The Association Between Pitch Conditions and the Incidence of Injury in Rugby

Nyagetuba MJK, Saidi H, Githaiga J

School of Medicine, University of Nairobi

Correspondence to: Dr. Muma J K Nyagetuba, P.O Box 2806-00100 Nairobi, Kenya. Email: kenmuma@gmail.com

Abstract

Background: Environmental conditions have been shown to influence incidence of rugby injuries. Harsh weather conditions and detrimental effect on poor Kenyan rugby pitches create a unique environment for injury exposure. We conducted a whole population prospective cohort study to determine the association of pitch conditions with injury incidence and severity. **Methods**: The study was conducted on 364 registered Kenya Rugby Union (KRU) players throughout the 2010 15-aside season. The injury incidence was calculated as injuries per 1000 match player hours (mph). Pitches were categorized into good and suboptimal based on quality indicators of ground characteristics. Injuries were defined and recorded according to the Rugby International Consensus Group (RICG) protocol and compared between the pitches. **Results**: One hundred and two injuries were recorded in 60 league games (2400 mph). Twenty nine of the 60 league games were played in the category B (suboptimal condition) pitches. The overall incidence of injuries was 42.50/1000mph. Good pitches had an injury of 29.0 injuries/1000mph (95% CI 0.81- 1.61) compared to 56.9 injuries/1000mph (95% CI 1.76-2.90) for suboptimal pitches. **Conclusion**: Although the overall Kenyan injury rate is comparable to the amateur level incidence from other studies, the higher rate associated with suboptimal pitches suggests interventions that can target pitch optimization.

Keywords: Injury rate, Ground conditions, Rugby, Kenya.

Ann Afr Surg. 2015; 12(2): 73-6.

Introduction

Rugby is an increasingly popular sport in Kenya. A burgeoning player profile and exposure to world class international competition and public scrutiny characterizes the sport. Therefore fitness and injury status are important elements of team performance (1). Environmental and pitch conditions have been identified as risk factors for injury in rugby (2-4). Ground hardness can result in increased incidence of injury by causing injury through physical contact with the hard ground and also by influencing running speed and resultant force of impact(3). In rugby league, degree of evenness, undulations or depressions, degree of coverage with sward of desirable grasses, and drainage system impact on injury when tackling, being tackled and diving (4). Different surfaces have different rates of risk for injury for example; anterior cruciate ligament injuries are four times higher in artificial turf when compared to natural grass surfaces (5). Incidence of injury has also been associated with type of grass and cool climatic conditions (6). Shoe-surface traction on natural grass surfaces will usually be higher on harder and drier grounds and when grass cover and root density are greatest. Football games played on harder surfaces and where traction is greater are probably played at faster speeds, which may partially explain the increased risk of injury (7, 8). It is possible that measures to reduce shoe-surface traction can reduce the risk of injury (6). In the Australian football league, the northern part of the country where conditions are warmer and drier tended to have a higher incidence of non-contact associated injuries, when compared to southern parts of the country (9-11).

Majority of Kenyan rugby union pitches are maintained by natural weather patterns, with most watering by rain and drainage of excess water by seepage. Furthermore, Kenya experienced a 4-month dry spell during the 2010 rugby season which coupled with the poor maintenance of pitches damaged the pitches. Thus far, there is no evidence to suggest the correlation between poor pitch conditions and

injuries but there have been anecdotes to support the theory (12).

Given the increasing popularity of rugby in Kenya and the condition of its pitches after the dry spell, the objective of this study were to assess our pitch conditions and to evaluate the relationship between pitch conditions and the incidence of injury in rugby union players.

Methods

A prospective whole population cohort study of 364 rugby players was conducted over 6 months of the 2010 15-aside rugby season. Included in the study were players registered with clubs and Kenya Rugby Union (KRU) for season 2010 and cleared by their team physician. The process of inclusion and exclusion was done by clinical officers who had been recruited as research assistants for the study. Players from each team who carried forward injuries from the previous season were excluded. These were players who had documented injury from the previous season and had not gotten clearance from their respective team physicians. Blood bin injuries, according to IRB Law 3.10 were also excluded (13), unless the player subsequently lost time from training or competition as a result of the injury. Ten clinical officers were recruited for purposes of data collection. They underwent 2 weeks of training on utility of instrument of data collection and piloted using preseason friendly matches to familiarize on definition of injuries.

Injury was defined using the RICG protocol (14), but for simplicity of interpretation the clinical officers were instructed to document any injury that resulted in a player pulling out of a game or missing the next training session or game. An injury that resulted in a player receiving medical attention was referred to as a 'medical-attention' injury and an injury that resulted in a player being unable to take a full part in future rugby training or match as a 'time-loss' injury (14). For purposes of the study, both were documented but the time-loss injury was the one consequently analyzed (14). Recurrent injuries were documented and calculated as a separate entity and were not included in the calculation for the incidence of injury as per defined criteria (15). Information regarding match fitness and return to play was forwarded by the team physician.

The pitches were categorized into good-condition pitches and suboptimal pitches. Grading of the pitches was performed two weeks before the start of the season. Five variables were included in the study tool. There were a total of 32 pitch assessors which constituted the captains and coaches from every team (Table 1). The assessment was done one week prior to the start of the season. A pitch could score a minimum of five and a maximum of 50 points. The pitch average from the scores derived was then calculated. Any score above 5 fell in the good category pitches, and below 5 fell in the suboptimal category pitches. When the rating tool was tested for reliability the single measures interclass correlation coefficient (ICC) was 0.8 with a 95% CI (0.68-0.95) p=<0.001 and this was considered a strong agreement between the raters. ICC was also calculated for the different variables used.

Table 1: Criteria for Grading Pitches

Criteria	ICC (CI)
Degree of evenness, undulations or depressions, firmness	0.71 (0.78-0.92)
Giving good grip for players especially during scrummages	0.67 (0.44-0.91)
Degree of coverage with sward of desirable grasses	0.67 (0.44-0.91)
Drainage system efficiency	0.66 (0.43-0.91)
Seasonal variation, affliction of pitch by extremes of weather.	0.73 (0.51-0.93)

The 2010 season was a one leg league season, games were distributed preseason by the KRU (independent of the study or choice of teams), and there was an attempt at equal distribution between number of home games and away games played. However, in the course of the season, the pitches were sometimes engaged with other activities, and this prompted the different teams (clubs) to utilize other pitches for their home games. The teams naturally sort after the two good pitches, resulting in more games being played in the good pitches.

Injury incidence proportion was calculated as injuries per 1000 match player hours (mph) of exposure (95% CI). Incidence was calculated as epidemiological injury proportion as defined by Knowles et al (15). Recurrent injuries were not included in calculation for incidence.

Match exposure was calculated on the basis of 15 players (8 forwards, 7 backs) per team exposed for 80 minutes. Cumulative match exposure times for the good and suboptimal pitches were then calculated. Training injuries were not included in this study because of the erratic duration of training days which would have made it difficult to realistically assess the injury exposure time (denominator), and also because the number of players per training session

was unpredictable which would have also influenced team exposure time (numerator). However, if after a healed training injury, a match injury occurred to a player similar to the training injury, it was entered as a recurrence to avoid an exaggerated influence of the training injury on incidence.

A recurrent injury was defined as an injury of the same type and location as an index injury which occurred after a player had returned to full participation following recovery from the index injury (14). The recurrences were not included in calculation of incidence according to Knowles (15). Severity of injury was defined as number of days that had elapsed from date of injury to date of player's return to full team training and availability for match selection (14). According to severity, injuries were thus grouped as follows; slight (0–1days), minimal (2–3 days), mild (4–7 days), moderate (8–28 days), severe (>28 days), "career-ending" and "non-fatal catastrophic injuries".

Data were collected using questionnaires and subsequently entered onto Microsoft excel spreadsheets. Statistical analysis was performed using SPSS version 11 (SPSS, Chicago Illinois). Incidence of injuries was calculated and the proportions were determined. Comparison between groups was done using the chi square test. Approval to carry out the study was obtained from the Kenyatta National Hospital Ethics and Research Committee and the KRU board.

Results

Three hundred and sixty four players were enrolled in the study (191 forwards and 173 backs) from the sixteen teams which participated in the 2010 season. The ages of the players ranged from 18 to 40 years with a mean of 22.80 years (SD 3.73). The mean weight of the players was 81.83kg (SD12.57) and mean height was 1.75metres (SD 0.70). The mean BMI was 26.59(SD 3.73).

There were 60 league games constituting 2400mph for the season. A total of 102 injuries were recorded. The incidence of injuries was 42.50/1000mph (Forwards 44.17; Backs 40.83). Six pitches fell in the suboptimal category and 2 in the good category. Thirty one games were played in the two good category pitches.

The incidence of injuries for good pitches was 29.03 injuries/1000mph (95% CI 0.81-1.61) compared to 56.9 injuries/1000mph (95% CI 1.76-2.90) for the sub optimal pitches (Table 2). Out of a total of 102 injuries, 66 were sustained in the suboptimal pitches and 36 in good pitches. The suboptimal category of pitches had a higher distribution of severe injuries (Table 3). There were 9 recurrences in the good pitches and 9 recurrences in the bad pitches.

Table 2: Incidence of injury as a function of pitch status

	Games	%	Injuries	%	Total mph
Good	31	51.67	36	35.29	1240
Suboptimal	29	48.33	66	64.71	1160
Total	**60**	**100.0**	**102**	**100**	**2400**

Table 3: Incidence of pitch injury as a function of severity

Severity	Good pitches	Suboptimal pitches	Total
Slight	1 (0.81)	2 (1.61)	3 (1.25)
Minimal	2 (1.61)	12 (9.68)	14 (5.83)
Mild	5 (4.03)	19 (15.32)	24 (10)
Moderate	17(13.70)	15 (12.10)	32 (13.33)
Severe	11 (8.87)	18 (15.52)	29 (12.08)
Total	**31 (25)**	**66 (53.23)**	**102 (42.5)**

Suboptimal category of pitches was found to have a higher distribution of severe injuries (p value 0.05) (χ^2 test).

Discussion

The injury incidence proportion was 42.5injuries per 1000mph and an association with pitch conditions was noted.

Most pitches that were graded as being suboptimal had higher injury incidence. The suboptimal pitches were characterized by unevenness with depressions, and had reduced sward of grass from the preseason assessment conducted by the assessors. This may have led to reduced cushioning during falls. The study did not delve into associated mechanism of injury which would have led to establishing with certainty the causality effect. That said, the correlation justifies the thought that improving pitch conditions would lead to a significant reduction of preventable injuries. The study was done over a 4 month dry spell season. It has been noted from other studies that overly wet conditions made the ground murky which acted as predisposition for injury due to clumsiness created by the inability to firmly grip the ground when propelling (4). The impact of wet pitch conditions cannot be ascertained from this study. Analysis of injury in

consecutive seasons would be appropriate to see the impact of wet conditions on pitch conditions and thus occurrence of injury. Thus, improving pitch conditions to IRB approved standards would be one of the ways in which injury rates may be reduced (13).

The study's limitations were lack of metric measurement of ground hardness and actual degree of sward/grass cover. While this is true, the study's intention as per Van Mechelen's recommendations for injury prevention was to identify pitch as a risk factor for injury and its overall impact on injury at the most basic level (16). Another limitation was that training injuries were not included because of the erratic duration of training which would have altered the denominator of time, and also because at any particular training session the number of players was not predictable. However, to avoid exaggerated influence on incidence, any injury that occurred after a training injury was documented as a recurrence. A final limitation was the fact that the pitch conditions were only assessed at the beginning of the season. Pitch conditions might have changed in the course of the season.

Conclusion

Sub-optimal pitch conditions are associated with injury in this environment and improving pitch conditions to IRB acceptable standards will impact on the occurrence of injury. This study has shown that majority of the pitches were in suboptimal condition in Kenya. Further to this, the incidence of injury in the suboptimal pitches was twice that of good pitches, meaning that in Kenya the pitch-injury interaction could be further explored to reduce occurrence of injury. The study has also shown that suboptimal pitches resulted in more severe injuries, implying that if pitch conditions were improved the injuries were likelier to be less severe.

Acknowledgements

Acknowledgements go to the medical director KRU who coordinated club level participation, and the entire KRU for the undue cooperation.

References

1. Fuller CW, Laborde F, Weather RJ, et al. International Rugby Board Rugby World Cup 2007 Injury Surveillance Study. Br J Sports Med. 2008; 42;452-59.
2. Alsop JC, Morrison L, Williams SM, et al. Playing Conditions, Player Preparation and Rugby Injury. J Sci Med Sport. 2005;8:2:171-80.
3. Takemura M, Schneider AG, Bell ML, et al. Association of Ground Hardness with Injuries in Rugby Union. Brit J Sports Med. 2007;41:582-7.
4. Gissane C, De Jennings K, Kerr JW, et al. Injury Rates in Rugby League Football: Impact of Change in Playing Season. Am J Sports Med. 2003;31:6:954-8.
5. Fuller CW, Clarke L, Molloy MG. Risk of Injury Associated with Rugby Union Played on Artificial Turf. J Sports Sci. 2010;28(5):563-70.
6. Orchard J. Is There a Relationship Between Ground and Climatic Conditions and Injuries in Football? Sports Med. 2002;32(7):419-32.
7. Orchard J. The AFL Penetrometer Study: Work in Progress. J Sci Med Sport. 2001;4(2):220-32.
8. Orchard J, Chivers I, Aldous D, et al. Rye Grass is Associated with Fewer Non-Contact Anterior Cruciate Ligament Injuries than Bermuda Grass. Br J Sports Med. 2005;39(10):704–9.
9. Orchard J, Seward H, McGivern J, et al. Intrinsic and Extrinsic Risk Factors for Anterior Cruciate Ligament Injury in Australian Footballers. Am J Sports Med. 2001;29(2):196-200.
10. Orchard J, Seward H, McGivern J, et al. Rainfall, Evaporation and the Risk of Non-Contact Anterior Cruciate Ligament Injury in the Australian Football League. Med J Aust. 1999;170(7):304-6.
11. Orchard J. The 'Northern Bias' for Injuries in the Australian Football League. Aust Turfgrass Manage. 2000;23:36-42.
12. Michezo Afrika (Internet). Nairobi. Poor Pitch Surface Affecting Growth of Kenyan Football. Michezo Afrika. 2012 (Cited 14 Feb 2012). Available from www.michezoafrika.com.
13. World Rugby (Internet). Dublin. Laws of the Game. World Rugby. 2015 (cited on 28 September 2015). Available from http://laws.worldrugby.org.
14. Fuller CW, Molloy MG, Bathgate C, et al. Consensus Statement on Injury Definitions and Data Collection Procedures for Studies of Injuries in Rugby Union. Brit J Sports Med. 2007;41: 328–31.
15. Knowles SB, Marshall SW, Guskiewicz KM. Issues in Estimating Risks and Rates in Sports Injury Research. J Athl Train. 2006;41(2):207-15.
16. Van Mechelen W. Sports Injury Surveillance Systems. 'One Size Fits All'? Sports Med. 1997;24(3):164-8.