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Injury surveillance during a national female youth football tournament in Kenya

Master's Thesis in Sports Physiotherapy

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Fornote: Cover picture is retrieved from MYSA shootback office. Permission to reproduce has been received from Stephen Muchoki, Sports manager in MYSA (Appendix 1).

"Some of my friends dropped out of school early because of poverty and ended up as prostitutes and criminals. I don't know where I would have been if it wasn't for football in MYSA".

Beldine Odemba, MYSA member

Abstract

Background: Participation of girls in football is growing in Kenya. Football in Kenya is not only a leisure time activity it is also used as a tool for community and individual development. Injuries in developing countries are often neglected. Most epidemiological studies on female youth football players are from Europe or North-America. Epidemiological studies on female youth football players in Africa are limited.

Objective: To analyze the incidence, characteristics and circumstance of injuries during a two-day national female youth football tournament in Kenya.

Method: Injuries were registered on a standardized injury report form by specially trained Kenyan injury reporters. They were supported by four physiotherapist and two doctors. Injuries were defined as all injuries, painful conditions or physical complaints that occurred during the match, regardless if the player could continue to play.

Results: A total of 252 injuries were reported from 106 matches. The incidence of all injuries was 191.2 injuries/1000h [95% CI 167.6-214.8]. Most injuries allowed the players to continue to play (n=199; 80%). U13 players had an increased risk of injury compared to U16 players (RR=1.36; 95% CI 1.01-1.84; p=0.043) and O16 players (RR=1.50; 95% CI 1.16-2.11; p=0.003). Fourteen injuries (6%; 10.6 injuries/1000h; 95% CI 5.1-16.2) were expected to result in absence from play for at least 1-7 days**.** The injuries most commonly involved the lower limb (n= 184; 73%). A contusion to the knee (n=27; 11%) and ankle (n=26; 10%) were the most common specific injury types. Most acute injuries (188 of 238, 79%) were caused by player contact.

Conclusion: The incidence of injuries among female youth football players in a national tournament in Kenya was high. U13 players had the highest injury risk. Contusions to the knee and ankle were the most common specific injury types. Most of the injured players had minor injuries and could continue to play, which is positive since football is used to develop individuals and communities.

Keywords: Injury surveillance, female youth football, tournament, Kenya

Content

Foreword

I worked as a physiotherapist in Kenya for 1.5 year through a peace corpse exchange program. During my stay I witnessed how powerful the tool of football can be in the fight against poverty, HIV/AIDS, gender inequity and to help the youth stay in school. I also witnessed the dark side of football in terms of injuries and how tragic the outcome can be when the money or knowledge to fix the injuries is not there. I have a great interest in prevention of injuries. I realized during my stay how important prevention is especially in a developing country like Kenya, where it is not always possible to do something about the injuries and where the consequence of an injury can therefore be great. My colleague from Kenya, Dr. Byakika, described it like this during the 2009 FIFA Futuro III football medicine course in Kenya: “In Europe you talk about how much it cost to treat the injuries, in Africa they have to live with the injuries”.

It has been a long process with a lot of challenges and cultural differences to overcome. I want to thank all the persons who helped me and gave valuable advices during the preparation of the study, during my data collection in Kenya and during the writing process.

I would especially like to thank my supervisors Thor Einar Andersen and Kathrin Steffen for your wisdom, inspiration, patience and availability and also for supporting me in my idea about conducting this study in Kenya.

A special thanks also goes to all the injury reporters who helped me during the data collection; Bruce, Moses, Karambu, Kemboi, Sally, David, Elvis, Pauline, Kariuki, Belinda, Wambui, Ruth, Ambrose and John. Also the Kenyan doctors Mutiso and Mbuwi, and the Norwegian physiotherapists Siri, Marianne and Solfrid deserves a big thank you for helping with diagnosing and guiding for the injury reporters. I couldn’t have done this without your help!

This project was financially supported by FIFA Medical Assessment and Research Centre and Fondet til fremme av idrettsmedisin og idrettsfysioterapi i Norge. Without your support I could not have travelled to Kenya to conduct this study.

A big thanks also to Randall Dick for reviewing my English, to Astrid Junge, Jiri Dvorak, Jan Ekstrand and Anders Hasselgård for showing an interest in this master’s thesis and for interesting discussions. I would also like to thank my family and friends for your support and understanding in this hectic period. Last but not least thanks Johann for your support during this demanding time.

Marianne Lislevand, Oslo, May 2010.

1. Introduction

1.1 Background

Africa is a continent with major developmental challenges like extreme poverty, hunger and infections. HIV/AIDS, malaria and tuberculosis kill three million people in Africa every year. In Kenya, especially HIV/AIDS is a major concern since no vaccine exists and the disease is causing approximately one third of the deaths in the country. The deaths are threatening the progress in human development in Kenya (WHO, 2006; UNDP, 2006).

Over the last decade, the use of sport as a tool to achieve development goals has gained immense support worldwide and football is the sport most frequently used (SDP IWG, 2007; Selliaas, 2008). United Nations define development as a process of enlarging people's choices and increasing the opportunities available to all members of society, particularly in countries considered to be low income (UN, 2003). Research shows that using sport as a tool for development has the potential to contribute to both personal and social development (Maro et al, 2009; SDP IWG, 2007). In Kenya most of the youth football leagues are organized by non-governmental organizations (NGO) that use football as a tool for development. Mathare Youth Sports Association (MYSA) is one of these organizations. In addition to the football activity the players receive education in healthy values, HIV/AIDS and drug abuse awareness, family planning and leadership. In addition MYSA organizes one national and one international football tournament every year targeting just female youth football players. The aim of these tournaments is to educate girls outside of MYSA (www.mysakenya.org).

Given the contact and collision aspects of football, football players are susceptible to the risk of injury and the possibility of not being able to participate in football activities because of the injury. Most of the studies on female youth football players are from Europe and North-America with the injury incidence ranging from 4.6 to 22.4 per 1000 match hours and 0.4 to 4.6 per 1000 training hours in seasonal play (Froholdt et al, 2009; Soligard et al., 2008; Le Gall et al, 2008; Steffen et al, 2007; Emery et al, 2005; Söderman et al, 2001a) and from 5.1 to 44.0 per 1000 match hour in tournament play (Soligard, 2010, personal communication; Backous et al, 1988; Mæhlum et al, 1986; Schmidt-Olsen et al 1985; Nilsson & Roaas, 1978). There are no known prospective studies on female youth players participating in development projects using football as a tool or within the continent of Africa. Only a one year

retrospective cross-sectional study is available on an African female youth population (Mtshali, 2007).

An injury in a developing country may cause other challenges and consequences than in the western world and it can therefore be argued that prevention of injuries is especially important in developing countries. The first step towards prevention of injuries is to examine the magnitude of the problem in terms of incidence and severity (van Mechelen et al., 1992). Since youth football in Kenya is often used as a tool for development and the participation in this kind of a development project presupposes players free of injuries, it is important to know if there is an injury problem in order to be able to prevent.

1.2 Aims

Descriptive epidemiological knowledge about injuries in female youth football players in Africa is limited. The primary research question in this master's thesis is therefore:

What is the incidence, characteristics and circumstances of injuries during a national female football tournament in Kenya?

Incidence of injury includes frequency and incidence of all new injuries. Injury characteristics include injury onset (acute/overuse), injury pattern (injury location and type) and injury severity. Circumstances of injury include injury mechanism and foul play.

1.2.1 Secondary aim

In this tournament there are three different age categories participating. Therefore it would also be interesting to ask the question:

Are there any differences of injury incidence between the age groups?

I will not go into risk analysis of different type of ground or equipment use since it is out of the scope of this master's thesis.

1.3 Literature search

"PubMed", "Google Scholar" and "SPORTDiscus" were the primary sources of the literature review. The MeSH terms used in different combinations were "female", "football", "youth", "tournament", "Kenya", "injury". In addition, literature was also collected from other relevant internet pages for example like www.mysakenya.org. Only English and Norwegian language literature were reviewed.

2. Theory

This theory chapter consists of two parts. The first part reviews the use of football as a tool for development. In this part I will discuss what is special about football in Kenya, how football is used as a tool for development, and advantages of youth participation. In addition, I will examine why it is important to prevent injuries, especially in a developing country like Kenya, as well as the consequences of injury. The second part is about injuries in football. First I will define injury surveillance and to outline different methodological considerations to consider when performing and interpreting results of injury surveillance studies. Second I will review the epidemiological studies on injuries in female football players with emphasis on youth. Finally, I will present studies on the causes of injuries, including risk factors and mechanism in female youth football players. Together these two parts will create the theoretical rationale behind this master's thesis.

Part I: Football as a tool for development

Extreme poverty, hunger, and infections are tearing the very foundation of the African continent. HIV/AIDS, malaria and tuberculosis are called the "Big Three" because they kill three million people in Africa every year. In 2003, HIV/AIDS had the highest prevalence of the "big three" in Kenya, accounting for 78% of the deaths. The deaths are threatening the progress in human development in the country (UNDP, 2006).

Over the last decade, the idea of sport as a simple, low-cost and effective means of achieving development goals worldwide has gained immense support (SDP IWG, 2007). In 2003, the United Nation (UN) claimed for the first time that sport could be a powerful tool to promote health, education, development and peace (UN, 2003). The UN dedicated 2005 to "The international Year of Sport and Physical Education", thereby increasing the focus on sport as a developing tool (UN, 2005). Norwegian authorities are also following the international trend of using sport as a tool for development. In 2008, approximately 51 million kroner was granted to sports and development projects from the Norwegian development budget (Hasselgård, 2009). Some of this support went to Mathare Youth Sports Association (MYSA) through The Stromme Foundation (http://www.strommestiftelsen.no/default.aspx?aid=460814).

Football is the most popular sport worldwide (Dvorak et al, 2004). Football is also the most frequently used sport to promote development. In 2008 approximately 260 sports aid projects were registered worldwide, over 80 of these were exclusively football projects. However, most of the other projects also used football as a tool for development in combination with other sports (Selliaas, 2008). FIFA also uses football as a tool for development through the Football for Hope Movement[1] (FIFA, 2009).

In addition, there has been an increasing academic interest in sport and development. The Sport for Development and Peace International Working Group (SDP IWG) reviewed the literature on the effect of using sport as a tool for development. Among the effects sport could have on the personal level, SDP IWG (2007) found that sport may decrease the likelihood of unhealthy practices such as illegal drug use and unsafe sex. Another finding was that sport may positively affect self-esteem and self-worth, especially for females. In addition, the opportunities for leadership experience could contribute to personal and professional growth. Among the effects on the social level, the group found that sport could positively influence social integration of females and successfully challenge traditional and oppressive gender relations. Based on these results the authors concluded that under the right conditions, sport had the potential to contribute to both personal and social development, but more research was needed to investigate the long term effects (SDP IWG, 2007).

Maro et al (2009) investigated the effect of an AIDS education program using peers in a football context. A randomized quasi-experimental design was used. The results indicated that the intervention using peer coaches in football settings was reliably more effective in transmitting HIV prevention knowledge, cognitions and perceived behaviors for at-risk youth than the traditional school-based HIV education or informal education for the out-of school children.

The literature indicates that using football as a tool has the potential to contribute to both personal and social development.

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[1] Football for Hope movement is a movement that uses football as a tool for social development. Leading the initiative are, FIFA, the world governing body of football, and streetfootballworld, a centre of expertise that supports a global network of local organizations in the field of development through football.

Currently, approximately 29 organizations in Kenya are using football as a tool for development (Stephen Muchoki, sports manager MYSA, personal communication). This section will focus on MYSA, one of the organizations, and how it uses football as a tool for development. I will also describe how female football is organized in Kenya and the consequences an injury might have for female players living in a developing country.

2.1 Female football in Kenya

Kenya is located on the East coast of Africa with an estimated population of 36.5 million (www.kenya.go.ke). Kenya is a developing country with high poverty levels. Almost half of the population is living on less than 1 US$ a day (Wamai, 2009).

2.1.1 Football for hope and development

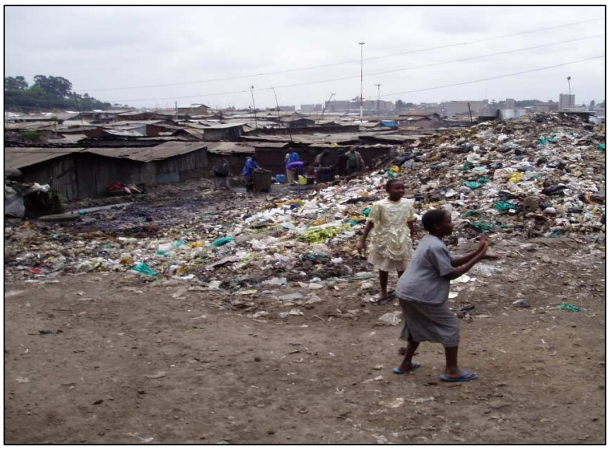

Figure 1: Slum environment. Children are playing beside piles of garbage.

MYSA was founded in 1987 by Canadian expatriate development worker Bob Munroe and has its origin in the Mathare Slum in Nairobi, Kenya. Mathare is one of Africa's largest and poorest slums and is home to several hundred thousand people. The people live under very harsh conditions. Their homes are made of mud, sticks, cardboard and flattened tins. The houses have no water, no electricity, no toilets, no garbage collection and no drainage ditches resulting in a neighborhood filled with garbage and running sewage (fig. 1) (www.mysakenya.org).

Females are especially vulnerable in the slum and poor environments and gender discrimination deeply affect the girls. Families favor boys when it comes to education, resulting in females dropping out of school at an early age. Many females fail to complete primary education even though it is free and accessible to all (MYSA, 2006; FIFA World, 2009). The young girls are faced with huge workloads at home, and are often forced to engage in income generating activities to boost their family's income. However, the employment opportunities are few and many girls end up as low-paid maids, sex workers, or casual

workers with no security. There is also a relatively high level of sexual coercion among girls in Kenya. Poor young women are particularly at risk of being exploited sexually, either in exchange for favors or money thus increasing the risk of contracting HIV (Brady & Kahn, 2002). The highest rate of HIV infection in Kenya is among youth between 15 and 24 years old, and girls in this age group are more than twice as likely to become infected as boys. In addition, surveillance data show a rapid increase in HIV prevalence rates among girls ages 15 to 24. The rate of HIV is highest among those women who began sex at an early age and lowest among those who started sex later (KDHS, 2003). The proportion of births to young women in their teens that occur prior to marriage is also increasing (Brady & Kahn, 2002). Low retention in school, vulnerability to HIV/AIDS and early and unintended pregnancies trap the girls in a cycle of poverty (www.mtgk.org).

It is in this setting that MYSA uses football as a tool for development. According to MYSA, the organization pioneered this linkage between sports, environment and community development. The aim of the organization is to help its members develop life skills on and off the playing field to help the members out of the cycle of poverty. The majority of MYSA members enter through the football program where the sport is used as a tool to fight poverty, gender inequity and improve health. MYSA develops its members by awarding scholarships, training the members in HIV/AIDS and drug abuse awareness, and family planning and leadership training. In addition the participants are required to participate in slum cleanups to increase the environmental awareness. By starting with the MYSA participants, the organization hopes ultimately to change the whole community (www.mysakenya.org).

2.1.2 League system

Nationally run female football leagues organized by the Kenya Football Federation (KFF) are rare. Female football leagues in Kenya are mostly organized by NGOs that use football as a tool for development. One example is MYSA, which organized the first league for female football in Kenya in 1992. Participation in the MYSA league has increased over the years. In 1992, 144 girls from eight teams participated. In 2009, 3469 girls ten years and older were divided between 278 teams representing 16 different zones in Nairobi (MYSA, 2009). The regular season league runs from March to September with finals from October to December.

In the last ten year, other NGOs have tried to empower the girls through football[2] by also starting girl's leagues using a similar model to the MYSA.

In late 2002 the KFF, Nairobi branch, started the first women's league. During 2002-2003 ten teams competed (www.mysakenya.org). Currently, this league is no longer running and the only federation-run league for females in Kenya is KFF Mombasa branch. This league runs from June to November and nine teams participated in the 2008 season (Asha, women's football coordinator KFF, personal communication). Since only one federation-run female league is currently in existence, the NGO's work to organize female leagues is still important. Some secondary schools are organizing school leagues during first (January until April) and second term (May until August). The winner of the local school leagues proceeds to the provincial level and then to national levels.

2.1.3 MYSA tournaments

Every year MYSA organizes one national and one international tournament only for female football players. In the MYSA tournaments, football is used as a tool for development. MYSA organized the first inter-provincial female tournament in 2001. This tournament gathered teams from different geographical locations of Kenya. In 2004 MYSA organized the first international girls' football tournament with teams from both within and outside Kenya. Over the years the tournaments have gathered teams from both Uganda and Tanzania in addition to Kenya (Odour, 2007). The number of participating teams in the tournaments is growing. In 2001, 13 teams participated in the first inter-provincial tournament while in 2007 66 teams participated (Odemba, 2007). In the international tournament the number of teams has increased, from 64 in 2004 to 93 in 2007 (Odour, 2007).

The aim of the MYSA tournaments is to empower females not only in sports but in confidence, careers, health, and life. In addition the tournaments are a way of reaching girls from societies outside of MYSA and Kenya. During the 2007 international tournament, over 1500 girls were educated on the risks and prevention of HIV/AIDS and substance abuse as well as on child labor issues (Odour, 2007). The tournaments also focus on gender equality and create confidence in the girls with slogans like "excellence knows no gender". In addition

[2] For more information about these NGOs visit the web pages; www.kisumuyouthfa.org and www.mtgk.org.

the girls can win scholarships which can help poor girls continue with their education. The MYSA tournaments also provide a good chance for the girls from different areas to participate, test and improve their football skills and teamwork.

The tournaments are very important and many spectators, media and politicians attend to watch the girls play. By drawing attention to the tournaments MYSA see it as an opportunity to influence society's view of the girls (Stephen Muchoki, sports manager MYSA, personal communication). The MYSA female football tournaments may become a catalyst for the transformation of social norms (Brady & Kahn, 2002).

2.2 Consequences of an injury in a developing country

Football participation carries a risk for injury (Drawer & Fuller, 2002). The high cost of treating the injuries or a concern of the long term clinical outcomes like osteoarthritis (Engebretsen & Bahr, 2009) are often discussed as consequences that should be minimized through an injury prevention program. However, in a developing country there are often additional consequences or challenges if a player sustain an injury. In the following section these consequences and challenges are outlined.

Availability of healthcare services and utilization in Kenya

One of the challenges in Kenya is the availability and utilization of healthcare services. The healthcare spending in Kenya is more than five times less than the recommended level by the World Health Organization (KSPA, 2004). According to KSPA (2004) the under-financing of the health sector in Kenya has reduced its ability to ensure an adequate level of healthcare for the population.

There are over 5000 health facilities across Kenya (Wamai, 2009). However, the health facilities are unevenly distributed across the country's seven provinces and Nairobi; therefore, the health facilities are not equally available for the population. For instance, the more affluent Central Province has about twice the number of facilities per population as the poorer provinces Nyanza and Western (Wamai, 2009).

The availability of doctors and health personnel is also a challenge in Kenya. In 2002, the total number of Kenyan health personnel was 59,000 (about 527 inhabitants per health personnel). This included 4506 doctors which was equivalent to a density of 6228 inhabitants per doctor (WHO 2006; Wamai, 2009). For comparison the total number of doctors in Norway in 2002 was 16540 which was equivalent to a density of 273 inhabitants per doctor (www.legeforeningen.no/index.db2?id=1458).

Even though health facilities are available it does not guarantee utilization. The Kenya Household Health Expenditure and Utilization Survey showed that one fourth of the population reporting being ill did not seek healthcare (Ministry of Health, 2003). Cost was reported as the main reason to not seek health care when being ill. Another second reason was the long distance to the nearest health facility (Ministry of Health, 2003).

The heavy burden of diseases and the rapid population growth are additional challenges for Kenya in the attempt to provide adequate healthcare for its citizens (KSPA, 2004). Malaria is the leading cause of outpatient morbidity in Kenya accounting for one-third of all new cases reported. The next most common illnesses seen in outpatient clinics are diseases of the respiratory system, skin diseases, diarrhea and intestinal parasites (KSPA, 2004). Diseases occupy most of the healthcare resources in Kenya.

Medical consequences

According to Engebretsen & Bahr (2009) Kennedy stated in 1970 that “the anterior cruciate ligament is the most common cause of the exathlete” meaning the treatment offered at the time did not permit athletes to go back to sport. The same authors then stated that this is no longer the case, at least in the short term, thanks to the advances in sports medicine with major improvements in surgical techniques and rehabilitation programs. However, this may not be true in the developing countries. According to Wekesa et al (2001) the occurrence of injuries in sports and the negligence of injured players have caused an early exit of talented players in most developing countries. Whether this is due to the burden of cost and availability of healthcare service is not known.

Njororai et al (1994) reported that 13 out of 33 football clubs in the male competitive league did not have a qualified medical attendant. Thus it seems like not all the football clubs have medical personnel to rehabilitate injured players.

The price of surgical operations varies depending on whether it is performed in a private or public hospital. Mutiso estimated the total cost of an ACL reconstruction performed in a private hospital to be approximately 350,000 Kenya Shillings which is equivalent to approximately 35,000 Norwegian kroner or 4,500 US$. In a public hospital Mutiso estimated the price of the same operation to be approximately 60,000 Kenya Shillings which is equivalent to approximately 6,000 Norwegian kroner or 780 US$ (Nairobi hospital and Department of Orthopedic Surgery University of Nairobi, personal communication).

Half of the population in Kenya lives on less than 1 US$ a day, meaning that most Kenyans can not afford this kind of operation even if it is done in a public hospital. Therefore, injured players have to live with untreated injuries for the rest of their lives.

Social and personal consequences

Because football in Kenya is used as a tool for development, these benefits, as well as increased health and fitness can be lost if the players can not play due to an injury.

One of the advantages that can be lost is team solidarity. MYSA girls reported that being in a team and not being on your own was greatly valued. The team and organization provided structure, guidance, confidence and encouraged healthy behaviors (Brady & Kahn, 2002). Other important advantages that could be lost are the valuable education about HIV/AIDS and drug abuse awareness, family planning and the opportunity to win scholarships. Organizations like MYSA that use football as a tool are also important avenues for personal and professional growth since the members are trained in leadership and skill-building. The players are coaching football teams, trained as HIV/AIDS peer educators and facilitating work shops.

2.3 Summary part I

Extreme poverty, hunger, and infections are tearing the very foundation of the African continent thereby threatening the progress of human development there. Over the last decade, the use of sport as a tool to achieve development goals has gained immense support worldwide and football is the sport most frequently used. Based on the available literature it seems like using football as a tool has the potential to contribute to both personal and social development. Most of the female youth football in Kenya is organized by non-governmental organizations that use football as a tool for development. However, football carries a risk for injuries. Since Kenya is a developing country with high poverty levels, receiving an injury may lead to additional challenges and consequences. The cost and lack of access to health care services may result in no more sport participation and living with life-long injuries. In addition advantages that may lead to personal and social development could be lost if the players can not play football. Based on these injury consequences one can argue that prevention of injuries is important, especially in developing countries like Kenya.

Part II: Injuries in Football

Physical activity is associated with an overall reduction in mortality, morbidity and improved quality of life (Haskell et al., 2007). However, sports participation also carries a risk for injuries. Therefore, one of the principal objectives of clinical sport medicine is the prevention of sport injuries (Engebretsen & Bahr, 2009; Drawer & Fuller, 2002). In 1992, van Mechelen presented a theoretical model recommended to be followed in research of sports injury prevention known as "the sequence of prevention" (fig. 2). The model consists of four steps. In the first step the magnitude of the problem is identified through injury surveillance and described in terms of the incidence and severity of sports injuries (descriptive epidemiology). Secondly, the risk factors and injury mechanisms that play a part in the occurrence of the injury must be identified (analytic epidemiology). The third step is to introduce preventive measures that are likely to reduce the future risk and/or severity of sports injuries. Finally, the effect of the measures must be evaluated by repeating the first step. The remainder of this theory chapter will address the first two steps in this model: Injury incidence, injury pattern, severity, injury risk factors and mechanisms of injury. The knowledge about these factors is essential in determining the extent of the injury problem, why injuries occur, and how to develop effective prevention programs (van Tiggelen et al, 2008; Finch, 2006; van Mechelen et al., 1992).

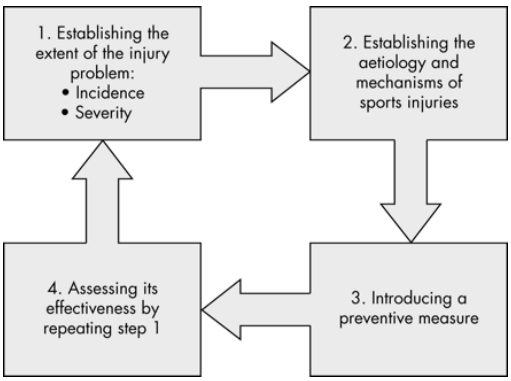

Figure 2: Sequence of prevention (van Mechelen et al., 1992).

2.4 Injury surveillance

Injury surveillance is the tool with which injury data can be collected (Finch, 1997; van Mechelen, 1997a). The object of surveillance is to enumerate the extent of injury in a given group or population over a specific time. It is recommended in studies of football that the study period should cover a whole season including preseason or the duration of a tournament (Fuller et al., 2006; Hägglund, 2005a; Junge & Dvorak, 2000). Based on surveillance data from previous studies, we can learn which injury types should be targeted when considering injury prevention or evaluating the effectiveness of a prevention program (Meeuwisse & Bahr, 2009; Finch, 1997; van Mechelen, 1997a; van Mechelen et al., 1992). However, the ability to record and report the magnitude of injuries reliably is a critical factor (Bahr, 2009). When comparing results between studies in different sports and sports settings, there are a number of important characteristics of surveillance that must be considered. These include definition of injury, injury classification and issues surrounding the count of injury and re-injury, and assessment of injury severity. A critical factor is that the studies use the same methodology and injury and exposure definitions to allow comparisons of injury risk (Meeuwisse & Bahr, 2009; Fuller et al, 2007c; Fuller et al., 2006; Hägglund et al., 2005a). The following section will review some of these characteristics including injury definition, exposure time, data collection and assessment of injury severity.

2.4.1 Definition of injury

The operational definition of an injury in epidemiological studies on football has varied. This makes a direct comparison between studies difficult since the definition used can influence the number of injuries recorded in a study (Brooks & Fuller, 2006; Fuller et al., 2006; Hägglund et al., 2005a; Junge & Dvorak, 2004; Dvorak & Junge, 2000; Junge & Dvorak, 2000; Inklaar, 1994a; van Mechelen et al., 1992; Noyes et al, 1988). One definition is not necessarily better than the other and there are different opinions about what is the most suitable definition (Hodgson et al, 2007; Orchard & Hoskins, 2007; Hägglund et al., 2005a; Junge & Dvorak, 2000).

Most epidemiological studies on football define an injury based on time-loss from football participation, recording only injuries resulting in the player missing the next training session or match (Jacobson & Tegner, 2007; Jacobson & Tegner, 2006; Arnason et al., 2004; Östenberg & Roos, 2000), or the day(s) following the injury (Le Gall et al., 2008; Faude et al, 2005; Andersen et al, 2004b; Hawkins & Fuller, 1999). A time-loss definition reflects the

immediate impact injuries have on the players' health and performance and also on the performance of the club. A possible limitation of this definition is that it depends on the frequency of training sessions and matches and this may introduce bias when comparing different levels of play. The time-loss definition is also sports specific since a broken finger may cause absence from play in handball, but may not cause absence from play in football. Other factors such as access to medical personnel, the importance of a game, or the pain threshold or motivation of the player may also influence (Junge & Dvorak, 2000; Noyes et al., 1988). According to Junge & Dvorak (2000) reporting an injury as a time-loss the day after the injury is more precise even though it does not resolve all difficulties mentioned above.

Other studies have used the anatomical "tissue" injury definition, (Soligard, 2010, personal communication; Junge et al, 2004b; Junge & Dvorak, 2000; Peterson et al, 2000). This is a much finer filter and includes all injuries, severe and minor, that occur as a result of playing football regardless of subsequent absence from participation. The definition could therefore lead to a higher injury rate even though some of the injuries may not influence the athlete or club to the same extent. It has been argued that all minor complaints (e.g blisters, wounds, bruises) should be left out since these may not affect the player's performance and health (Noyes et al., 1988). The use of a broad and sensitive definition like this requires much more effort on the part of the recorders and observers (Hodgson et al., 2007; Noyes et al., 1988). The "tissue" definition can be influenced by how active the observer is in seeking out injured players and the registration requires qualified medical practitioners to evaluate all injuries (Junge et al., 2008; Hägglund, 2007; Fuller et al., 2006). The advantage with a broad definition is the possibility to assess the impact of the full spectrum of injuries from mild contusion to fractures. Assessing the long-term consequences of injuries may benefit from this broad approach, since an analysis of injury sequences shows that minor injuries are often followed by moderate or major ones, and acute complaints are a predictor of subsequent injuries (Junge & Dvorak, 2000). In addition a broad definition allows filtering of records so that data can be reported in a variety of comparable ways (Hodgson et al., 2007). The athlete sometimes competes despite an injury. An "all encompassing" injury definition does not leave it up to the physician to judge which injuries should or should not be included (Junge et al., 2008). The tissue injury definition is potentially the most objective method to determine whether an injury has occurred, but the reliability is dependant on if objective methods have been used in diagnosing an injury i.e, magnetic resonance imaging or ultrasound. Otherwise, an observer and patient bias are likely to occur. The observer is subjective in his/her judgment

of a tissue injury, and a player is subjective in his response to the examination (Hägglund et al., 2005a; Noyes et al., 1988).

Some studies use a medical attention definition (Giza et al., 2005; Lüthje et al., 1996) based on if the injury required treatment from a physician or physiotherapist. The use of this definition is dependent on access to medical personnel. A limitation with this definition is the different availability of medical personnel across teams. It is therefore likely that the reporting threshold would be substantially higher in the lower divisions where the medical personnel are less present at training and/or matches (Hägglund et al., 2005a). In addition psychological factors like pain threshold may determine when players with the same injury seek care from sports medicine personnel (Caine et al., 1996).

Due to the differences in methodology several authors have expressed the need for unification of the methodologies employed in epidemiologic studies of sports injuries (Brooks & Fuller, 2006; Ekstrand & Karlsson, 2003; Junge & Dvorak, 2000; van Mechelen et al., 1992; Noyes et al., 1988). A consensus statement on injury definitions and data collection procedures in studies of football injuries has now been published (Fuller et al., 2006). The consensus presents three different injury definitions: “any physical complaint” defined as; any physical complaint sustained by a player that results from a football match or football training, irrespective of the need for medical attention or time-loss from football activities, “medical attention injury” defined as; an injury resulting in a player receiving medical attention, and “time-loss” injury defined as; an injury resulting in a player being unable to take full part in future training or match play. The purpose and setting of individual studies determine whether all, medical-attention, or time-loss injuries are recorded (Fuller et al., 2006).

2.4.2 Exposure time and injury incidence

The importance of exposure data in injury surveillance has been frequently stated (Brooks & Fuller, 2006; van Mechelen, 1998; de Loes, 1997). Reporting of athlete exposure time i.e, the time the athletes spend at risk of receiving an injury, enable relationships between the incidence of injury and risk factors within the study population to be explored (Hodgson et al., 2007; Fuller et al., 2006). However, the way of registering exposure in relation to incidence has varied in the literature. Some studies report the incidence as number of injuries per 1000 athlete-exposures, meaning one athlete participating in one training or match (Yard et al., 2008; Dick et al., 2007; Kucera et al., 2005). A weakness with this method is that the teams

can have different durations of a training session, or that the players entering a match in the last minutes is less exposed than the players playing a whole match. The last example can lead to an overestimation of exposure time resulting in an underestimation of incidence. However, an advantage of using this method is the easy way of collecting the exposure data.

Other studies report the incidence as number of injuries per 1000 hours of exposure (Froholdt et al., 2009; Le Gall et al., 2008; Steffen et al., 2007). This method of exposure registration gives a truer picture to the actual time exposed to the risk of injury and is therefore recommended to use (Fuller et al., 2006; Hägglund et al., 2005a). In addition the incidence for training and match injuries should be registered separately since the exposure to training and match could differ in time (Fuller et al., 2006).

Some studies report exposure individually for each player (Emery et al., 2005; Soligard et al., 2008; Söderman et al., 2001a) or calculate it on the basis of the team's attendance (Le Gall et al., 2008; Steffen et al., 2008a). A weakness of the latter is that it can lead to an overestimation of the exposure time since absence of players from part of games or trainings is not registered. This may again lead to an underestimation of the injury incidence (Junge & Dvorak, 2000). The strength of registering individually is that the method can be adjusted for the fact that playing time can vary greatly between players in a team. However, to register exposure individually is very time consuming and should only be recorded if the information is specifically required to meet the aims of the study (Fuller et al., 2006). One example is if the intention of the study is to investigate relationships between the incidence of injury and individual risk factors, then the actual exposure times for each player must be recorded (Fuller et al., 2006).

2.4.3 Data collection

As mentioned earlier the ability to record the magnitude of injuries reliably is a critical factor in injury surveillance (Bahr, 2009). A concern with data being collected from several teams is the many different observers involved in recording attendance and injury data. By providing the teams or injury recorders with a study instruction manual the reliability of data recording can be assumed to be improved (Hägglund et al., 2005a). A standardized data collection form should also be used consistently throughout a study (Fuller et al., 2006).

Another critical factor in injury surveillance is who is recording the injuries. Different procedures of injury recording have been performed in past studies. In most studies the team physician or the team physiotherapist has been responsible for diagnosing the injuries and completing the injury report form (Ekstrand et al., 2009; Le Gall et al., 2008; Hägglund et al., 2008; Faude et al., 2006; Andersen et al., 2004a; Östenberg & Roos, 2000; Hawkins & Fuller, 1999; Arnason et al., 1996), but the coach has also been used (Soligard, 2010, personal communication). The frequency of reporting data to the register has varied. In tournament studies the forms have typically been collected after each match (Junge & Dvorak, 2007; Junge et al., 2004b), but in studies lasting for a season, data have been collected on a weekly (Jacobson & Tegner, 2007; Faude et al., 2005; Hawkins et al., 2001) or monthly basis (Froholdt et al., 2009; Steffen et al., 2007; Hägglund et al., 2005b; Andersen et al., 2004b; Arnason et al., 2004). According to the consensus the injury report form should optimally be completed by a medical professional as soon as possible after the event to avoid recall bias (Fuller et al., 2006). In tournament studies Junge et al (2008) suggest the injury report forms should be returned daily to the study centre.

2.4.4 Definition of severity

Injury severity have been described on the basis of six criteria in the literature: nature of sports, duration and nature of treatment, sporting time lost, working time lost, permanent damage, and cost (van Mechelen, 1997b). Most studies of football injuries describe the severity of injury based on sporting time lost, meaning days absent from sport. However the cut-off point for different categories of injury severity differs between studies. Some studies have categorized the injuries into minor (absent 1-6 days), moderate (absent 7-30 days) and major (absent >30 days) (Le Gall et al., 2008; Faude et al., 2005; Söderman et al., 2001a; Söderman et al., 2001b; Östenberg & Roos, 2000; Engström et al., 1991). Others have categorized the severity of injuries differently into, slight (absent 1-3 days), minor (absent 4-7 days lost), moderate (absent 8-28 days) and major (absent >28 days) (Jacobson & Tegner, 2007; Jacobson & Tegner, 2006; Drawer & Fuller, 2002). To be able to compare between different studies Fuller et al (2006) recommends injury severity to be classified into slight (0 days of absence), minimal (1 to 3 days), mild (4 to 7 days), moderate (8 to 28 days), severe (> 28 days) and career ending injuries.

2.5 Injury incidence in female football players

2.5.1 Injuries during seasonal play

Female youth football players

Only six prospective studies reporting incidence as 1000 hours of exposure are found for seasonal play in female youth football (Table 1). All the studies are from Europe or North-America. There are no prospective studies reporting injury incidence on female youth football players from Africa available. The only study on female youth players from Africa is a one year retrospective cross-sectional study and is therefore not included in the following presentation of injury incidence (Mtshali, 2007).

Table 1: Injury incidence in female youth football players during seasonal play. Only studies that are prospective and report incidence as injuries per 1000 player hours are included

Reference	Population (n=) Level of play	Follow up (length of season)	Injury recording	Injury definition	No of injuries	Injury Incidence per 1000h		
						Match	Training	Total
Söderman et al., 2001a	153 amateur	1 season (7 months)	Physiotherapist	Time-Loss	79	9.1[1]	1.5[1]	4.4[1]
Emery et al., 2005	164 amateur	1 season (3 months)	Doctor/Physiotherapist	Time-loss	39	8.6	2.6	5.6
Steffen et al., 2007	2020 amateur	1 season (8 months)	Physiotherapist (telephone contact)	Time-loss	456	8.3	1.1	3.2[2]
Soligard et al., 2008	837[3] amateur	1 season (8 months)	Physiotherapist/Medical student (telephone contact)	Time-loss	166	7.9[2]	2.0[2]	3.7[2]
Le Gall et al., 2008	119 Elite	8 seasons (8 months)	Doctor at research center	Time-loss	619	22.4	4.6	6.4
Froholdt et al., 2009	591 amateur	1 season (7 months)	Physiotherapist (telephone contact)	Time-loss	53	4.6	0.4	-

[1] Only acute injuries. [2] Calculated on the basis of information from the article. [3] Only the control group is included.

Söderman et al (2001a) recorded injuries in 153 14-20 year old soccer players. The players were followed during one season lasting for seven months. The level of play was mainly intermediate or recreational. Only the incidence of acute injuries was reported; 9.1 acute injuries per 1000 match hours and 1.5 acute injuries per 1000 training hours. The injuries were recorded by the players, in co-operation with their coaches and most often diagnosed by one of the authors who were medical personnel. Exposures were collected from diaries

completed by the players and their coaches. One limitation with this study was that the author helped diagnose the injuries and could potentially bias the data collection.

Similar results have been reported by Emery et al (2005). The authors recorded injuries among 12-18 year old Canadian male and female players during one season (3 months). Among 164 females 39 injuries were registered. The female injury incidence was 8.6 injuries per 1000 match hours and 2.6 per 1000 training hours. A weakness with this study was the relatively small sample size and subsequent low number of recorded injuries. In addition only one team for each gender, division (1-4) and age group was randomly selected for the study. It is therefore questionable whether this sample accurately represented the population. Strengths with this study were that five physiotherapist assigned to the different teams examined and diagnosed all the injuries and exposure was registered individually.

Steffen et al (2007) examined the risk of injury on artificial turf and natural grass with data from a randomized trial. The population consisted of 2020 female players from 14-16 year old and the study period was eight months. The injury incidence for the whole population was 8.3 per 1000 match hours and 1.1 per 1000 training hours. The strength of this study was the large number of players which could be regarded as more representative for the population. However a limitation was that exposure data was collected on a team basis and the injury recording was collected with an interview by telephone.

Soligard et al (2008) conducted a randomized controlled trial to examine the effect of a prevention program on rates of lower limb injuries. The population in the control group was 837 players and they were followed during one season. The injury incidence for the control group was 7.9 per 1000 match hours and 2.0 per 1000 training hours. The strength of this study was that exposure was registered on an individual basis. A weakness was that the injury registration was done by interview retrospectively.

Le Gall et al (2008) followed French elite female players between 15 and 19 years of age during eight seasons. A total of 619 injuries were documented among 110 players. The injury incidence was 22.4 per 1000 match hours and 4.6 per 1000 training hours. This incidence is considerably higher than what the other studies reported. The explanation could be that the players were elite and trained more often. When using a time-loss loss definition the probability of recording a less severe injury increases when the players train more often. In addition the authors speculated that the high match incidence may have been due to the wide

variation of ages (15-19) competing in the same cohort where young players play against older more mature players. The strength of this study was that the players were followed over eight seasons and that all the injuries were examined and diagnosed by the same sports medicine doctor. A limitation was that the exposure time was calculated per player on an assumed average of participation in training and match when not injured.

Froholdt et al (2009) examined the risk of injuries among Norwegian male and female players aged 6-16 throughout one season. The incidence of acute injuries for female players was 4.6 per 1000 match hours and 0.4 per 1000 training hours. This was a much lower incidence than reported in other studies. In this study the players did not train often especially in the younger age groups and less severe injuries could have been missed. In addition the method had weaknesses because exposure data were collected on a team basis and the injury recording was collected with an interview by telephone. According to the authors, this could have led to an underestimation of injury risk either by underreporting of injuries or overestimating of training or match exposures.

According to the presented studies the injury incidence among female youth players ranged from 4.6 to 22.4 per 1000 match hours and 0.4 to 4.6 per 1000 training hours. The differences could be due to the various methodologies used to register injuries and exposures, the level of play (elite versus amateur) or the different age groups studied. For comparison the incidence in male youth players during seasonal play ranged from 5.4 to 11.2 injuries per 1000 match hour and 0.5 to 3.9 per 1000 training hours (Froholdt et al., 2009; Johnson et al., 2009; Le Gall et al., 2006; Kakavelakis, 2003). This was a lower incidence than reported for female youth football players. It is difficult to conclude if the differences are due to gender or other factors since the methods and age ranges varied between the studies. However, two of the included studies used the same methodology, age range and recorded injuries simultaneously for both genders. No gender difference for injury incidence was found in either of the studies (Froholdt et al., 2009; Emery et al., 2005). The incidence for match play was higher for both elite male (Johnson et al., 2009; Le Gall et al., 2006) and female youth players (Le Gall et al., 2008) compared to amateur male (Froholdt et al., 2009; Kakavelakis et al., 2003) and female (Froholdt et al., 2009; Soligard et al., 2008; Steffen et al., 2007; Emery et al., 2005; Söderman et al., 2001a) players, but the incidence for training injuries were similar.

Female adult football

In female adult football players (amateur and elite) the incidence of injury ranged from 10.0 to 24.3 per 1000 match hours and from 1.2 to 8.4 per 1000 training hours (Hägglund et al., 2008; Tegnander et al., 2008; Jacobson & Tegner, 2007; Jacobson & Tegner, 2006; Faude et al., 2005; Söderman et al., 2001b; Östenberg & Roos, 2000; Engström et al., 1991). The difference in injury incidence could be due to the different level of play (elite versus amateur). The incidence in female adult football players is much higher than amateur youth players, but more similar to elite youth players (Table 1). Only one prospective study is found on female adult football players from Kenya (Wekesa et al., 2001). The injury incidence was 2.4 injuries per match. However the result are based on a short follow up time (three months) and only 20% of the matches within this period were included. Exposure hours were not reported.

Comparison to male adult football

The incidence in male adult football players ranged from 13.0 to 30.5 per 1000 match hours and 2.1 to 11.8 per 1000 training hours, and was similar or slightly higher than female adult football players (Ekstrand et al., 2009; Hagglund et al., 2008; Fuller et al., 2007a; Fuller et al., 2007b; Hägglund et al., 2006; Hägglund et al., 2005b; Walden et al., 2005a; Walden et al., 2005b;; Andersen et al., 2004b; Arnason et al., 2004; Hägglund et al, 2003; Hawkins & Fuller, 1999; Arnason et al., 1996; Engström et al., 1990; Ekstrand et al., 1983).

Only two studies have used the same method and recorded injuries simultaneously for both genders (Fuller et al., 2007a; Fuller et al., 2007b; Hägglund et al., 2008). Both studies indicated that the incidence for match injuries and training injuries were slightly higher in elite male players than elite female players**.** However, this comparison could be biased since the velocity and intensity in male football players is thought to be higher than female football players (Hägglund et al., 2008) and therefore could cause the difference rather than gender.

2.5.2 Injuries during tournament play

Female youth football

There are not many studies reporting injuries during female youth tournament play (Table 2). Most of the studies are more than 20 years old (Backous et al., 1988; Mæhlum et al., 1986; Schmidt-Olsen et al., 1985; Nilsson & Roaas, 1978). Only one recently study was found (Soligard, 2010, personal communication). The tournament studies were from Europe or North-America. Only one study was available on a youth tournament in Africa, but the population was male players (Frantz et al., 1999).

Table 2: Injury incidence in female youth football players during tournament play. Only studies that are prospective and report incidence as injuries per 1000 player hours are included

Reference Tournament	Population n= Age	Follow-up period (year(s))	Injury recording	Injury definition	No of all injuries	Injury per 1000 match/h	Time-loss per 1000 match/h
Nilsson & Roaas, 1978 Norway Cup	n=unknown 11-18 years	1 week (1975, 1977)	Tournament medical staff	Medical attention	-	44.0	-
Schmidt-Olsen et al., 1985 Denmark	n=1325 9-19 years	1 week (1984)	Tournament medical staff	Medical attention	117	17.6	-
Mæhlum et al., 1986 Norway Cup	n= ca 3900[1] 12-18 years	1 week (1984)	Tournament medical staff	Medical attention	145	17.6	-
Backous et al., 1988 Summer Camp USA	n= 458 6-17 years	4,5 day each 5 sessions	Certified trainer	Time-loss	107	-	10.6
Soligard, 2010[2] Norway Cup	n=unknown 13-19	1 week (2005-2008)	Coaches	Tissue	2454	42.0	5.1[3]

[1] Ca = estimate of the players. [2] Personal communication. [3] Expected time-loss.

Nilsson & Roaas (1978) found in a study from Norway Cup in 1975 and 1977 an injury incidence of 44.0 injuries per 1000 match hours in female youth players aged 11 to 18. This was a substantially higher incidence than Mæhlum et al., (1986) reported from Norway Cup (1984) six years later (17.6 injuries per 1000 match hours). However, the same injury incidence i.e, 17.6 injuries per 1000 match hours was reported from a youth tournament in Denmark (Schmidt-Olsen et al., 1985). All the three studies used a medical attention

definition and injuries were recorded by the tournament medical staff. A strength with these tournament studies was the high number of players participating (Table 2), however there was limited information to judge whether injury and exposure were measured in a precise way.

Backous et al (1988) recorded injuries at a summer camp in USA and found a lower injury incidence than the above mentioned studies (10.6 injuries per 1000 match hours). This could be due to the use of a time-loss definition. Another cause could be that the summer camp is not exclusively a tournament consisting only of matches. Training sessions are also part of the summer camp. A strength with this study was that the duration of the summer camp was approximately five weeks which is longer than the other tournaments included.

During four years of the world's largest youth football tournament, the Norway Cup, a total of 2454 injuries were registered which is equivalent to an injury incidence of 42.0 per 1000 match hours (Soligard, 2010, personal communication). This is a much higher incidence than reported previously for Norway Cup (Mæhlum et al., 1986) and other youth tournaments (Backous et al., 1988; Schmidt-Olsen et al., 1985), however it is similar to what Nilsson & Roaas (1978) reported from Norway Cup in 1975 and 1977. It is difficult to directly compare the studies due to differences in injury definition and data collection procedures. The use of a tissue injury definition may explain the higher incidence reported by Soligard (2010, personal communication) as a higher number of minor contusions and bruises are normally included in the data when using a broad definition. The weaknesses of this study were that the injuries were registered by team coaches and that the response rate of the injury report forms was also low (64%). However a strength was that the injury recording was conducted over four years which give a higher statistical power.

According to the presented studies the incidence in female youth tournament players ranged from 5.1 to 44.0 per 1000 match hour. Tournament studies conducted 20 years ago reported a higher incidence among female players than male players. The authors speculated if this could be due to the lower skill in female players since it was a relatively new sport for the females at that time (Mæhlum et al., 1986; Schmidt-Olsen et al., 1985). However, Soligard (2010, personal communication) found no difference in injury incidence between male and female players during four years of injury recording in Norway Cup (RR = 1.1; 95% CI 1.0 to 1.2; $p<0.02$).

The incidence of injury in a male youth (aged 14-19) football tournament in South Africa was similar to the presented studies on female youth football players. The interprovincial tournament lasted for six days and 405 players participated. The injury incidence was 33.3 per 1000 match hours. Only the injuries reported to the medical tent were included (Medical attention) and the injuries were recorded by physiotherapists. Injuries treated at the side of the field were not included (Frantz et al., 1999).

Female adult football

The incidence of injury in seven female top level tournaments (World Cup and Olympic Games) was 67.4 per 1000 match hours with the highest incidence found in the U19 world championship (85-89 injuries per 1000 match hours) (Junge & Dvorak, 2007). This is a much higher incidence than reported in female youth amateur tournaments (Table 2) indicating a greater risk of injury, probably with higher intensity of play. The incidence in four female European championships ranged from 11.7 to 36.0 injuries per 1000 match hours with the highest incidence found in the adult tournament (Hägglund et al., 2009; Waldén et al., 2007). The difference in incidence between the FIFA and UEFA studies could be due to the different use of definition i.e, medical attention in FIFA studies and time-loss in UEFA studies.

Comparison to male football

In male top level tournaments (World Cup and Olympic Games) the incidence of injury ranged from 52 to 144 per 1000 match hours (Dvorak et al., 2007b; Junge et al., 2006; Junge et al., 2004a; Junge et al., 2004b). In these male tournaments the highest injury incidence was found in youth (U 20) players. In male European championships the incidence ranged from 16.3 to 41.6 (Hägglund et al., 2009; Waldén et al., 2007) with the highest incidence found in the adult players.

Both male top level adult and youth tournament (Olympic Games and world championships) appear to have a higher incidence than the corresponding female tournaments (Dvorak et al., 2007b; Junge & Dvorak, 2007; Junge et al., 2006; Junge et al., 2004a; Junge et al., 2004b). However, this apparent finding was not seen in European championships where the incidence of injury was similar between the corresponding tournaments for males and females (Hägglund et al., 2009; Waldén et al., 2007).

2.6 Injury onset and pattern in female football players

The injury location and type in female youth football players during seasonal and tournament play are shown in table 3. All the studies are prospective except one study (Mtshali, 2007), however since this is the only study on female youth players from Africa it is included.

According to the presented studies most of the injuries in female youth players were acute (66-94%) and affected the lower limb (63-89%). Upper limb injuries accounted for only 4-7%. The most frequently injured body parts were the ankle, knee and thigh (Table 3), however three studies also found a high proportion of head and neck injuries (Soligard, 2010, personal communication; Yard et al., 2008; Emery et al., 2005). The most common injury types were contusion (12-58%), sprain (11-48%) and strain (8-29%). Two studies reported that contusion and sprain injuries more commonly occurred in matches and strain injuries more often occurred during training (Le Gall et al., 2008; Yard et al., 2008). Two of the youth tournament studies which only report match injuries also found contusion and sprain to be the most common injury types (Mæhlum et al., 1986; Schmidt-Olsen et al., 1985). Soligard (2010, personal communication) and Backous et al (1988), however, found contusion and strain as the most common injury type. The most common specific injury type reported in seasonal play was ankle sprain (20-71%) (Yard et al., 2008; Le Gall et al., 2008; Steffen et al., 2008a; Söderman et al., 2001a) followed by thigh/groin strain (10-17%) and knee sprain 11% (Yard et al., 2008; Söderman et al., 2001a). In tournament play Soligard (2010, personal communication) reported contusion to the ankle or knee to be the most common specific injury type and could be due to the use of a tissue injury definition. Knee ligament injuries and ankle sprains were the most common severe (absence >21 days) specific injury types (Yard et al., 2008; Le Gall et al., 2008; Söderman et al., 2001a). The proportion of re-injuries varied between the studies (4-41%) and could be due to the different definition used, frequency of reporting re-injuries or access to medical personnel and proper rehabilitation (Le Gall et al., 2008; Steffen et al., 2008a; Söderman et al., 2001a).

The majority of injuries in female (69-90%) (Tegnander et al., 2008; Jacobson & Tegner, 2007; Faude et al., 2005; Giza et al., 2005; Söderman et al., 2001b; Östenberg & Roos, 2000; Engström et al., 1991) and male (62-94%) adult football had an acute onset (Hägglund et al., 2006; Walden et al., 2005b; Arnason et al., 2004; Arnason et al., 1996; Lüthje et al., 1996) and affected the lower limb.

The most frequently injured body parts were the ankle, knee and thigh among both genders. However similar to female youth players, female adult football players sustained more ankle and knee injuries (Tegnander et al., 2008; Jacobson & Tegner, 2007; Faude et al., 2005; Giza et al., 2005; Söderman et al., 2001b; Östenberg & Roos, 2000; Engström et al., 1991) compared to males while thigh and groin injuries were more common among adult male players (Ekstrand et al., 2009; Hägglund et al., 2006; Walden et al., 2005b; Drawer & Fuller, 2002; Hawkins et al., 2001; Hawkins & Fuller, 1999; Lüthje et al., 1996). The most common injury types reported were strains, sprains and contusions. In female adult football it seems to be a similar proportion of ligament sprain (Dick et al., 2007; Jacobson & Tegner, 2006; Faude et al., 2005; Söderman et al., 2001b; Engström et al., 1991) and muscle strain injuries reported as the most common injury type (Hägglund et al., 2008; Tegnander et al., 2008; Jacobson & Tegner, 2007; Giza et al., 2005; Östenberg & Roos, 2000). However, in male adult football muscle strain accounted for the greatest proportion of injuries in the majority of the studies (Ekstrand et al., 2009; Hägglund et al., 2006; Walden et al., 2005b; Drawer & Fuller, 2002; Hawkins et al., 2001; Hawkins & Fuller, 1999; Arnason et al., 1996). Similar to female youth tournament play, the majority of the studies in both female (Junge & Dvorak, 2007) and male (Dvorak et al., 2007b; Junge et al., 2006; Junge et al., 2004a; Junge et al., 2004b) adult tournament play reported contusions as the most common injury type.

An injury of specific concern in football is anterior cruciate ligament (ACL) injury. The concern is because some players are unable to reach pre-injury level of participation, the increased risk of developing early osteoarthritis, the cost of repair and length of rehabilitation (Myklebust & Bahr, 2005; Roos, 2005; Lohmander et al., 2004). ACL injury incidence in female youth and adult football players ranged from 0.07 to 2.2 injuries per 1000 player hours (Tegnander et al., 2008; Hägglund et al., 2008; Steffen et al., 2008a; Le Gall et al., 2008; Faude et al., 2005; Giza et al., 2005; Bjordal et al., 1997), and the incidence are reported to be two to five times higher in female than male athletes (Fuller et al., 2007a; Fuller et al., 2007b; Agel et al., 2005; Powell & Barber-Foss, 2000; Bjordal et al., 1997; Arendt & Dick, 1995). In addition women appear to injure their knees at an earlier age than men (Bjordal et al., 1997; Arendt & Dick, 1995; Roos et al., 1995).

Table 3: Injury pattern in female youth football players during seasonal and tournament play (%)

Reference	Söderman et al., 2001a[1]	Emery et al., 2005	Mtshali, 2007	Steffen et al., 2008a[1,2]	Soligard et al., 2008[2]	Yard et al., 2008	Le Gall et al., 2008	Froholdt et al., 2009[1]	Schmidt-Olsen et al., 1985	Mæhlum et al., 1986	Backous et al., 1988	Soligard 2010[6]
Season	1996	2004	2005	2005	2007	2005-2007	1998-2006	2005	1984	1984	Unknown	2005-2009
Follow-up	7 months	3 months	1 year retrospective	8 months	8 months	2 school years	8 months	7 months	1 week	1 week	4.5 weeks	1 week
Players	153	164	103 respondents	947	837	413684	119	591	1325	3900	458	ca20000
Level of play	Amateur	Amateur	High School	Amateur	Amateur	High School	Elite	Amateur	Amateur	Amateur	Amateur	Amateur
Injuries	79	47	78	210	166	744	619	38	117	145	197	2454
Age range (years)	14-19	12-18	12-19	Under 17	13-17	Unknown	15-19	6-16	9-19	<19	6-17	13-19
Injury location												
Head/neck	-	10.6	-	-	-	14.6	0.5	7.9	5.1	-	6.5	15.8
Shoulder/arm/finger	3.8	6.4	-	-	-	6.1	5.6	-	6.8	-	3.7	5.2
Trunk/back	1.9	4.3	-	-	-	4.2	8.2	-	5.1	-	3.7	5.9
Hip	-	10.6	4.9	-	-	1.6	0.3	2.6	-	-	1.3	2.3
Groin	1.9	-	2.0	6.6	4.2	-	9.4	0	2.6	-	5.1	0.9
Thigh	26.9	6.4	9.8[4]	13.3	7.9	11.7	20.7	7.9	12.8	-	19.0	11.0
Knee	15.4	23.4	18.6	14.2	27.0	21.8	16.8	21.0	8.5	-	19.0	13.7
Lower leg	5.8	2.1	13.8[5]	-	10.2	7.8	5.0	2.6	6.0	-	12.7	8.7
Ankle	34.6	27.7	17.6	35.2	24.2	24.7	25.4	21.0	22.2	-	22.8	21.4
Foot	9.6	8.5	9.8	-	-	6.9	6.1	13.1	30.8	-	8.9	10.8
Other	-	-	-	-	-	0.8	1.9[3]	-	-	-	2.5	-
Injury type												
Sprain	48.1	36.1	-	40.0	46.6	29.2	26.9	39.4	21.3	25.5	21.4	11.4
Strain	28.8	19.1	-	20.0	17.2	17.1	25.2	7.9	8.5	-	23.4	14.6
Contusion	11.5	-	-	25.7	20.2	-	16.1	34.2	31.6	45.5	30.8	58.2
Fracture	3.8	-	-	-	4.3	-	3.2	5.3	3.4	6.2	-	0.4
Concussion	-	4.3	-	-	-	12.2	-	-	0.9	-	-	-
Dislocation	3.8	-	-	-	-	-	0.3	-	0.9	-	-	1.1
Other	3.8	40.4	-	13.8	-	-	3.0	13.1	28.2	22.8	22.8	9.8
Overuse	34.2	-	-	12.8	28.9	-	13.4	28.3	6.0	-	-	1.3
Re-injury	41	-	-	22	-	-	4	-	-	-	-	-

[1]Only acute injuries were presented. [2]Only the control group is included. [3]Including pelvis. [4] Including 4.9% hamstring- and 4.9% quadriceps muscle. [5] Including 6.9% calf muscle and 6.9% leg bone.
[6]Personal communication.

2.7 Injury severity in female football players

The proportion of injuries by time-loss categories in female youth football is summarized in table 4. A direct comparison between all the studies is not possible due to the different injury definitions and varied cut-off point for the severity categories. However, after grouping the nine studies into the categories recommended by Fuller et al. (2006), the majority of the injuries were categorized as mild or moderate both in seasonal and tournament play. Most of the studies combined training and match injuries when reporting injury severity. However, Le Gall (2008) reported the severity separately and found that the majority of the injuries were classed as minor in both training and match play. In both female (Tegnander et al., 2008; Hägglund et al., 2008; Jacobson & Tegner, 2007; Östenberg & Roos, 2000; Engström et al., 1991) and male (Hägglund et al., 2006; Walden et al., 2005b; Drawer & Fuller, 2002; Lüthje et al., 1996) adult players, most of the injuries were classified as mild or moderate.

Table 4: Severity of injuries in youth female football players according to the number of days absent from play (days shown in parentheses). Percent values were calculated in relation to all injuries

Reference	Population	Severity Classification				
		Slight (0 days)	Minimal (1-3)	Mild (4-7)	Moderate (8-28)	Severe (>28)
Soligard et al., 2008[1]	Amateur Seasonal play		15	16	33	37
Soligard, 2010[2,4]	Amateur Tournament play	66[5]	21	6	5	2
				(1-6)	(7-30)	(>30)
Söderman et al., 2001a[3]	Amateur Seasonal play			34	52	14
Le Gall et al., 2008	Elite Seasonal play			52	36	12
				(1-7)	(8-21)	(>21)
Steffen et al., 2008a[1,3]	Amateur Seasonal play			39	33	28
Yard et al., 2008	Amateur Seasonal play			54	29	17
Froholdt et al., 2009[3]	Amateur Seasonal play			46	35	19
				(1-7)	(8-28)	(>28)
Mtshali, 2007	High School one year retrospective			80	12	7
			(0-1)	(2-7)	(8-14)	(>14)
Emery et al., 2005[3]	Amateur Seasonal play		36	36	8	21

[1]Only the control group is included. [2]Severity was based on the anticipated duration of absence from football. [3]Only acute injuries were presented. [4] Personal communication. [5] Including players out for the rest of the game.

2.8 Injury risk factors

The second step towards injury prevention is to establish the causes of injury (van Mechelen et al., 1992). The causes include information about risk factors and injury mechanisms (Bahr & Holme, 2003).

A risk factor in sport is any factor that may increase the potential for injury (Emery, 2003). Traditionally, risk factors are divided into two main categories: intrinsic athlete related factors (e.g. age, gender, and conditioning) and extrinsic environmental related factors (e.g. weather, field condition and equipment) (van Mechelen et al., 1992). The risk factors, whether internal or external, can also be divided into modifiable or non-modifiable. Modifiable risk factors (e.g. strength, balance and flexibility) are factors that can be altered by injury prevention strategies to reduce injury incidence. Non-modifiable factors (e.g. age, gender and previous injury) can not be altered, but may be important in order to identify players prone to injury (Meeuwisse, 1991).

Causality associated with injury is both complex and dynamic in nature and many factors (internal and external risk factors as well as the inciting event) may interact before the actual occurrence of the injury event (Meeuwisse et al., 2007; Bahr & Krosshaug, 2005; Meeuwisse, 1994). Since many factors may interact it is necessary to use multivariate statistical analyses in studies of risk factors (Bahr & Holme, 2003; Inklaar, 1994b; Meeuwisse, 1994). By using a multivariate approach it is possible to control for interaction between risk factors and confounding factors (Bahr & Holme, 2003). However, only one study on female and male youth football players (Kucera et al., 2005) and two studies on female adult football players (Söderman et al., 2001b; Östenberg & Roos, 2000) have used a multivariate approach.

The following section is restricted to risk factor studies on female football players. The main focus will be on female youth players but studies on female adult players will also be mentioned for comparison. Gender and level of play have been outlined in the injury incidence section and will therefore not be mentioned here.

2.8.1 Intrinsic risk factors

Age

There are conflicting results whether age is a risk factor for injury in female youth football players. Some studies have found there is an increased risk of injury in the older age groups (Froholdt et al., 2009; Kucera et al., 2005), while other studies have found there is an increased risk of injury in the younger age groups (Le Gall et al., 2008; Emery et al., 2005). The results have also been conflicting in female adult football players. Östenberg & Roos, (2000) reported that older female players (above 25 years) had a higher injury risk than younger players (less than 25 years). In contrast, other studies have shown no association between age and injury in female adult players (Faude et al., 2006; Söderman et al., 2001b), however the age range in these studies was tighter than in other studies.

Previous injury

Previous injury as a risk factor has been examined in three youth studies. The results showed an increased risk of ankle, knee (Steffen et al., 2008b; Kucera et al., 2005) and groin (Steffen et al., 2008b) injuries in players who had sustained a previous injury to the same site. In addition Emery et al. (2005) reported that a previous injury was a risk factor for new injuries regardless of location. However, in studies on female adult players an association between a previous ankle and knee injury and a new injury to the same site or any location was not found (Faude et al., 2006; Söderman et al., 2001b). Only a previous ACL injury was found to increase the risk of a new ACL injury (Faude et al., 2006).

Physical fitness

Emery et al. (2005) did not find an association between jumping height and injury risk in female youth players. In female adult players an increased strength has been shown beneficial (Söderman et al., 2001b; Östenberg & Roos, 2000), however endurance based on estimated maximal oxygen consumption (VO_{2max}) was not found to be associated with injury risk (Östenberg & Roos, 2000).

Psychological factors

Life-event stress has been hypothesized to reduce attention and mental performance, which in turn reduces reaction time in an athletic situation, leading to injury (Junge, 2000). In a cohort of young female football players the results showed that a perceived mastery climate and a high level of life stress were significant predictors for new injuries (Steffen et al., 2009). Similar results were found in Swedish elite football players where players with high levels of life stress and low coping strategies were more prone to injury than players with lower stress levels (Johnson et al., 2005).

2.8.2 Extrinsic risk factors

Playing surface

Traditionally football is played on grass but the last few decades there has been an increased use of artificial turfs. There has been an ongoing debate whether an artificial turf increase the risk of injuries. Only one study has examined the risk of injury on artificial turf and grass in female youth players. Steffen et al. (2007) found no difference in the overall injury incidence or acute injuries on artificial turf and grass over one season of play. However, the incidence of serious acute injuries (>21 days of absence) was greater on artificial turf. There was also a tendency of a higher frequency of ligament injuries on artificial turf compared with grass. Also a study on college female players found no difference in the overall injury incidence on artificial turf versus grass (Fuller et al., 2007a; Fuller et al., 2007b).

Exposure

Exposure can be measured according to how many years the player has participated or how many hours the player participates per week in match or training. Steffen et al. (2008b) found that years with organized football play was significantly associated with new injuries for each additional year reported. However, there was no association between injury and weekly exposure during one season. In female adult football there were conflicting results with studies reporting high overall exposure (Söderman et al., 2001b) or low training and match exposure (Faude et al., 2006) as risk factors for injury. However, years of participation did not seem to affect the injury risk (Östenberg & Roos, 2000).

Equipment

In a biomechanical study, Boden (1998) demonstrated a 41-77% reduction in load force with shin guards, depending on the type tested. Backous et al (1988) found that failure to wear shin guards markedly increased the proportion of leg injuries. Of all injured players who wore shin guards, only 2.2% sustained an injury to a leg. Of all players documented as not wearing shin guards at the time of the injury, 10.5% had leg injuries. Thus it seems like failure to wear shin guards may increase the risk for injury. However, there are no prospective studies in female football assessing the effect of protective equipment.

Foul play

Penalties like a free kick, yellow or red card are intended to modify foul play that potentially increases the risk of injury in football. From studies on female youth players, the injuries caused by foul play (based on a referee's decision) ranged from 13 to 14% of all injuries. (Yard et al., 2008; Emery et al., 2005). Studies from women's football showed a higher foul play rate ranging from 19 to 23% of all injuries (Jacobson & Tegner, 2007; Faude et al., 2005). However, top level female tournament players had an even higher foul play rate (35%). Thus it seems like foul play is a considerable risk factor for injury, and the attitudes of players should be a focus of attention.

2.9 Injury mechanisms

Injury mechanism is a description of the inciting event and should include the events leading to the injury situation (playing situation, player & opponent behavior) as well as include a description of whole body and joint biomechanics at the time of injury (Bahr & Krosshaug, 2005). In the following section only studies on female youth football players will be included.

There are different approaches to describe the mechanism of injuries in sport e.g. athlete interview and video analysis, however each of the approaches has strengths and limitations. It is therefore recommended to combine a number of different approaches to describe the mechanism fully (Krosshaug et al., 2005).

Most studies on female youth football players report the mechanism of injury based on an athlete interview (Soligard 2010, personal communication; Froholdt et al., 2009; Soligard et

al., 2008; Yard et al., 2008; Steffen et al., 2007; Emery et al., 2005). The advantage of this approach is that it is relatively easy to obtain data from a large number of injured athletes, however the reliability of the data may be weak due to recall bias (Krosshaug et al., 2005).

A variety of different terms have been used to describe the inciting event in youth football. The use of different terms makes a direct comparison between all studies difficult. Some studies report the mechanism as contact versus non-contact (Froholdt et al., 2009; Soligard et al., 2008; Steffen et al., 2007). A more detailed description of the "contact injuries" has been used with terms like "player-to-player contact", "contact with playing surface" , "contact with playing apparatus", "contact with another player or equipment" (Soligard, 2010, personal communication; Froholdt et al., 2009; Yard et al., 2008; Emery et al., 2005). In addition some studies report the activity leading to injuries using terms like "heading duel", "tackling duel", "running", "general play", "goaltending" (Froholdt et al., 2009; Yard et al., 2008; Steffen et al., 2007).

Based on the six presented studies above, contact injuries were the most frequent injury mechanism and accounted for 47-78% of all injuries. Two studies reporting mechanisms from seasonal play found the proportion of contact injuries to be higher during matches (51-86%) than training (14-19%) (Steffen et al., 2008a; Yard et al., 2008). In tournament play the proportion of contact injuries (78%) was similar to seasonal match play (Soligard, 2010, personal communication). Two studies reported the mechanism of injury in more detail. Yard et al (2008) found that the majority of the contact injuries occurred by player contact (58%), followed by playing surface contact (27%) and playing apparatus contact (15%). The most common activity causing injury was general play (21%), dribbling (14%), chasing a loose ball (14%) or defending (14%). Froholdt et al., (2009) found the most common activities leading to injury were tackling duel (37%), running (18%) and collision with other player (16%).

2.10 Summary part II

Few studies have reported injury incidence, injury pattern and injury severity in female youth seasonal and tournament players. Most of the studies were from Europe or North-America. There were no prospective cohort studies on female youth football players from Africa, however a one year retrospective cross-sectional study was found.

According to the available studies on female youth football players, the injury incidence ranged from 4.6 to 22.4 per 1000 match hours and 0.4 to 4.6 per 1000 training hours in seasonal play and from 5.1 to 44.0 per 1000 match hour in tournament play. Similar to adult female players most of the injuries were acute-onset lower limb injuries. In seasonal play a sprain in the ankle and knee, and strain in the thigh or groin were the most common injuries. However during tournament play a contusion to the ankle or knee was the most common injury. Most of the injuries were classified as mild or moderate severity.

Only a few studies reported injury risk factors and injury mechanisms in female youth players. In these studies, players with a previous injury had a higher risk of experiencing a new injury to the same site. A high level of life stress and failure to wear shin guards has also been associated with a higher risk of injury. In addition years with organized football play was associated with new injuries for each additional year reported. However, weekly exposure during one season and type of playing surface was not associated with injury risk. In addition there were conflicting results whether age was a risk factor for injury. Contact injuries were the most frequent injury mechanism.

Finally, there was little published information specific to the injury incidence, injury patterns and severity in female youth football players from Africa.

3. Method

3.1 Study design

This is a prospective study of football injuries during a two day female youth tournament.

3.2 Study population

Figure 3: Provinces of Kenya.
(From:http://www.mapsofworld.com/kenya/maps/kenya-map.jpg).

A total of 938 female amateur players from 69 different teams participated. The age categories were under 13 (U13), under 16 (U16) and over 16 (O16) (Table 5). There were 37 teams playing in the U13 group, 14 teams in the U16 group and 18 teams in the O16 group. Detailed information about the age of the cohort was not available. The players came from five provinces of Kenya: Nairobi, Coast, Nyanza, North Eastern and Central province (fig. 3). All players in the tournament were invited and accepted to participate in the study.

Table 5: Age specifications according to the tournament rules

U13	Players turning 13 in the year of the tournament and below.
U16	Players turning 16 in the year of the tournament and below.
O16	Players 17 years old and above. Also younger players were allowed to play.

3.3 Study setting

The MYSA inter-provincial tournament is organized once every year in Nairobi, Kenya. The 2008 tournament was the 8th inter-provincial tournament arranged and the source of this study. Fourteen fields were used, six of the fields were grass and eight were dust (fig. 4). The condition of the fields varied between slippery, smooth, bumpy and hard (fig. 5). Some fields also had holes in the field. The weather was sunny and hot both days.

U13 played seven-a-side football and the other age categories played eleven-a-side football. Total match time for U13 was 2x15 min, U16 was 2x25 min and O16 was playing 2x30 min.

Figure 4: Field type (Grass and dust).

Figure 5: Different conditions of the fields' e.g. bumpy, long grass, smooth, hole in the field.

3.4 Organizing and conducting the study

3.4.1 Teaching injury reporters

In the three years prior to the 2008 tournament, injury reporters were educated by five Norwegian physiotherapists in anatomy, physiology, first aid, and examination and rehabilitation of sport injuries. Their knowledge was tested both by written and practical exams after each semester. Based on the exams during the semester the best qualified injury reporters were chosen to register injuries at MYSA inter-provincial female football tournament in September 2008.

In June 2008 the data collection method was pilot-tested in the East Africa Cup, an international tournament in Tanzania with 49 participating teams from four different countries. The injury reporters used the injury report form to register injuries and gave feedback regarding the procedures of data collection.

An instruction manual was created with various definitions, examples on how to complete the injury report form and procedures on what to do on the field (Fuller et al., 2006; Hägglund et al., 2005a). Before the MYSA tournament the project leader reviewed the instruction manual with all the injury reporters. In addition injury reporters were given practical training in how to register injuries on the injury report form with case examples that represented different complex scenarios. At the end of the theoretical and practical sessions a consensus was reached between the injury reporters to ensure that data were collected in a consistent fashion during the tournament. The instruction manual was also taught to the injury reporters before the pilot study.

3.4.2 Information to participants and coaches

Coaches of the participating teams were informed about the study at a pretournament meeting. The presentation was held in English by the project leader. Written information was also distributed in both English (Appendix 2) and Swahili (Appendix 3). The referees were also informed about the study so they were aware of the procedures on the field and could cooperate.

Before each match the injury reporters informed both teams about the purpose of the research project and that participation was voluntarily. The information was standardized, translated

into Swahili by a Kenyan medical doctor and written in a notebook to ensure everyone was giving the same information (Appendix 4).

3.4.3 Injury reporting on the field

Figure 6: Injury reporting on the field.

One Kenyan injury reporter was present at each of the fourteen fields to prospectively register all tissue injuries that occurred during a match. They wore a t-shirt with injury reporter written on the back so it was easy to find them (fig. 6). The definitions applied in the study are shown in table 6.

The injuries were registered in three ways: 1) the player came to report the injury due to a physical complaint like musculoskeletal injuries or symptoms of head injury, 2) the referee called the injury reporter out on the field due to an expected injury and the player confirmed a physical complaint, 3) the injury reporter approached the player after the match with a suspicion of an injury due to the following criteria: the match was interrupted by the referee, a player was on the ground for more than 15 seconds, or the player appeared to be in pain (Andersen et al., 2003). If an injury was confirmed it was registered. At one field an ambulance was present. In case any of the players came to see them the ambulance personnel were instructed to ask the injured player to report to the injury reporters.

If an injured player came to register after the game they were registered on a separate form marked as “latecomers”. It was not possible to have a study code on the participants since there was no participant list available. The injury reporters were therefore instructed to ask if the same injury had been registered before to avoid double registration of injuries.

Any injuries that required further clarification or insight were reviewed by a Kenyan medical doctor or a Norwegian physiotherapist. The project leader was also present at the tournament in case of any questions and travelled between the fields to monitor the injury reporters.

During the day of group play the injury reporters were also responsible for the First-Aid on their field. At the day of the finals one injury reporter was responsible for the injury reporting

and the other for the First-Aid since only five fields were used the last day. If the referee called on the First-Aider the injury reporter also went to see if the injury should be reported.

3.4.4 Definition of injury

The definitions used in this study followed the recently published international guidelines for football injury research with some modifications to fit the study (Table 6) (Fuller et al., 2006; Hägglund et al., 2005a).

This study used a tissue injury definition (Fuller et al., 2006; Hägglund et al., 2005a; Junge & Dvorak, 2000). In addition, time-loss injuries were also registered and reported. Because follow-up was not possible, the injury reporters were asked to state an estimate of the duration of the player's likely absence from training and/or matches as a result of the injury.

Medical problems that were not clearly associated with playing football like asthma attack, stomach pain or insect bites were not included in the study.

Table 6: Operational definitions

Term	Definition
Match	Competitive match against another team. Injuries occurring during warm up were rare and are not accounted for.
Tissue Injury	Any physical complaint sustained by a player newly incurred during the football match, irrespective of the need for medical attention or time-loss from football activities
Time-loss injury	Injury where the player was expected to be unable to participate in training or match for at least one day following the incident
Acute injury	Injury resulting from a specific, identifiable event
Overuse injury	Injury caused by repeated micro trauma without a single, identifiable event responsible for the injury
Injury type	
Contusion	Tissue bruise without concomitant injuries classified elsewhere (ex fracture)
Sprain	Acute distraction injury of ligaments or joint capsules
Strain	Stretching or tearing of muscle fibers
Fracture	Traumatic break of bone
Dislocation	Partial (subluxation) or complete (luxation) displacement of the bony parts of a joint
Superficial skin lesion	Abrasion (bruise)
Deep skin lesion	Cut, laceration
Other injury type	Injuries not classified elsewhere. Examples: concussion with or without loss of consciousness etc.
Injury severity	Expected time elapsed from injury to full participation
Slight injury	Injury with expected 0 days of absence (including players who were out for the rest of the game but were expected to fully participate in the following match)
Minimal injury	Injury with expected 1-3 days of absence
Mild injury	Injury with expected 4-7 days of absence
Moderate injury	Injury with expected 8-28 days of absence
Severe injury	Injury with expected >28 days of absence
Injury mechanism	
Player contact injury	Acute injury resulting from contact with another player
Other contact injury	Acute injury resulting from contact with the ground, ball or goalpost
Non-contact injury	Acute injury not resulting from contact with another player or object
Foul play	Violation of the laws of football according to the referee

3.4.5 Injury report form

The injury report form used (Appendix 5 & 6) in this study has been used in previous studies (Soligard, 2010, personal communication; Junge et al., 2008; Junge et al., 2004b). However, some modifications were added for this study.

Two forms were used in one match, one for each team. The injury report form comprised a single page on which all injuries occurring in one team during a given match were described in tabular form. Where applicable the non-occurrence of injuries was recorded on the sheet. There was space for additional comments on the side of the form.

Before the match, the following information was documented for each team:

- Age category.
- Total number of players in the team including substitutes.
- Number of players wearing football boots (including also other type of shoes like sandals and rubber shoes) and shin guards.

For all injuries, the following information was documented:

- Injury location and type.
- Injury description (index injury, re-injury, exacerbation).
- Expected absence from football.
- Injury mechanism and foul play.
- Use of shin guard and/or football boots.
- The way the injury was reported (approached the player, reported by the player, called on by the referee).
- Age of injured player.

One side of the form was in English and the other side was in Swahili. Two Kenyan medical doctors translated the form into Swahili.

Definitions of terms on the report form were found in the instruction manual, which all injury reporters had available when they were on the field.

Only new injuries were analyzed because it was deemed too unreliable to review recurrent injuries because there were no medical personnel following the teams to decide when the players could return to full participation (Fuller et al., 2006).

3.4.6 Handling of data

At the end of the day the injury reporters handed in the injury report forms to the project leader who reviewed them and asked clarifying questions if something was unclear or data was missing. All data were manually entered into a computer by the project leader and checked twice for accuracy.

3.5 Calculations and statistical methods

3.5.1 Calculation of Exposure and Incidence of Injury

The total player exposure hours was calculated on a team basis as ($N_M \times P_M \times D_M/60$), where N_M is number of returned team injury report forms, P_M is the number of players in the team on the field, and D_M is the duration of the match in minutes (Fuller et al., 2006).

Since the different age categories have different number of players in the team and different duration of a match the exposure hours were first calculated separately.

The incidence of injury is expressed as 1) number of injuries per match and 2) number of injuries per 1000 match hours (Fuller et al., 2006; Junge et al., 2004b). The rates were calculated as follows: 1) number of injuries divided by number of matches documented (with returned injury report forms), and 2) number of injuries multiplied by 1000 and divided on exposure hours.

Less time or extra time and reduced numbers of players on the field were not taken into account because few matches went into extra time or less than the original match time and fewer players on the field was a rare exception.

Response rate from the injury reporters were determined by dividing the number of received forms by the number of expected forms.

3.5.2 Statistics

Statistical Package for the Social Science (SPSS Science Inc, version 15.0 for windows, Chicago, Ill, USA) and Microsoft Office Excel 2003 were used for statistical analyses. Analyses included descriptive statistics, frequencies and cross-tabulations. A z-test based on the Poisson model was used to compare the incidence of injury, injury location and injury type between the age groups pair wise (U13, U16 and O16). U16 and O16 served as a reference group versus U13. O16 served as a reference group versus U16. For time-loss injuries and some injury locations and injury types the injury numbers were too small and therefore not subjected to statistical testing. Group mean values were presented with standard deviation (SD). For incidence rate and relative risk (RR), 95% confidence interval (CI) were applied. Incidence and CI are not calculated when five or fewer injuries have occurred in a group. A two-sided P value of less than 0.05 was regarded as statistically significant.

3.6 Ethical aspects

The study was approved by the Ethical Committee in Kenya (Appendix 7), the Regional Committee for Medical Research Ethics in Norway (Appendix 8) and the Norwegian Social Data Services (Appendix 9). Since all the data collected was anonymous consent was not needed.

Confidentiality of all information was ensured. Information about the study including the right to not participate was given to the players before each match.

4. Results

A total of 938 female youth amateur players from 69 different teams participated and 114 matches were played including group play and finals (Table 7). The injury reporters returned 211 out of 228 of the injury report forms resulting in a response rate of 93%. The U13 injury reporters had the lowest response rate (Table 7). Almost all missing report forms (16 out of 17) came from one field.

Table 7: Number of matches, total number of injury report forms and returned injury report forms

Age Category	No of matches n	No of injury report forms[1] n	Returned injury report forms n (%)
U13	70	140	123 (88)
U16	22	44	44 (100)
O16	22	44	44 (100)
Total	114	228	211 (93)

[1] Two forms per match, one for each team.

Most of the injuries were reported by the player themselves (n = 123, 49%). A total of 73 (29%) injuries were reported after the referee called on the First-Aiders. Fifty six (22%) of the injuries were reported when the injury reporters approached the players after the match.

The age of the injured athletes ranged between 10 and 25 year old (mean 14; SD = 3). Five of the injuries in the U13 age category and one of the injuries in the U16 age category were sustained by individuals who subsequently reported their age as older than 13 and 16 respectively. In 17 cases (7%) of the reported injuries, age was missing.

4.1 Injury incidence and exposure

A total of 252 injuries were reported from 106 matches. The incidence of all injuries was 191.2 injuries/1000 match hours or 2.37 injuries/match. Injury incidence and exposure for all age categories are presented in table 8. U13 players had an increased risk of injury compared to U16 players (RR = 1.36; 95% CI 1.01-1.84; p = 0.043) and O16 players (RR = 1.50; 95% CI 1.16-2.11; p = 0.003). There was no difference in injury incidence between U16 and O16 players (RR = 1.15; 95% CI 0.83-1.59; p = 0.38).

Of all reported injuries (n=252), 14 injuries (6%) were expected to result in absence from play. The incidence of time-loss injuries was thus 10.6 injuries/1000 match hours or 0.13 injuries/match.

Table 8: Number of injuries, incidence of injuries and exposure hours

Age Categories	Total n=938[1]	U13 n=433[1]	U16 n=213[1]	O16 n=292[1]
All injuries (n)	252	105	72	75
Incidence				
Injuries/1000h n [95% CI]	191.2 [167.6-214.8]	243.6 [197.0-290.2]	178.7 [137.4-219.9]	155.0 [119.9-190.0]
Injuries/match n [95% CI]	2.37 [2.08-2.67]	1.69 [1.37-2.01]	3.27 [2.51-4.02]	3.40 [2.64-4.18]
Time-loss injuries[2](n)	14	9	2	3
Incidence				
Injuries/1000h n [95% CI]	10.6 [5.1-16.2]	20.9 [7.2-34.5]	-	-
Injuries/match n [95% CI]	0.13 [0.06-0.20]	0.14 [0.05-0.24]	-	-
Exposure hours	1318	431	403	484

[1] Number of participants. [2] Expected absence from play.

4.2 Injury characteristics

4.2.1 Injury onset and pattern

The onset, locations and types of injuries are shown in table 9. Location was missing in one of the injuries. Most of the injuries were classified as acute and affected the lower limbs. The most common injury locations were the knee followed by the ankle and foot/toe. The most common injury types were contusion, laceration/skin lesion and sprain.

U13 players had a higher risk of sustaining an injury located to the foot/toe than U16 (RR = 2.57; 95% CI 1.14-5.77; p = 0.023) and O16 (RR = 3.52; 95% CI 1.50-8.26; p = 0.004) players. There were no other significant differences between the locations of the injuries between the age groups.

Regarding the injury types, U13 players had higher risk of sustaining a contusion than O16 players (RR = 1.68; 95% CI 1.14-2.48, p = 0.009). In addition, U13 players had a higher risk of sustaining a laceration/skin lesion than U16 players (RR = 2.59; 95% CI 1.21-5.56; p = 0.014). The distribution of the other injury types was similar across age categories.

Table 9: Number (%) and incidence [95% CI] of injury onset, injury location and injury type

	Number of injuries (%)	Injuries/1000h [95% CI]
Injury onset		
Acute	247 (98)	187.4 [164.0-210.8]
Overuse	5 (2)	-
Injury location[1]		
Head/neck	12 (5)	9.1 [4.0-14.3]
Upper limb	36 (14)	27.3 [18.4-36.2]
Trunk	19 (8)	14.4 [7.9-20.9]
Lower limb[2]	184 (73)	139.6 [119.4-159.8]
Hip/groin	8 (4)	6.1 [1.9-10.3]
Thigh	16 (9)	12.1 [6.2-18.1]
Knee	60 (33)	45.5 [34.0-57.0]
Lower leg	23 (13)	17.5 [10.3-24.6]
Ankle	40 (22)	30.3 [20.9-39.8]
Foot/toe	37 (20)	28.1 [19.0-37.1]
Injury type[3]		
Contusion	154 (62)	116.8 [98.4-135.3]
Sprain	27 (11)	20.5 [12.8-28.2]
Strain	2 (1)	-
Laceration and skin lesion	54 (22)	41.0 [30.0-51.9]
Other injury type	10 (4)	7.6 [2.9-12.3]

[1] Location was missing in one of the injuries. [2] Subgroup calculated % of lower limb. [3] Only acute injuries are included.

Specific injury type

The most common specific injury type was a contusion to the knee and ankle, followed by superficial skin lesion to the knee. Twenty one of the injuries were a contusion located to the lower leg and 13 of the injuries was an ankle sprain (Table 10).

The most common specific injury type in the upper limb was laceration/skin lesion and sprain. Almost all of the injuries to the trunk and head/neck were a contusion (30 of 31) (Table 10).

Table 10: Number (%) of specific injury type of all injuries (values below 1% not shown)

	Contusion	Sprain (joint/ligament)	Strain (muscle)	Laceration /skin lesion	Overuse injury	Other injury type	Total
Head/neck	11 (4)		1				12 (5)
Upper limb	7 (3)	11 (4)		16 (6)		2 (1)	36 (14)
Trunk	19 (8)						19 (8)
Hip/groin	6 (2)		1			1	8 (3)
Thigh	12 (5)			1	1	2 (1)	16 (6)
Knee	27 (11)	3 (1)		25 (10)	3 (1)	2 (1)	60 (24)
Lower leg	21 (8)			1	1		23 (9)
Ankle	26 (10)	13 (5)				1	40 (16)
Foot/toe	24 (10)			11 (4)		2 (1)	37 (15)
Total	153 (61)	27 (11)	2 (1)	54 (22)	5 (2)	10 (4)	251[1]

[1] Location was missing in one of the injuries. Values within brackets show percentage of total.

4.2.2 Severity

Severity was available from 99% (250 of 252) of the injuries. In the majority of the injuries the player could continue to play (80%, 199 of 250). Absence from football was expected in 20% (51 of 250) of the injuries. Most of the expected absence injuries were classified as slight (37 of 51), followed by minimal (9 of 51) and mild (5 of 51) (fig. 7). No moderate or severe injuries were reported.

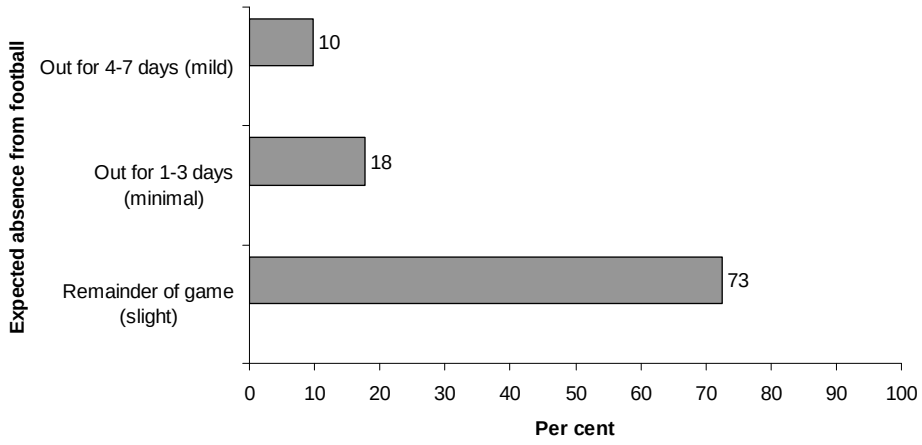

Figure 7: Expected absence from football in per cent (n=51).

Specific injury type

Ankle sprain was the most common specific injury type of the time-loss injuries (out for 1-7 days) (table 11).

Table 11: Specific injury type of expected time-loss injuries (out for 1-7 days)

	Contusion	Sprain (joint/ligament)	Strain (muscle)	Laceration/skin lesion	Overuse injury	Other injury type	Total
Head/neck							
Upper limb		3 (21)					3 (21)
Trunk	1 (7)						1 (7)
Hip/groin							
Thigh							
Knee	2 (14)					1 (7)	3 (21)
Lower leg							
Ankle	1 (7)	5 (36)					6 (43)
Foot/toe				1 (7)			1 (7)
Total	4 (29)	8 (57)		1 (7)		1 (7)	14

Values within brackets show percentage of total.

4.3 Injury circumstances

Mechanism and foul play

Mechanism of injury was available from 96% (238 of 247) of the traumatic injuries. A total of 79% (188 of 238) of the injuries was caused by player contact, 16% (38 of 238) was caused by other contact, and in 5% (12 of 238) of the traumatic injuries there were no contact at all.

Of all injuries 34% (85 of 251) were due to foul play according to the referee; 96% (82 of 85) of these were associated with player contact.

4.4 Equipment

In 106 matches 91% (2393 of 2638) of the players did not use shin guards and 24% (629 of 2638) did not use football boots. A variety of equipment was reported, including playing in sandals, rubber shoes or only socks, and using cardboard as shin guards.

In 89% (n = 224) of the injuries the player did not use shin guard and in 25% (n = 63) of the injuries the player did not use football boots.

More of the injured players in the U13 (102 of 105, 97%) and U16 (71 of 72, 99%) age category were lacking shin guards than O16 (224 of 251, 89%) players. Forty-three per cent (45 of 104) of the injured U13 players, 17% (12 of 72) of the injured U16 players and 8% (6 of 73) of the injured O16 players did not use football boots.

5. Discussion

The purpose of this study was to analyze the incidence, characteristics and circumstances of injuries during a national female youth football tournament in Kenya.

The main findings of this study showed an overall high incidence of injury (191.2 injuries/1000 match hours), and the youngest age group (U13) had the highest injury risk of all participants. The lower limbs were most frequently injured (73%). Knee and ankle contusions were the most common types of injuries (11% and 10% respectively) and an ankle sprain (36%) was the most common injury type leading to expected time-loss. Almost all the injured players (80%) could continue to play after the injury. Of the expected time-loss injuries, most of the injuries were categorized as slight. The most common injury mechanism was contact with another player.

This chapter starts with a presentation of the results. The results will be interpreted and discussed with relation to the existing literature. Next, the limitations and advantages of the methods and definitions used in this study will be discussed.

5.1 Injury incidence

Injuries were registered in three ways (reported by the player, called on by the referee or approached the player). No studies have used this method of recording injuries and therefore a direct comparison with other studies is difficult. However, relevant studies will be used to try and explain the findings, but in the absence of similar studies the author's and other colleagues' reflections will also be used.

The incidence of injuries reported in the present study (191.2 injuries/1000 match hours) was substantially higher than the incidence of match injuries reported from female youth seasonal play (4.6 to 22.4 injuries/1000 match hours) (Froholdt et al., 2009; Soligard et al., 2008; Le Gall et al., 2008; Steffen et al., 2007; Emery et al., 2005; Söderman et al., 2001a) and tournament play studies (5.1 to 44.0 injuries/1000 match hours) (Soligard, 2010, personal communication; Backous et al., 1988; Mæhlum et al., 1986; Schmidt-Olsen et al., 1985; Nilsson & Roaas, 1978).

One possible explanation of the high injury incidence in the present study may be the method of data collection. Three ways of registering injuries were used; therefore most of the actual injuries were registered compared to possible underreporting of injuries in other studies (Froholdt et al., 2009; Soligard, 2006). The injury reporters were also First-Aiders so if players needed assistance to clean a wound the injury was registered. In addition there was one injury reporter present at all 14 fields and were easily accessible. Soligard (2006) compared the method of injury registration at the field hospital with the registration by the coaches close to the field. The results showed that coaches close to the field registered more injuries (39.5 injuries/1000 match hours) than at the field hospital (7.1 injuries/1000 match hours). Despite similar injury definitions, the method of injury registration appears to influence the injury incidence (Inklaar, 1994a).

Another reason for the high injury incidence could be the injury definition. The consensus paper provided three different injury definitions. The “any physical complaint” definition, which was used in this study is broadest and expected to yield a higher injury rate than a “medical attention” or a “time-loss” definition (Bahr, 2009). Most of the studies on female youth football players used a time-loss injury definition (Froholdt et al., 2009; Le Gall et al., 2008; Soligard et al., 2008; Steffen et al., 2007; Emery et al., 2005; Söderman et al., 2001a Backous et al., 1988) or a medical attention definition (Mæhlum et al., 1986; Schmidt-Olsen et al., 1985; Nilsson & Roaas, 1978) which may explain the lower incidence in these studies. The only study in female youth tournament players using a “any physical complaint” (tissue) injury definition is Soligard (2010, personal communication) who registered injuries during four years of Norway Cup. However, even though the method of injury registration was almost the same (coaches close to the field) the injury incidence was much lower (42.0 injuries/1000 match hours) than in the present study (191.2 injuries/1000 match hours). One explanation could be that the coaches did not register all the injuries since they may have been more interested in following the matches and coaching the players than in registering injuries. Soligard (2006) showed in the first of the four years of injury registration in Norway Cup that the coaches registered only half (46%) of the actual injuries compared to medical doctors registering injuries in the same matches. If this pattern continued the following three years the injury incidence would have been twice as high (84.0 injuries/ 1000 match hours). In our study, if only the injuries reported by the players were included, the injury incidence would be 93.3 injuries/1000 match hours, and if the laceration and superficial skin lesions were excluded, the incidence would be even lower (72.8 injuries/1000 match hours). Thus it seems

like the injury incidence could be similar to the incidence of Soligard (2010, personal communication) assuming the coaches missed half of the injuries occurring.

The expected time-loss injuries reported in this study (10.6 injuries/1000 match hours) were similar to other female youth amateur seasonal (7.9 to 9.1 injuries/1000 match hours) (Soligard et al., 2008; Steffen et al., 2007; Emery et al., 2005; Söderman et al., 2001a) and tournament play (10.6 injuries/1000 match hours) (Backous et al., 1988) studies using a time-loss definition.

There are conflicting results whether age is a risk factor for injury in female youth football players. Some studies have found there was an increased risk of injury in the older age groups (Froholdt et al., 2009; Kucera et al., 2005), while other studies have found there was an increased risk of injury in the younger age groups (Le Gall et al., 2008; Emery et al., 2005). In our study we found an increased risk of injury in the youngest age category (U13) similar to the latter results. One explanation could be that overage players were playing in the U13 age category. Söderman et al. (2001a) suggested that younger players playing against older, more mature, and heavier opponents may lead to a higher incidence of injury in younger players. This suggestion was also supported by Le Gall et al. (2008) who found that U15 players, competing in the same cohort as U19 players, had the highest incidence of injury. Other confounding factors possibly influencing results include the use of equipment, field condition and how active the injury recorders were in seeking out injured players.

5.2 Injury onset and pattern

The majority of injuries in this study was acute (98%) and affected the lower limb (73%). These findings are in accordance with other studies reporting injuries in female youth (Froholdt et al., 2009; Le Gall et al., 2008; Soligard et al., 2008; Steffen et al., 2007; Söderman et al., 2001a; Schmidt-Olsen et al., 1985) and adult football players (Tegnander et al., 2008; Jacobson & Tegner, 2007; Junge & Dvorak, 2007; Faude et al., 2005). The knee was the most common injury location (33%), followed by ankle (22%). These injury locations are consistently highest in other studies examining injuries in youth football (Table 3).

Contusion was the most common injury type (62%), followed by laceration/skin lesion (22%) and sprain (11%). Also in other tournament studies contusion was the most common injury type accounting for 31-58% of the injuries (Soligard, 2010, personal communication; Backous

et al., 1988; Mæhlum et al., 1986; Schmidt-Olsen et al., 1985). In addition, two seasonal play studies found a higher proportion of contusion injuries in matches compared to training (Le Gall et al., 2008; Yard et al., 2008). Steffen et al., (2008a) found that the proportion of contact injuries was higher in matches compared to training and could therefore explain the high proportion of contusion injuries in tournaments and seasonal match play.

Laceration and skin lesions (22%) were the second highest injury type in our study. A study reporting injuries from a male youth tournament in South-Africa also found laceration and skin lesion to be the second highest injury type (26%) (Frantz et al., 1999). In contrast, Soligard (2010, personal communication) did not find a high proportion of laceration/skin lesions (3%) during four years of Norway Cup. Noyes et al (1988) argued that all minor complaints (e.g. blisters, wounds, bruises) should not be counted since these may not affect the player's performance and health. However, in Africa bacteria are aggressive due to the climate. In addition most of the players in this tournament are living in slum areas where the environment is filled with garbage and running sewage, thus the risk of infection might increase. Therefore one can argue that the primary outcome might not interfere with the player's performance, but the secondary outcome in terms of infection risk might. This is why I chose to keep laceration/skin lesion in the injury report form for analyses.

Sprain was the most common injury type in all the female youth studies reporting injuries during seasonal play (Table 3). In our study it was the third most common injury type. One reason for sprains being lower than other studies could be due to the wider definition (all injuries) used in this study compared to the time-loss definition used in all the seasonal play studies. However, in our study a sprain (57%) was the most common injury type of the expected time-loss injuries similar to the seasonal play studies using a time-loss definition.

The most common specific injury type in our study was a contusion to the knee and ankle which is similar to Soligard (2010, personal communication) using the same definition.

5.3 Injury severity

In the majority of the injuries reported in this study the player could continue to play (80%, 199 of 250). Only 20% (51 of 250) of the injuries were expected to cause absence from training or match.

The majority of expected time-loss injuries were classified as slight (73%, 37 of 51), followed by minimal (18%, 9 of 51) and mild (10%, 5 of 51). This was similar to the severity reported for female youth in another football tournament using the same definition of severity as in our study (Soligard, 2010, personal communication). The results indicate that playing football in MYSA inter-provincial tournament primarily results in minor non time-loss injuries. Thus players' participation in this tournament is relatively safe.

Similar to other studies using a time-loss definition an ankle sprain was reported as the most common specific injury type of the time-loss injuries (Yard et al., 2008; Le Gall et al., 2008; Steffen et al., 2008a; Söderman et al., 2001a).

5.4 Injury circumstance

The most common mechanism leading to injury in our study was player contact (79%). This result is similar to another tournament study reporting 78% of the injuries due to player contact (Soligard, 2010, personal communication). Two studies reporting player contact injuries independently for match and training found that the proportion of contact injuries was much higher during matches (51-86%) than training (14-19%) (Steffen et al., 2008a; Yard et al., 2008). Since tournaments only consist of matches this could be the reason why there were a high proportion of contact injuries in our study. In addition the nature of a football match is that two teams compete against each other to put the ball in the goal which can also explain the high proportion of contact injuries.

One third (34%) of the contact injuries were caused by foul play according to the referee in the present study. This is much higher than reported from other female youth (13-14%) (Yard et al., 2008; Emery et al., 2005), and adult (19-23%) seasonal play studies (Jacobson & Tegner, 2007; Faude et al., 2005). However, it is similar to the foul play rate reported from female adult tournaments (35%) (Junge & Dvorak, 2007). Foul play appears to be a considerable risk factor for injury in this study, and the attitudes of players should be a focus of attention. However, the high proportion of foul play injuries in this study could also be due

to a higher standard of refereeing and the lower rate in other studies could be due to the referee failed to recognize foul play.

5.5 Regional differences

Regional differences have been reported to influence the injury rates and pattern (Jacobson & Tegner, 2006; Hägglund et al., 2005b; Walden et al., 2005b). The influence of regional difference on the risk of injury may be related to several factors such as playing intensity, playing style, rule interpretation, weather and pitch conditions (Walden et al., 2005b).

In the present study there was a high injury incidence compared to other female youth seasonal and tournament studies. As mentioned before, this could be due to the definition or method of data collection used. However, it could also be partly due to the regional differences. Because the population in Europe and North-America is different than the population in Africa direct comparison are difficult. An African population might yield a higher incidence of injury than in the western world possibly due to use of equipment and access to health system.

In Kenya the socioeconomic status is very different than in Europe and North-America; thus socioeconomic status could also be ascribed as a regional difference factor influencing on injury risk. More than half of the population is living on less than 1 US$ a day (Wamai, 2009) and few can afford adequate football equipment. In this tournament most players were lacking shin guards (91%) and one fourth (24%) of the players did not use football boots. The lack of protective equipment may have led to a higher incidence of injury in our study. In contrast to most of the other female youth studies there were a higher proportion of lower leg injuries (13%) and foot/toe (20%) injuries in this study. Two studies have reported a similar proportion of lower leg injuries (13 and 14%) (Mtshali, 2007; Backous et al., 1988). Both these studies reported a lack of protective equipment similar to our study. Backous et al. (1988) found that players not using shin guards had a higher proportion of leg injuries compared to players using shin guards. Indicating that lack of shin guards might lead to a higher incidence of injury. Whether the lack of football boots influence injury rate is more difficult to analyze since sandals and rubber shoes were also registered as football boots by some of the injury reporters.

Similar to another study on an African youth population there was a high proportion of laceration/skin lesions in our study (Frantz et al., 1999). This finding could not be confirmed by Soligard (2010, personal communication) reporting injuries during Norway Cup. One reason can be that African youth have a lower threshold of seeking medical attention due to a wound since they might not have the equipment of cleaning a wound themselves due to poverty. In the study by Frantz et al. (1999) the medical tents were away from the fields, but the players still sought medical attention to treat the wounds. However, the low proportion of laceration/skin lesion reported by Soligard (2010, personal communication) may also be due to the coaches not reporting a minor injury like a wound. Another reason for the high proportion of laceration/skin lesion in our study may be the field surface. In this tournament the dusty fields were particularly rough after the sun had dried the red soil.

Overage players in younger age categories in African teams have been reported previously (Dvorak et al., 2007a). According to Kambua (2009) the issue of overage players was a big challenge in the present tournament (MYSA interprovincial tournament 2008). It is unclear whether this is due to the players not knowing their age or if the players or coaches just ignore the rules. In the U13 age category, five injuries were associated with players who reported they were older than 13 years old. It appears from these findings that the players know their age and it is the players and coaches who ignore the rules. The overage players playing in younger age categories could also have caused the higher incidence of injury in our study as discussed previously. Future tournaments should better enforce player ages for not only fairness but safety.

5.6 Methodological considerations

This study followed the basic recommendations from the recently published consensus statements on football injuries (Fuller et al., 2006; Hägglund et al., 2005a). However, some modifications were made to fit this study due to the cohort and setting of the study.

Research design

For this study, a prospective cohort design was chosen. This design is recognized as the "gold standard" in injury surveillance research, primarily as it eliminates the occurrence of recall bias (Fuller et al., 2006; Junge & Dvorak, 2000). This study described the magnitude, mechanism and risk factors of the injuries. After randomized controlled trials, a prospective cohort design is the strongest design to identify risk factors (Caine et al., 1996). However, a prospective cohort design can only provide evidence of an association between a factor and risk of injury (Hopkins et al., 2007).

Observation period

According to the consensus statement in studies of football injuries, a study should last for a minimum period of one season, or the duration of a tournament (Fuller et al., 2006). This study lasted for one tournament (two days). However, reviews on injuries from several international championships in football showed a great difference in incidence among different tournaments and between the different years of the same tournament (Junge & Dvorak, 2007; Junge et al., 2004b). One tournament is simply a snapshot of "the game". The results of this study contain significant variability, as reflected by the wide confidence intervals of the injury incidence and the results should therefore be read with care. In addition we were not able to present data breakdowns for all subgroups, because in some instances there would be too few injuries to make any conclusions.

Study population

All players in the tournament were invited and accepted to participate in the study. The results can therefore be considered representative for all players in this particular tournament. It is unclear whether results are representative of all female youth tournaments in Kenya, however as teams from the whole country were in attendance, this may be considered likely.

Injury definition

In this study we used the “any physical complaint” definition (tissue injury), which is the broadest of the three definitions recommended to be used in studies of football injuries (Fuller et al., 2006). A time-loss injury definition was not considered the best definition to use since the players could not be followed over time to check when they returned to full participation. In addition a medical attention definition was not possible to use since the definition required injuries to be assessed by qualified medical practitioners. The injury reporters in this study did not have a medical degree.

The advantage with a broad definition is the ability to assess the impact of the full spectrum of injuries from mild contusion to fractures (Junge et al., 2008). However, to report a truly objective tissue injury objective methods like MRI or ultrasound should be included (Hägglund et al., 2005a). Using these objective methods in diagnosing the injuries was not possible in this study and an observer or patient bias was possible. The injury reporters could have been subjective in their judgment of the injury and the players could have been subjective in the response to the examination (Hägglund et al., 2005a).

Time-loss and severity of injuries were based on expected absence from football since follow up was not possible. This is a study weakness and the results could have been influenced by factors like the importance of a game, pain threshold or motivation of the player (Junge & Dvorak, 2000; Noyes et al., 1988). Even though the injury reporters were supported by physiotherapist and doctors who were experienced in diagnosing injuries and the expected time-loss it would have been more accurate if the players were followed over time to know the exact time of absence.

Method of data collection

Three ways of collecting injuries were used in this study to ensure all the injuries were registered. Underreporting of injuries has been noted in previous football injury surveillance studies (Bjorneboe et al., 2010; Soligard, 2006), particularly minor injuries or those that did not lead to medical treatment. We therefore believed that registration of injuries in three ways may give a more complete picture of the injury situation. Several attempts were made to encourage players to report injuries, including giving them information orally prior to the

match, and having injury reporters wearing clothing that identified them easily to injured players. Also at one field an ambulance was present and the ambulance personnel were instructed to send injured players to the injury reporters. The true incidence of injuries in the competition is unknown, however we believe that due to the abovementioned factors, we were able to capture a very large percentage.

According to Hägglund (2007) the tissue injury definition can be influenced by the observer's diligence in seeking injured players. One of the ways to report an injury was through observation of the match with suspicion of an injury due to defined criteria ("approached the player"). If the defined criteria (i.e, all situations in which the match was interrupted by the referee, or a player was on the ground for more than 15 seconds, or the player appeared to be in pain) was observed, injury reporters were instructed to approach the player after the match to inquire about the possible injury. Although the criteria to approach the player after the match was defined one injury reporter was observed asking the teams after the match if someone was injured. This could have led to more injuries being reported on this field. To ensure a more consistent way of reporting injuries "approached the player" could be eliminated in future studies.

The players in this tournament did not have an ID number since there was no participant list available. Since no ID numbers were used injuries could have been double registered. However, the injury reporters were instructed to ask if the same injury had been registered before in the tournament to avoid duplicate recording. In addition the majority of the matches in one group were played on the same field the first day of the tournament, meaning few players changed fields. Since the injury reporters only followed one field, they probably remembered if the player had registered the injury before.

The injury reporters were asked to fill out two injury report forms for each match (one per team) and hand the forms in to the project leader in the end of the day. Compliance with the data collecting procedure was good as demonstrated by the response rate of 93%. Most of the missing injury report forms came from one field both during the group play and the final. That field had twice as many walk over matches i.e, matches that were not played due to one or both teams did not show up, as the other fields in the U13 age category. The injury reporters were instructed to tick the box "no injuries in this team" to distinguish the absence of injury with missing data and to also make the response check easier. The many walk over matches

could have led the injury reporter to be confused and forget to tick the box with “no injuries in this match” if a match was played with no injuries. In the future adding a “walk over match” category in addition to the “no injuries” category would be helpful. Also the double role as an injury reporter and a First-Aider the first day of the tournament could have led to the confusion with the injury report forms. After the pilot study in East-Africa Cup it was recommended to have one First-Aider and one injury reporter. However, due to the lack of First-Aiders it was not possible to follow this advice the first day of the tournament. Future studies should consider having separate injury reporters and First-Aiders if possible. However, it seems like most of the injury reporters tackled the double role well in this tournament demonstrated by the 100% response rate from the other age categories and almost all the other U13 fields.

The injury report form used in this study was standardized and used consistently throughout the whole study which is an advantage. The report form has also been used in previous studies (Soligard, 2010, personal communication; Junge et al., 2008; Junge et al., 2004b). However, some modifications were done to fit this study. According to Bahr (2009) a critical factor in injury surveillance studies is to record the magnitude of the injuries reliably. A weakness with our study is that 14 injury reporters were involved to record injuries. To minimize bias and to ensure that injuries were registered reliably an instruction manual was created and taught to the injury reporters to facilitate optimal recording. At the end of the theoretical and practical sessions a consensus was reached between the injury reporters. However, no specific test to evaluate the inter-rater reliability was conducted.

Who is recording the injuries is another critical factor in injury surveillance studies. According to Junge et al. (2008) and Fuller et al. (2006) injuries should be diagnosed and reported by qualified medical personnel (team physician or physiotherapist) to ensure valid information on the characteristics of the injury and a comparable standard of the data. This was not possible in our study since no teams had medical personnel following the team. Instead Kenyan injury reporters recorded the injuries. No one of the injury reporters used in this study had a medical degree and can therefore be a limitation of this study. However, the injury reporters have been educated by Norwegian physiotherapists in the three years prior to the tournament so they have some knowledge about anatomy and diagnosing of injuries. In addition all the injury reporters spoke the local language. Since the injury recording was mostly based on an interview it was considered an advantage to use injury reporters who

spoke the local language (Swahili) so the understanding could be more accurate. Especially players in the U13 age category did not speak English very well. All the injury reporters apart from one had registered injuries during the pilot testing of the data collecting method in East-Africa Cup so they were familiar with the procedures.

The mechanism of injury in this study was reported based on the interview with the player. The advantage of this approach is that it is relatively easy to obtain data from a large number of injured athletes, however the reliability of the data may be weak due to recall bias since the injuries usually happen quickly and often involve several players (Krosshaug et al., 2005).

6. Conclusion

The incidence of injuries among female youth football players in a national tournament in Kenya was high, however in most of the injuries the player could continue to play. A majority of the injuries had an acute onset. The most common injury location was the knee and the most common injury type was a contusion. Ankle sprain was the most common specific injury type of the expected time-loss injuries. U13 players had the highest injury risk. Player contact was the most common injury mechanism and the foul play injury rate was high.

7. Perspectives

Kenya is a country that faces major developmental challenges like high poverty levels and high death rates of HIV/AIDS (UNDP 2006; WHO, 2006). Women are especially vulnerable in the slum and poor environments. Therefore, every year MYSA organizes an inter-provincial tournament targeting just female youth players. This tournament is not only about playing football, it also educates the females about HIV/AIDS awareness, the risk of substance abuse and healthy values. In addition the girls can win scholarships which can help poor girls continue with their education. The participation has increased in the tournament over the last decade (Odemba, 2007).

Football carries a risk for injury and since participation in development projects using football as a tool presupposes players free of injuries it is important with descriptive studies to try and identify injury patterns. In addition injury surveillance and subsequent prevention programs are especially important in developing countries since the cost and availability of health care services may increase the risk of injured players living with lifelong ailments. To our knowledge, this is the first study to examine injury incidence, pattern and severity among football players in a tournament where football is used as a tool for development. We found that the risk of injury was high with the highest risk in the youngest age category. However most of the players had only minor injuries and the majority of the players could continue to play. Since the risk of severe injuries was low football can be a good tool to use to achieve development goals in this tournament. Some of the injuries could possibly have been prevented by the use of adequate protective equipment, better field conditions, emphasis on fair play and implementation of control mechanisms to prevent overage players playing in the younger age categories.

This two day tournament is only a snapshot of “the game” which may not be completely representative of all tournaments in this environment. Therefore, more tournament studies are needed to increase the statistical power and get a more complete picture of the match-related injuries in female youth tournament players from Kenya. Implementation of injury surveillance systems could also be useful to identify injury patterns and subsequent prevention programs based on the four step process proposed by van Mechelen et al. (1992). Also studies focusing on what happens to those players incurring severe injuries in development projects using football as tool would have been interesting. Do the players have

to quit participation in the development project due to the injury or do they get help with the injuries?

Finally, there has been an increase in development projects using football as a tool the last decade in Kenya. Future studies should outline strategies on how to deal with possible injured players and quantify the value of these educational initiatives.

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Definition of terms

ACL	Anterior Cruciate Ligament
AIDS	Acquired Immunodeficiency Syndrome
CI	Confidence Interval
Development	A process of enlarging people's choices and increasing the opportunities available to all members of society, particularly in countries considered to be low income (UN, 2003)
Development goals	Economic, social and environmental goals
Development project	A project designed to achieve the agreed economic, social and environmental goals
FIFA	Federation of International Football Associations
UEFA	Union of European Football Associations
HIV	Human Immunodeficiency Virus
KFF	Kenya Football Federation
MYSA	Mathare Youth Sports Association
NGO	Non-governmental organization
U13	Under 13
U16	Under 16
O16	Over 16
RR	Relative risk
SD	Standard deviation
Tool for development	An activity, method, project or program that contribute to development

Appendices

Appendix 1: Permission letter from MYSA to use picture.

Appendix 2: Information to coaches before the tournament (English).

Appendix 3: Information to coaches before the tournament (Swahili).

Appendix 4: Information to the players before each match (English & Swahili).

Appendix 5: Injury report form (English).

Appendix 6: Injury report form (Swahili).

Appendix 7: Approval from Ethical Committee in Kenya.

Appendix 8: Approval from Regional Committee for Medical Research Ethics in Norway.

Appendix 9: Approval from Norwegian Social Data Services.

MATHARE YOUTH SPORTS ASSOCIATION

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17th February 2009

TO WHOM IT MAY CONCERN

RE: Marianne Lislevand

This is to kindly confirm to you that the above mentioned person is authorized by MYSA to use any publications, pictures, tables and handouts which have been done by MYSA for her masters study.

Yours Faithfully

Stephen Muchoki

Sports Manager

Mathare Youth Sports Association

Information to coaches/players of all teams participating in MYSA inter-provincial girls' football tournament

Oslo Sports Trauma RESEARCH CENTER

NORWEGIAN SCHOOL OF SPORT SCIENCES

SPORTS AND COMMUNITY SERVICE MYSA

Research project during MYSA inter-provincial girls' tournament

This is a Masters project in Sports Physiotherapy. The purpose of the study is to examine what kind of injuries that occur during the tournament, the severity of the injuries and how the injuries happen. This is important to know in order to prevent the injuries in the future.

All the participating teams will receive this information letter and be asked to participate in the research project.

During each match there will be a first-aider who will register the injuries. All injuries, painful conditions, or physical complaints that occur during the match shall be registered. If you want to join the project it is important that the player report to the first-aider after the match if they feel any pain during the match.

The injury information that will be registered will be kept anonymous and it includes information like: condition of the field, number of injuries that occurred during the match, injured body part, injury type, foul play, expected absence from football because of the injury.

Participation in the research project is voluntarily.

The research project will be finished and results ready in May 2009. It will not be possible to recognize individuals in the publication of the results.

Kind regards,

Marianne Lislevand

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Norwegian School of Sport Sciences

Oslo Sports Trauma Research Center

Maelezo kwa makocha na wachezaji wa timu zinazoshiriki katika mchezo wa soka ya wasichana ya wilayani inayo andaliwa na MYSA

Oslo Sports Trauma RESEARCH CENTER

NORWEGIAN SCHOOL OF SPORT SCIENCES

SPORTS AND COMMUNITY SERVICE MYSA

Utafiti wa Mradi wakati wa michezo ya wasichana ya wilaya inayo andaliwa na MYSA

Huu ni mradi wa shahada kwa mafunzo ya physiotherapy. Mathumuni ya utafiti huu ni kuchunguza baadhi ya majeraha na jinsi majeraha yanavyotokea au kupatikana wakati wa michezo, ukali wa jeraha. Ni muhimu kuweza kuchunguza ili kuweza kupanda njia mathubuti ya kukinga majeraha na pia kuzuia.

Wachezaji wote watapokea barua hii, kama ombi la kushiriki katika mradi huu.

Watoa huduma ya kwanza watanakili au kutoa ripoti punde tu majeraha au maumivu yanapatikana na jinsi yanayopatikana; washiriki waliosajiliwa wanaombwa kuwasiliana na watoa huduma ya kwanza punde tu majeraha au maumivu yanatokea.

Maelezo yote yatahifadhiwa kwa siri, na maelezo ni kama, hali ya viwanja, idadi ya majeraha wakati wa michezo, viungo vilivyo jeruhiwa, uchezaji mmbaya, au kutoshiriki katika mchezo sababu ya majeraha.

Kushiriki ni kwa kujitolea.

Maelezo na matokeo ya utafiti yanatarajiwa mwishoni Mai 2009. Hakutakuwa na uwezekano wa kutambua waliohusika kwenye matokeo.

Ni mimi wenu

Marianne Lislevand
Masters student in Sports Physiotherapy
Norwegian School of Sport Sciences
Oslo Sports Trauma Research Center

Thor Einar Andersen
Associated professor MD PhD
Norwegian School of Sport Sciences
Oslo Sports Trauma Research Center

Information given before the match in both english and swahili.

INFORMATION BEFORE MATCH

- Hi! My name is…….
- On this tournament we are going to count all the injuries that happen. The reason is to know what kind of injuries that happen and how they happen. If we know this it is possible to prevent the injuries.
- Please come and report any pain you experience during the match caused by playing football no matter how big or small the injury is.
- It is voluntary to report.
- We will not note any names and no one will know what you tell us. It is completely anonymous.
- It will not take a long time to report only 1-2 min.
- Look for my t-shirt with "INJURY REPORTER" on my back if you feel any pain during the match.

MAELEZO KABLA YA MECHI

Jambo! Jina langu ni…….

- Katika tonamenti hii, tutahesabu majeraha yote yatakayotendeka. Hii ni kwa sababu tunataka kujua ni majeraha yapi mnayopata na mnayapata vipi. Tukijua haya basi, ni rahisi kuweza kuelewa vile tunavyoweza kuyazuia.
- Tafadhali turipotie majeraha yoyote au maumivu unayopata wakati unapocheza soka hata ikiwa ni ndogo kiasi gani.
- kuripoti si kwakulazimishwa.
- Majina hatatambuliwa na hakuna atakayejua yale utakayotuambia. Hii ni ripoti iliyo ya siri kabisa.
- Ripoti hii haitachukua muda mrefu; kama dakika moja au mbili.
- Tafadhali tafuta shati iliyoandikwa "INJURY REPORTER" unapo pata maumivu wakati mechi inapo endelea.

Oslo Sports Trauma RESEARCH CENTER

NORWEGIAN SCHOOL OF SPORT SCIENCES

INJURY REGISTRATION 2008 – INFORMATION

- Please register all injuries, painful conditions or physical complaints occurring during the match, even if the player is able to continue to play.
- The form has room for up to 10 injuries - *use one column for each injury.*

UNDER 13: ☐ **UNDER 16:** ☐ **OVER 16:** ☐

Number of players in the team: ☐ **Number of players w/ shin guard:** ☐ **Number of players w/ football boots:** ☐

Condition of field: ☐**Hard** ☐**Soft** ☐**Bumpy** ☐**Smooth** ☐**Slippery** ☐**Wet** ☐**Dry** (fill in one or more)

Field Type: ☐ **Dust** ☐ **Grass** ☐ **There were no injuries in this team.**

Injury	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
1 Body part										
Toe	O	O	O	O	O	O	O	O	O	O
Foot	O	O	O	O	O	O	O	O	O	O
Ankle	O	O	O	O	O	O	O	O	O	O
Lower leg	O	O	O	O	O	O	O	O	O	O
Knee	O	O	O	O	O	O	O	O	O	O
Thigh	O	O	O	O	O	O	O	O	O	O
Thigh - Quadriceps	O	O	O	O	O	O	O	O	O	O
Thigh - Hamstrings	O	O	O	O	O	O	O	O	O	O
Hip	O	O	O	O	O	O	O	O	O	O
Groin	O	O	O	O	O	O	O	O	O	O
Back/spine	O	O	O	O	O	O	O	O	O	O
Stomach/chest	O	O	O	O	O	O	O	O	O	O
Arm/elbow/wrist/hand/fingers	O	O	O	O	O	O	O	O	O	O
Shoulder incl. clavicle	O	O	O	O	O	O	O	O	O	O
Neck	O	O	O	O	O	O	O	O	O	O
Head	O	O	O	O	O	O	O	O	O	O
2 Injury type										
Contusion	O	O	O	O	O	O	O	O	O	O
Sprain incl. rupture (joint/ligament)	O	O	O	O	O	O	O	O	O	O
Strain (muscle)	O	O	O	O	O	O	O	O	O	O
Fracture	O	O	O	O	O	O	O	O	O	O
Dislocation	O	O	O	O	O	O	O	O	O	O
Superficial skin lesion (abrasion)	O	O	O	O	O	O	O	O	O	O
Deep skin lesion (cut, laceration)	O	O	O	O	O	O	O	O	O	O
Overuse injury (gradual onset)	O	O	O	O	O	O	O	O	O	O
Other injury type	O	O	O	O	O	O	O	O	O	O
3 Injury description										
New injury	O	O	O	O	O	O	O	O	O	O
Re-injury (completely recovered)	O	O	O	O	O	O	O	O	O	O
Exacerbation (worsening exist. inj.)	O	O	O	O	O	O	O	O	O	O
4 Expected absence from football										
Continued playing	O	O	O	O	O	O	O	O	O	O
Remainder of game	O	O	O	O	O	O	O	O	O	O
Out for 1-3 days	O	O	O	O	O	O	O	O	O	O
Out for 4-7 days	O	O	O	O	O	O	O	O	O	O
Out for 8-28 days	O	O	O	O	O	O	O	O	O	O
Out for 28+ days	O	O	O	O	O	O	O	O	O	O
5 Mechanism										
Contact with another player	O	O	O	O	O	O	O	O	O	O
Contact with ground	O	O	O	O	O	O	O	O	O	O
Contact with ball	O	O	O	O	O	O	O	O	O	O
Contact with goal	O	O	O	O	O	O	O	O	O	O
No contact	O	O	O	O	O	O	O	O	O	O
6 Foul Play										
Red card	O	O	O	O	O	O	O	O	O	O
Yellow card	O	O	O	O	O	O	O	O	O	O
Free kick	O	O	O	O	O	O	O	O	O	O
No	O	O	O	O	O	O	O	O	O	O
7 Use of shin guard										
Yes	O	O	O	O	O	O	O	O	O	O
No	O	O	O	O	O	O	O	O	O	O
8 Use of football boots										
Yes	O	O	O	O	O	O	O	O	O	O
No	O	O	O	O	O	O	O	O	O	O
9 Way of reporting										
Approached the player	O	O	O	O	O	O	O	O	O	O
Reported by the player	O	O	O	O	O	O	O	O	O	O
Called on by the referee	O	O	O	O	O	O	O	O	O	O
10 Age of injured player										

Supplementary comments:

Oslo Sports Trauma RESEARCH CENTER

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UANDIKISHAJI WA MAJERUHI 2008 - MAELEZI

- Tafadhali andika majeraha yote hapa – hata ikiwa aliyeumia anaweza kuendelea kucheza.
- Fomu hii ina sehemu ya majeraha kumi pekee – *tumia 'column' moja kwa kila jeraha.*

CHINI YA MIAKA13: ☐ **CHINI YA MIAKA 16:** ☐ **ZAIDI YA MIAKA 16:** ☐

Wachezaji katika timu: ☐ **Wachazaji walio na vizuizi mguu:** ☐ **Wachezaji walio na viatu vya soka:** ☐

Hali ya uwanja: ☐**Ngumu** ☐**Nyororo** ☐**Isiyo laini** ☐**Laini** ☐**Telezi** ☐**Majimaji** ☐**Usio majiji** (jaza moja au zaidi)

Aina ya uwanja: ☐ **Vumbi** ☐ **Nyasi** ☐ **Hakuna majeruhi katika hii mechi**

Majeraha	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
1 Sehemu ya mwisho										
Kidole cha mguu	O	O	O	O	O	O	O	O	O	O
Guu/Foot	O	O	O	O	O	O	O	O	O	O
Kifundo cha mguu/Ankle	O	O	O	O	O	O	O	O	O	O
Mguu/Lower leg	O	O	O	O	O	O	O	O	O	O
Goti	O	O	O	O	O	O	O	O	O	O
Paja	O	O	O	O	O	O	O	O	O	O
Mbele ya paja/Thigh - Quadriceps	O	O	O	O	O	O	O	O	O	O
Nyuma ya paja/Thigh - Hamstrings	O	O	O	O	O	O	O	O	O	O
Kiuno/Hip	O	O	O	O	O	O	O	O	O	O
Groin	O	O	O	O	O	O	O	O	O	O
Mgongo	O	O	O	O	O	O	O	O	O	O
Tumbo/Kifua	O	O	O	O	O	O	O	O	O	O
Mkono/vidole/wrist/elbow/arm	O	O	O	O	O	O	O	O	O	O
Bega/Shoulder incl. clavicle	O	O	O	O	O	O	O	O	O	O
Shingo	O	O	O	O	O	O	O	O	O	O
Kichwa	O	O	O	O	O	O	O	O	O	O
2 Aina ya jeraha/Injury type										
Chubwa/Contusion	O	O	O	O	O	O	O	O	O	O
Teguka/Sprain incl. rupture	O	O	O	O	O	O	O	O	O	O
Kuumia Misuli/Muscle strain	O	O	O	O	O	O	O	O	O	O
Vunjika mfupa/Fracture	O	O	O	O	O	O	O	O	O	O
Teguka/Dislocation	O	O	O	O	O	O	O	O	O	O
Jeraha ndogo la ngozi (bruise)	O	O	O	O	O	O	O	O	O	O
Jeraha kubwa la ngozi (cut)	O	O	O	O	O	O	O	O	O	O
Jerah juu ya utumizi sana/overuse	O	O	O	O	O	O	O	O	O	O
Jeraha aina lingine	O	O	O	O	O	O	O	O	O	O
3 Jinsi ya jeraha										
Jeraha jipya	O	O	O	O	O	O	O	O	O	O
Jeraha juu ya lingine lililopona	O	O	O	O	O	O	O	O	O	O
Jeraha sehemu halijapona	O	O	O	O	O	O	O	O	O	O
4 Muda wa mapumziko utarajiwao										
Endelea kucheza	O	O	O	O	O	O	O	O	O	O
Muda uliobaki	O	O	O	O	O	O	O	O	O	O
Pumzika siku 1 - 3	O	O	O	O	O	O	O	O	O	O
Pumzika siku 4 - 7	O	O	O	O	O	O	O	O	O	O
Pumzika siku 8 - 28	O	O	O	O	O	O	O	O	O	O
Pumzika siku zaidi ya 28	O	O	O	O	O	O	O	O	O	O
5 Njia ya majeraha										
Kugongana na mchezaji mwenzake	O	O	O	O	O	O	O	O	O	O
Kuanguka sakafuni	O	O	O	O	O	O	O	O	O	O
Kuumizwa na mpira	O	O	O	O	O	O	O	O	O	O
Kuumizwa na goli	O	O	O	O	O	O	O	O	O	O
Hakuna kuguzana	O	O	O	O	O	O	O	O	O	O
6 Mchezo wa 'foul'										
Cadi nyekundu	O	O	O	O	O	O	O	O	O	O
Cadi ya manjano	O	O	O	O	O	O	O	O	O	O
'Free kick'	O	O	O	O	O	O	O	O	O	O
Bila	O	O	O	O	O	O	O	O	O	O
7 Utumizi wa vizuizi-mguu										
Ndio	O	O	O	O	O	O	O	O	O	O
La	O	O	O	O	O	O	O	O	O	O
8 Utumizi was viatu vya soka										
Ndio	O	O	O	O	O	O	O	O	O	O
La	O	O	O	O	O	O	O	O	O	O
9 Jinsi ya kuripoti										
Kuuliza mchazaji	O	O	O	O	O	O	O	O	O	O
Ripoti na mchezaji	O	O	O	O	O	O	O	O	O	O
Kuitwa na refa	O	O	O	O	O	O	O	O	O	O
10 Umri wa mchezaji aliyeumia										

Maelezo zaidi:

KENYATTA NATIONAL HOSPITAL
Hospital Rd. along, Ngong Rd.
P.O. Box 20723, Nairobi.
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP", Nairobi.
Email: KNHplan@Ken.Healthnet.org

Ref: KNH/UON-ERC/ A/190

8th April 2009

Marianne Lislevand
Norwegian School of Sport Sciences
Department of Sports Medicine

Dear Marianne

Research proposal: "Injury Surveillance during a national female football tournament in Kena: A Pilot study(P235/8/2008)" (P235/08/2008)

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and **approved** your above revised research proposal for the period 8th April 2009 –7th April 2010.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given. Clearance for export of biological specimen must also be obtained from KNH-ERC for each batch.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF. A N GUANTAI
SECRETARY, KNH/UON-ERC

c.c. The Chairperson, KNH/UON-ERC
The Deputy Director CS, KNH
Supervisors: Dr. Thor Einar Andersen
Dr. Vincent M. Mutiso

UNIVERSITETET I OSLO

DET MEDISINSKE FAKULTET

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Dato: 05.09.2008
Deres ref.:
Vår ref.: S-08492b 2008/16104

S-08492b Skaderegistrering under en nasjonal jentefotball turnering i Kenya. En pilot studie (6.2008.1372)

Komiteen behandlet søknaden i sitt møte den 28. august 2008. Prosjektet er vurdert etter lov om behandling av etikk og redelighet i forskning av 30. juni 2006, jfr. Kunnskapsdepartementets forskrift av 8. juni 2007 og retningslinjer av 27. juni 2007 for de regionale komiteer for medisinsk og helsefaglig forskningsetikk.

Saksframstilling
Pilotstudien er et mastergradsprosjekt i idrettsfysioterapi som skal kartlegge skadeinsidens, alvorlighetsgrad og skademekanismer under en nasjonal jentefotballturnering som skal avvikles i Kenya. Syttifem lag skal delta. Datainnsamling skal skje ved bruk av et standardisert spørreskjema som besvares av førstehjelpere som har fått opplæring av prosjektleder. Registreringen vil kunne gi et bilde av skadepanoramaet i kenyansk kvinnefotball og kunne relateres til epidemiologiske studier fra Nord-Amerika og Europa. Pilotstudien skal kunne danne grunnlag for forebyggende tiltak.

Forskningsetisk vurdering
Komiteen er av den oppfatning at de forskningsetiske vurderingene synes ivaretatt.

Informasjonsskriv/Samtykkeerklæring
Komiteen har ingen merknader til det foreliggende informasjonsskriv.

Vedtak
Prosjektet godkjennes.

Komiteens avgjørelse var enstemmig.

Med vennlig hilsen

Tor Norseth
Leder

Julianne Krohn-Hansen
Komitésekretær

Norsk samfunnsvitenskapelig datatjeneste AS
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0806 OSLO

Vår dato: 04.12.2008 Vår ref:19815 / 2 / IB Deres dato: Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 28.08.2008. All nødvendig informasjon om prosjektet forelå i sin helhet 02.12.2008. Meldingen gjelder prosjektet:

19815	*Skaderegistrering under en nasjonal jentefotballturnering i Kenya. En pilot studie*
Behandlingsansvarlig	*Norges idrettshøgskole, ved institusjonens øverste leder*
Daglig ansvarlig	*Thor Einar Andersen*
Student	*Marianne Lislevand*

Etter gjennomgang av opplysninger gitt i meldeskjemaet og øvrig dokumentasjon, finner vi at prosjektet ikke medfører meldeplikt eller konsesjonsplikt etter personopplysningslovens §§ 31 og 33.

Dersom prosjektopplegget endres i forhold til de opplysninger som ligger til grunn for vår vurdering, skal prosjektet meldes på nytt. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/forsk_stud/skjema.html.

Vedlagt følger vår begrunnelse for hvorfor prosjektet ikke er meldepliktig. Prosjektet kan settes i gang.

Vennlig hilsen

for
Bjørn Henrichsen

Inga Brautaset
Inga Brautaset

Kontaktperson: Inga Brautaset tlf: 55 58 26 35
Vedlegg: Prosjektvurdering
Kopi: Marianne Lislevand, Olav M Troviksvei 54, HO313, 0864 OSLO