access.

3.9 Limitations of the study

The limitations of this study were:

1. The study relied heavily on the coach and self-reporting for the time loss injuries through phone calls by the researcher hence compromising on comparability with other studies.
2. The determination of severity of the injuries was not standardized hence there might have been over or under treatment i.e. those who required medical attention might not have gotten it or vice-versa.

The mitigation measure applied was physical exam by the researcher.

CHAPTER FOUR: RESULTS

4.1 Introduction to the chapter

This chapter deals with the results of the study, categorized according to the study objectives, and are presented in tables, figures and prose narratives.

4.2 Demographic Characteristics of the rugby players

A total of 123 male high school rugby players participated in the study; the demographic characteristics are as shown below.

Table 4.2.1: Demographic Characteristics

| Variable | N | Mean (SD) |
|--------------------------|-----|---------------|
| Age (Years) | 123 | 17.6 (1.3) |
| Range (Min. - Max.) | | 14.0 - 21.0 |
| Weight (Kg) | 123 | 68.7 (6.7) |
| Range (Min. - Max.) | | 50.3 - 82.0 |
| Height (cm) | 123 | 176.2 (6.7) |
| Range (Min. - Max.) | | 163.0 – 189.0 |
| BMI (Kg/m ²) | 123 | 22.1 (2.0) |
| Range (Min. - Max.) | | 16.7 - 27.6 |

4.3 Distribution of rugby players by position played

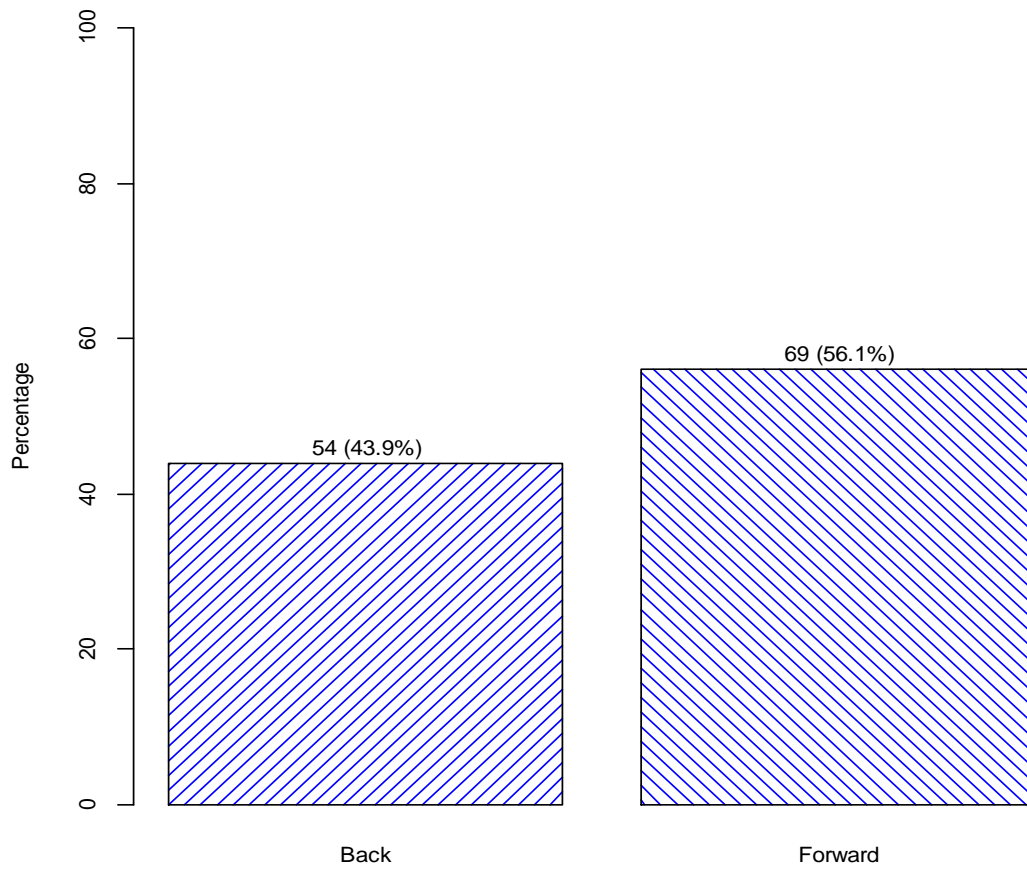


Figure 4.3.1: Distribution of the student players by position played

Distribution of student players by the position they played showed that more than half (56.1%) were forwards.

4.4 Number of injuries

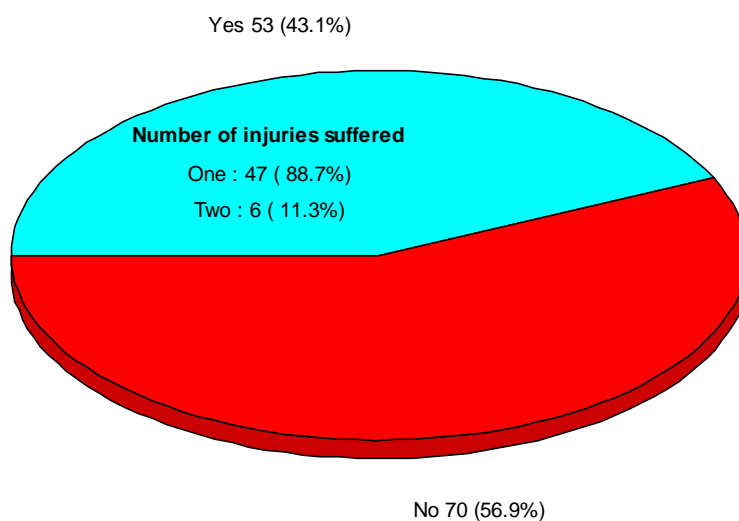


Figure 4.4.1: Injuries suffered.

There were 53 (43.1%) players who reported injury in the period of study. Among those who were injured, 47 (88.7%) had suffered one injury while 6 (11.3%) had suffered two injuries. This gave a total of 59 injuries suffered.

The study sought to establish the profile of these injuries, and their initial care.

4.5 Injury Site

The sites of the injury were as follows:

Table 4.5.1: Description of the site of the injury

| Site of injury | N = 59 | n (%) |
|----------------|--------|-----------|
| Knee | | 9 (15.3%) |
| Wrist | | 6 (10.2%) |
| Ankle | | 5 (8.5%) |
| Lower Leg | | 4 (6.8%) |
| Shoulder | | 4 (6.8%) |
| Foot | | 3 (5.1%) |
| Head | | 3 (5.1%) |
| Neck | | 3 (5.1%) |
| Hand | | 3 (5.1%) |
| Lower arm | | 3 (5.1%) |
| Upper arm | | 2 (3.4%) |
| Face | | 2 (3.4%) |
| Abdomen | | 2 (3.4%) |
| Fingers | | 2 (3.4%) |
| Thumb | | 2 (3.4%) |
| Chest | | 2 (3.4%) |
| Pelvic | | 1 (1.7%) |
| Upper Leg | | 1 (1.7%) |
| Toes | | 1 (1.7%) |
| Spine | | 1 (1.7%) |

Majority of the reported injuries (15.3%) were to the knee followed by injuries to the wrist (10.2%), and injuries to the ankle (8.5%). Injuries to the shoulder and the lower leg presented equally with a proportion of 6.8% of all the injuries. The proportions of foot, neck, head, hand, and lower arm injuries were all the same, 5.1% each. Upper arm, face abdomen, fingers, thumb, chest, pelvic, upper leg, toes and spine injuries all had less than 5% presentation of all the injuries

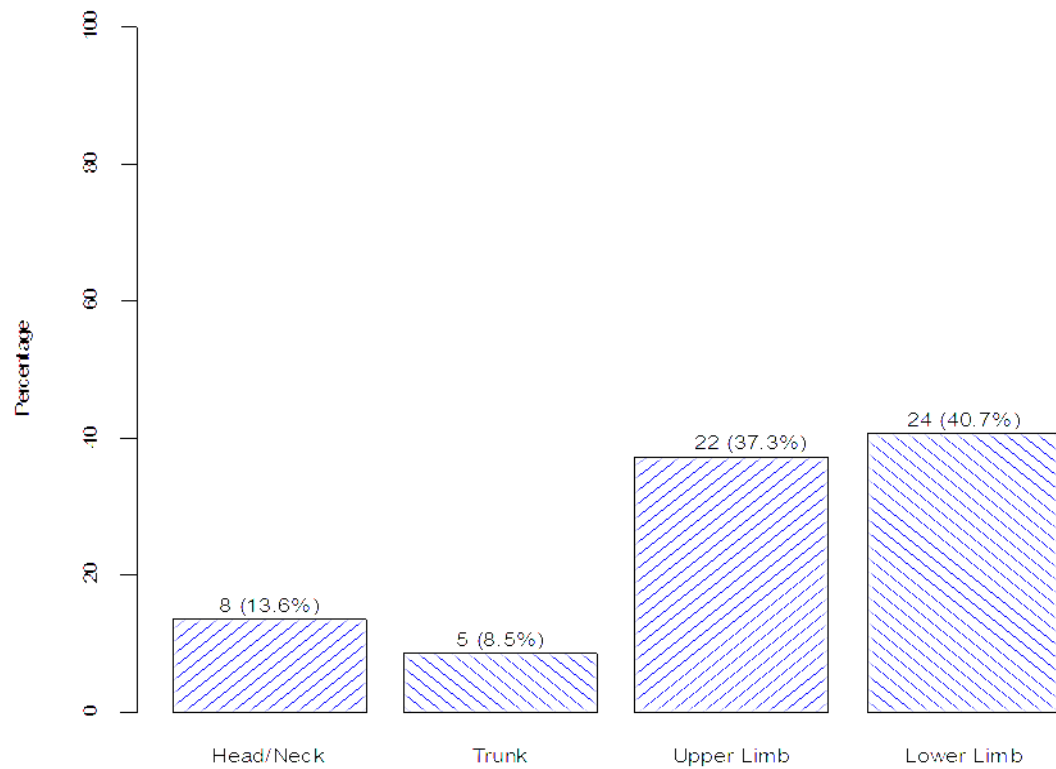


Figure 4.5.1: Anatomic distribution of the injuries

The lower limb had the largest number of injuries (40.7%) followed by upper limb(37.3%) , head and neck(13.6%) and trunk(8.5%)

4.6 Description of the injuries

Table 4.6.1: Description of the injuries suffered

| Variable | N | n (%) |
|---|----|------------|
| Mechanism of injury | 59 | |
| Contact with another player | | 32 (54.2%) |
| Contact with obstacle | | 1 (1.7%) |
| Hit by ball | | 13 (22.0%) |
| During movement | | 13 (22.0%) |
| Phase of play or aspect of training | 59 | |
| Collision | | 5 (8.5%) |
| Kicking | | 5 (8.5%) |
| Lineout | | 2 (3.4%) |
| Maul | | 4 (6.8%) |
| Pileup | | 5 (8.5%) |
| Scrum | | 9 (15.2%) |
| Tackle | | 28 (47.4%) |
| Other | | 1 (1.7%) |
| Time of game | 34 | |
| First half | | 10 (29.4%) |
| Second half | | 24 (70.6%) |
| Relationship of ball and injured player | 59 | |
| Behind play | | 7 (11.9%) |
| Near ball | | 52 (88.1%) |
| Play type | 59 | |
| Competitive game | | 35 (59.3%) |
| Normal training | | 24 (40.7%) |

Majority of the injuries (54.2%) were as a result of contact with another player. Up to 13 (22.0%) were as result of being hit by a ball. Another 22% were as result of falling or sliding.

The injuries occurred mostly when the players were tackling or being tackled by their opponents or during scrum.

The proportion of injuries reported during the first half was 29.4%. During the second half and added time 70.6% of the reported injuries occurred.

4.7 Severity of injuries and their treatment

Table 1.7.1: Severity of injury and Treatment

| Variable | N | n (%) |
|-----------------------------------|----|------------|
| Who gave initial treatment | 59 | |
| Coach/teacher | | 4 (7.0%) |
| Peers | | 55 (93.0%) |
| Duration to return to play | 59 | |
| 2-3 days | | 26 (44.1%) |
| 4-7 days | | 14 (23.7%) |
| 8-21 days | | 9 (15.3%) |
| > 21 days | | 10 (16.9%) |
| Injured players taken to hospital | 22 | 22 (37.3%) |
| Admitted to hospital ward | 2 | 2 (9.1%) |
| Type of facility | 22 | |
| Sub county hospital | | 13 (59.1%) |
| Health Centre | | 2 (9.1%) |
| National referral hospital | | 7 (31.8%) |

Up to 10 (16.9%) of the injuries suffered caused the player to stay away from the field for more than 21 days and were severe injuries.

Of the 59 reported injuries 22 (37.3%) of the injuries resulted in hospital visit of the injured. Of the reported hospital visits, 2 (9.1%) ended up as admissions.

Hospital visits occurred in sub county hospitals (59.1%), health centers (9.1%), and National Referral Hospitals (31.8%).

4.8 Associations

Table 4.8.1: Association between injury and demographic characteristics

| Variable | N | Injured | | †P |
|--------------------------|-----|-------------|-------------|--------------|
| | | No | Yes | |
| | | Mean (SD) | | |
| Age (Years) | 122 | 17.5 (1.5) | 17.6 (1.2) | 0.735 |
| Weight (Kg) | 123 | 67.5 (5.9) | 70.1 (7.4) | 0.038 |
| Height (cm) | 123 | 175.7 (6.9) | 176.9 (6.4) | 0.317 |
| BMI (Kg/m ²) | 123 | 21.9 (1.8) | 22.4 (2.2) | 0.164 |

†independent samples t - test

The high school rugby players who were injured were not different in age, height, and BMI from those who were not injured (17.6 (SD: 1.2) years versus 17.5 (SD: 1.5) years, $p = 0.735$), (176.9 (SD: 6.4) cm versus 175.7 (SD: 6.9) cm, $p = 0.317$), and (22.4 (SD: 2.2) Kg/m² versus 21.9 (SD: 1.8) Kg/m², $p = 0.164$) respectively, hence these findings were not statistically significant. However, those who were injured appeared heavier than those who were not injured, mean weight: 70.1 (SD: 7.4) kilograms versus 67.5 (SD: 5.9) kilograms, $p = 0.038$, hence statistically significant.

Table 4.8.2: Association between the position played and occurrence of an injury

| Variable | Injured | | P |
|-----------------|-----------------------|----------------------|----------|
| | Yes N = 53 | No N = 69 | |
| Position played | | | |
| Forward | 25 (47.2%) | 44 (62.9%) | |
| Back | 28 (52.8%) | 26 (37.1%) | 0.121 |

There was no sufficient evidence from the data to link the position played by the high school rugby player to the occurrence of the injury ($p = 0.121$). The results however showed that the backs were more regularly injured compared to the forwards.

Table 4.8.3: Relationship between aspect of play and site of the injury

| Site | Phase | | | | | | | TOTAL |
|--------------|-----------|----------|----------|----------|----------|----------|-----------|-----------|
| | Collision | Kicking | Lineout | Maul | Pileup | Scrum | Tackle | |
| Knee | 1 | - | 1 | - | 1 | - | 5 | 8 |
| Lower Leg | - | - | - | - | - | - | 4 | 4 |
| Wrist | - | - | - | 2 | - | - | 3 | 5 |
| Ankle | 1 | - | - | - | - | 1 | 3 | 5 |
| Upper arm | - | - | - | - | - | - | 2 | 2 |
| Shoulder | - | - | - | - | - | 1 | 2 | 3 |
| Back | 1 | - | - | - | - | - | - | 1 |
| Lower arm | - | 1 | - | - | - | - | 2 | 3 |
| Upper leg | - | - | - | - | - | - | 1 | 1 |
| Head | - | - | - | - | - | 1 | - | 1 |
| Abdomen | - | 1 | - | - | 1 | - | - | 2 |
| Face | 1 | - | 1 | - | - | - | - | 2 |
| Head | - | - | - | 1 | - | - | 1 | 2 |
| Hand | - | 1 | - | - | - | 1 | 1 | 2 |
| Foot | - | 1 | - | - | 1 | - | 1 | 3 |
| Chest | 1 | - | - | - | - | - | 1 | 2 |
| Pelvic | - | - | - | - | - | - | 1 | 1 |
| Toes | - | - | - | - | 1 | - | - | 1 |
| Fingers | - | - | - | - | - | 2 | - | 2 |
| Neck | - | - | - | - | - | 3 | 1 | 3 |
| Thumb | - | 1 | - | - | 1 | - | - | 2 |
| TOTAL | 5 | 5 | 2 | 3 | 4 | 9 | 28 | 59 |

In tackles the most common injuries were those to the knees (8) followed by the lower leg (5) then the wrist (4) whereas in scrum the most common injuries were those to the fingers and the neck.

CHAPTER FIVE: DISCUSSION

5.1 Introduction to the chapter

This chapter covers the discussion of the results of the study including the patterns and initial care of high school rugby players in Eldoret. The correlations and associations between variables have been covered.

5.2 Demographic characteristics

The study was conducted in high schools with the participants ranging between 15-21 years; this is the expected age for high school students as they join form one after completion of eight years in primary school. The average age was 17.6 years; this is a true reflection of the student population given the age range given above. A study in Zimbabwe found the mean age of 17.6 years; this is in agreement with that found in the Rugby Injury Surveillance in Ulster schools (RISUS) study by Archbold et al., 2015, where the mean age was 16.9 years, and a study in Zimbabwe that had a mean age of 16 years as documented by Chiwaridzo et al., 2015. This was in agreement with the study as settings were similar to this study, as it involved high school students. In the RISUS study 825 adolescent rugby players were followed up for one year and injuries recorded, while the study in Zimbabwe had 275 male high school rugby players followed up for one year. In this study high injury risk was associated with higher age, higher weight and increased BMI. Increased injury risk was only significantly associated with increased weight with a $p= 0.038$ (statistically significant).

The above findings are in agreement with those by the RISUS study where injury risk was also associated with higher weight and increased BMI. Increased weight and BMI may be associated with the higher forces that occur during collision with opposing player.

5.3 Injury Frequency

A few studies have been conducted involving high school rugby players injuries compared to the many studies conducted for the elite league players. Most of the studies have had rugby players being lumped up with other games hence the specific injury rates have not been reported adequately. This study recorded 59 injuries in 53 players with an injury rate of 43%. The RISUS study found the injury rate to be 36.8% where 304 out of the 825 players recorded 426 injuries as documented by Archbold et al., 2011. This study's injury frequency was higher than that of the RISUS study; this may be attributable to the differences in the player settings in terms of the terrain of the field, protective gear, match officiating; which may have been better for the players in the RISUS study compared to those in this study. The results of this study agree with those reported in Zimbabwe where the injury rate was 58.2 % as documented Chiwaridzo et al., 2015.

The major challenge in rugby injury surveillance studies has been comparison of injury rates between studies as the injury definition has not been standardized. Some studies define an injury based on time loss that is time taken by the player before resuming sports activity, while others base their definition on match stoppage or at the doctor's discretion.

5.4 Position Played

This study found that backs i.e. those playing in the defensive positions sustained more injuries at 52.8% with the forwards recording 47.2%. This however did not bear any statistical significance ($p= 0.121$). This could be attributable to the fact that the backs cover a lot of distance during play hence more fatigue. Stringent measures have also been put in place to reduce foul play and increase safety of players especially the

scrum where the forwards are involved. This is in agreement with a study by Wekesa et al., (1996) that had the backs recording more injuries at 53.2 percent. A surveillance of injuries in the 2011 world cup also found backs to have sustained more injuries than forwards as documented by Fuller et al., 2013.

Most studies contrast these findings as they have found the forwards to sustain more injuries as they have more contact during play than the backs as documented by Collins et al., 2008. The explanation for this has been the larger body frame and BMI that is required of the forwards as the nature of their play requires more force compared to, the backs. The difference in the frequency of injuries between the forwards and backs has however not been statistically significant.

5.5 Site of injury

Majority of studies have shown that the head and neck are the most common sites of match injuries in senior rugby players, while knees are the most common sites of injury in junior league rugby players as documented by Freitag, 2015. This study found that the extremities i.e. the lower limb and the upper limb presented the highest number of injuries recording twenty four and twenty two injuries respectively, with the knee being the most injured part of the lower limb where nine players sustained injuries.

This is in agreement with most studies. McManus and Cross, (2004) carried out a study that found the lower limb to be the most injured site at 37%. Another study by Gabbet, (2000) is in disagreement with this study having found injuries to the head and neck at 25%, and the knee at 11% among amateur rugby players in a study carried out for three consecutive seasons. Collins et al., (2008) also found the head as the most injured part followed by the knee contrasting the findings of this study. This is

because most sports involve lots of running and turning. In rugby this happens as the player has contact with other players such as during the tackle leading to lower limb injuries.

5.6 Phase of play

Rugby includes four main phases of play: the tackle, ruck and maul, set pieces (scrum and lineout), and open play. Most studies have described the tackle to be the phase of play where most injuries took place both in high school and in elite leagues. In a study of 364 Kenya rugby union league players in Nairobi by Muma et al., (2012), the tackle phase recorded 63.7% of the injuries, while the scrum recorded 13.6% of the injuries. A study by Bathgate et al., (2002) recorded 58.7% of injuries in tackle phase. Another study by Collins et al., (2008) had 60% of the injuries reported occurring during the tackle phase of play. This study had 47.4.% of injuries occurring in the tackle phase followed by the scrum at 15.2%. These figures are in agreement with findings from the above studies. This study found the mechanism of injury contributing to the highest number of injuries to be contact with another player. This mainly occurred during the tackle occurring in both the tackler and the tackled player followed by the scrum.

This is in agreement with many studies both in the elite and high school sports. Wekesa et al., (1996) had 40.7% of injuries occurring during the tackle. The high number of injuries has led to contemplation of banning this phase of play to avoid such injuries.

5.7 Time of game

This study found the second half as the time of the game where most injuries occurred at 70.6% with the first half and added time recording 23.5% and 5.9% respectively. Wekesa et al., (1996) also found the second half as the phase of play where most injuries occurred for competitive play with 61.7% of injuries occurring in the second half and 38.3% occurring in the first half. Gabbett et al., (2000) also found that most of the injuries occurred in the second half at 70.8%, while Bathgate et al., (2002) found the injuries to be 69%, significantly more injuries occurred in later stages of the season. Other studies also agreed with the same. Other studies (Collins et al., 2008; Wekesa et al., 1996) have divided the game into quarters and have found that most injuries tend to occur in the last Quarter. This can be attributed to physiologic fatigue among players especially if they have low fitness levels. In this study, players were assumed to have low fitness level because they did not practice all year round but instead practiced close to the start of the games. Fatigue negatively affects the concentration, technique and general coordination of the player. Accumulative micro trauma may also lead to increased injuries.

Most of the injuries occurred when the player was near the ball. This is due to the fact that the mechanism of injury and phase of play when the injury occurred was the tackle; during this phase of play the tackled player has the ball in his hands.

Rugby injuries are mostly due to contact unlike other sport such as basketball or football as documented by Swenson et al., 2010. The findings are in agreement with most studies as documented by Freitag et al., 2015.

5.8 Severity of injuries

Severity of injuries was defined as per rugby injury consensus statement of 2007 as documented by Fuller et al., 2007. Most epidemiological studies have recorded majority of players sustaining minor and moderate injuries as compared to severe injuries which is in agreement with this study that had 16.9% of the players sustaining severe injuries while the rest had minor, mild and moderate injuries. Collins et al., (2008) did a similar study and had most of the injuries resolving in less than 10 days with 26.9% resolving greater than 21 days. Chiwaridzo et al., (2015) had 7.7% of injuries reported as severe injuries, with the rest being reported as mild or moderate. Chiwardizo et al., (2015) recorded fewer injuries compared to this study.

Severe injuries impact on the athlete's life as they lead to time lost both in the games and in school. Some of the injuries sustained also lead to lifelong complications such as, permanent neurological deficits due to injury to the brain or the spinal cord. These injuries also lead to anxiety among the players, teachers and parents, e.g. concussions and spinal cord injury. This study did not report any life threatening injuries.

5.9 Initial care of injuries

Treatment of sports injuries includes the initial treatment on the field and referrals to a hospital. Treatment modalities included cold therapy with a cryotherapy spray, bandaging soft tissue massage with topical analgesics and resting of the injured part.

These were not quantifiable as they were mostly used together. This study had 37% of high school rugby players with injuries seeking attention at medical facilities of different levels while the rest of those injured were attended to on the field and at the school. This number was higher compared to those in a study by Constantinou, D and

Bentley, A., (2015) that had 21% of those injured being taken to hospital, this however may not compare well with this study as the former had a team physician on the field while the players in this study had none, hence injuries that may have not required attention at the hospital may have been taken to hospital. Some of the schools in this study were day schools and did not have a resident nurse, hence all treatment was sought at the nearest health facility. The boarding schools however had a resident nurse and had minor procedures such as dressing of wounds done at the school. The medical personnel however did not attend to the students on the field as most games were held over the weekend leaving only first aiders and coaches who were school teachers to attend to the injured players. In the developed countries, a trained doctor (team physician) and a physiotherapist attend to injured players and also follow them up to determine when the player returns to play.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

1. The patterns showed that majority of the injuries involved the extremities (both upper and lower extremities).
2. The initial care given was first aid on the field offered by fellow students or coach.

6.2 Recommendations

1. In view of the high injury rate; there is need for continuous surveillance of risk factors associated with rugby injuries and ways to mitigate such risk should be encouraged.
2. Protective equipment such as shin shields should be used to reduce the injuries.
3. Event organizers should hire medical personnel to attend to the injured students especially at competitive levels.

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APPENDICES

Appendix 1: Questionnaire

1. Code no.....
2. School admission number.....
3. Date:
4. Date of birth..... Age (years).....
5. Weight..... Height..... BMI.....

Injury profile

6. Any history of previous injury Yes No

7. Site of injury (circle)

Head, Face, Neck, Shoulder, Upper Arm, Lower Arm, Wrist, Hand, Fingers,
Thumb, Chest, Abdomen, Spine, Back, Pelvis, Upper Leg, Lower Leg, Knee,
Ankle, Foot, Toes, Other.

8. Mechanism of injury. How did the injury occur?

Hit by ball

Contact with obstacle

Contact with another player

Injury without contact by another player or ball(during movement)

Others

Specify.....

.....

.....

9. Phase of play or aspect of training

Scrum Maul Pileup

Lineout Tackle Collision

Ruck Kicking Other

10. Time of game: 1st half 2nd half Added time on

11. Relationship of ball and injured player: Near ball Behind play

12. Play type: Competitive game Normal training

13. Position played indicate: Forward Back

14. Who gave initial treatment on the field

Doctor

Nurse

Physiotherapist

Coach/ teacher

Fellow student

What treatment was given specify

.....
.....
.....

15. How many days did it take before return to play?

Less than a day

2 - 3 days

4 - 7 days

8 - 21 days

More than 21 days

Severity of injury For researchers use only

16. Severity of injury minor mild moderate severe

NOTE:

SEVERITY OF INJURY

MINIMAL - if able to return to game/training in which injury occurred in 2 to 3 days.

MILD - if missed four to seven days.

MODERATE - if missed 8 to 21 days.

SEVERE - if missed more than 21 days

17. Was the student taken to hospital yes

18. If yes was the patient admitted yes no

SEVERE INJURIES HOSPITAL RECORD SHEET

Name of facility

19. Type of facility

Dispensary Health Centre

Sub-county Hospital county hospital level 4

county hospital level 5 National referral al

20. procedure done at hospital

Casting other

Surgery

specify.....

Medication

Appendix 2: Consent Form

CONSENT FORM

**PATTERN AND INITIAL CARE OF SPORTS INJURIES AMONG
HIGH SCHOOL RUGBY PLAYERS IN ELDORET, KENYA**

RESEARCHER: DR. ELIZABETH KHISA, MBChB

I.....of P.O Box.....

Tel.....confirm that the purpose of this study and my role have been well explained to me by Dr. Elizabeth Khisa. I have also been assured that all information shall be treated and managed in confidence. I have not been induced or coerced by the investigator (or her appointed assistant) to cause my signature to be appended in this form and by extension participate in this study. I agree to the conditions explained and give consent to be included, on behalf of..... who is my dependant by virtue of being a minor and unable to consent.

Initials of parent or guardian.....

Signature.....

ID No.....

Date.....

Witness

Sign.....

Date.....

Contact: Dr. Khisa Elizabeth

Telephone number: 0720336418

Appendix 3: Assent Form

ASSENT FORM

**PATTERN AND INITIAL CARE OF SPORTS INJURIES AMONG
HIGH SCHOOL RUGBY PLAYERS IN ELDORET, KENYA**

RESEARCHER: DR. ELIZABETH KHISA, MBChB

I.....of P.O
Box.....

Tel.....confirm that the purpose of this study and my role have been well explained to me by Dr. Elizabeth Khisa. I have also been assured that all information shall be treated and managed in confidence. I have not been induced or coerced by the investigator (or her appointed assistant) to cause my signature to be appended in this form and by extension participate in this study. I agree to the conditions explained and give assent to be included by virtue of being a minor therefore unable to consent.

Initials of participant.....

Signature.....

Student ID No.....

Date.....

Witness

Sign.....

Date.....

Contact: Dr.Khisa Elizabeth

Telephone number: 0720336418

Appendix 4: McManus Validated Data Collection Instrument

A

| | | |
|--|----------------|---|
| | | ID# <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1-5 |
| Name _____ | 1. Grade _____ | (Office use only) <input type="checkbox"/> <input type="checkbox"/> 6-7 |
| 2. Date <input type="checkbox"/> <input type="checkbox"/> dd <input type="checkbox"/> <input type="checkbox"/> mm <input type="checkbox"/> <input type="checkbox"/> yy | 8-13 | 3. Age (in years) _____ <input type="checkbox"/> <input type="checkbox"/> 14-15 |

| | | |
|---|--|--|
| 4. Site of injury (circle) | Head, Face, Neck, Shoulder, UArm, LArm, Wrist, Hand, Fingers, Thumb, Chest, Abdomen, Spine, Back, Pelvis, ULeg, LLeg, Knee, Ankle, Foot, Toes, Other _____ | (Office use only) <input type="checkbox"/> <input type="checkbox"/> 16-17 |
| 5. Severity of injury (circle) | minor / mild / moderate / severe | <input type="checkbox"/> <input type="checkbox"/> 18-19 |
| 6. Mechanism of injury (circle) | extrinsic / intrinsic | <input type="checkbox"/> <input type="checkbox"/> 20-21 |
| 7. Where (circle) | game / training | <input type="checkbox"/> <input type="checkbox"/> 22-23 |
| 8. Phase of play or aspect of training (circle) | Scrum, Lineout, Ruck, Maul, Tackle, Kicking, Pileup, Collision, Other _____ | <input type="checkbox"/> <input type="checkbox"/> 24-25 |
| 9. If terrain a factor of injury (circle) | hard / soft / muddy / other _____ | <input type="checkbox"/> <input type="checkbox"/> 26-27 |
| 10. If weather a factor of injury (circle) | hot / cold / wet / other _____ | <input type="checkbox"/> <input type="checkbox"/> 28-29 |

If injured in game continue. If at training, go to Question 16. *on the reverse.*

| | | |
|--|--|--|
| 11. Time of game (circle) | 1st half / 2nd half / time on | (Office use only) <input type="checkbox"/> <input type="checkbox"/> 30-31 |
| 12. Relationship of ball and injured player (circle) | near ball / behind play | <input type="checkbox"/> <input type="checkbox"/> 32-33 |
| 13. Play (circle) | legal / illegal | <input type="checkbox"/> <input type="checkbox"/> 34-35 |
| 14. Position played (circle) | LHP H THP LL RL LF RF 8 HB 5/8 LW IC OC RW FB | <input type="checkbox"/> <input type="checkbox"/> 36-37 |
| 15. Back or forward (circle) | B / F | <input type="checkbox"/> <input type="checkbox"/> 38-39 |

Appendix 5: IREC Approval



MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 334711/2/3
Reference: IREC/2014/138
Approval Number: 0001241

Dr. Elizabeth Khisa,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.



MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET
19th August, 2014



Dear Dr. Khisa,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-

"Pattern and Treatment of Sport Injuries among High School Rugby Players in Eldoret Municipality."

Your proposal has been granted a Formal Approval Number: **FAN: IREC 1241** on 19th August, 2014. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 18th August, 2015. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

**PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE**

cc Director - MTRH Dean - SOP Dean - SOM
 Principal - CHS Dean - SON Dean - SOD

APPENDIX 6: BUDGET

| Code | Item | Cost (Kshs) |
|-------------|--|--------------------|
| 1 | Six Reams of plain and ruled paper @ 500 | 3,000.00 |
| 2 | Pens, pencils, folder and other stationery | 2,000.00 |
| 3 | Two Computer Flash discs | 3,000.00 |
| 4 | Printing research proposals | 10,000.00 |
| 5 | Printing thesis | 15,000.00 |
| 6 | Binding thesis | 3,000.00 |
| 7 | Transport costs | 20,000.00 |
| 8 | Research assistants | 30,000.00 |
| 9 | I.R.E.C. fee | 1,000.00 |
| 10 | Data handling | 30,000.00 |
| 11 | Miscellaneous | 5,000.00 |
| 12 | Add 10% contingency | 12,200.00 |
| | TOTAL | 134, 200.00 |

APPENDIX 7: STUDY TIMETABLE

| Activity | Duration | Time period | Responsible person |
|---|-----------------|-----------------------------|---------------------------------|
| Selection of topic | 2 months | February to March 2014 | Researcher |
| Literature review | 3 months | March to June 2014 | Researcher |
| Writing proposal | 1 month | June 2014 | Researcher |
| Submission to IREC | 1 month | July 2014 | Researcher and supervisors |
| Approval by IREC | 1 month | July 2014 | IREC committee |
| Data collection including pilot study | 18 months | January 2015 to June 2016 | Researcher and her assistants |
| Writing the thesis report/departmental mock defense | 9 months | September 2016 to June 2017 | Researcher |
| Submission of thesis | 1 month | October 2017 | Researcher, supervisors and HOD |
| Oral defense of thesis | | August 2018 | Researcher |