RUNNING-RELATED MUSCULOSKELETAL INJURIES, RISK FACTORS AND TREATMENT AMONG KENYAN RUNNERS

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ABSTRACT

Background: There is dearth of data on Running-Related Musculoskeletal Injuries (RRMI) both locally and regionally.
Objective: To determine the types, associated risk factors and treatment of RRMI among the runners in the North Rift region of Kenya.
Methods: A cross-sectional descriptive study of Kenyan runners within selected training camps was conducted from January to March 2016. An interviewer-administered questionnaire was used to collect data.
Results: A total of 108 runners were interviewed with a male to female ratio of 5:1. The most common location of injury encountered were; posterior thigh or hamstring 43 cases (39.8%), knee 33 cases (30.6%), Achilles tendon 30 cases (27.8%) and groin injuries 24 cases (22.2%). Female runners sustained more hip injuries than the males (p=0.001) while male runners sustained more groin injuries (p=0.012). About 67% of the participants trained more than 15 hours per week while 75% ran over 150km weekly without recommended rest. There was poor health seeking behaviour with only 19% of the RRMI being seen in hospitals while the rest undergoing massaging within the camps for almost all the injuries.
Conclusion: Hamstring injuries were the commonest RRMI. Most runners practised overtraining, used medicated ointments for first aid then underwent physiotherapy within the camps without proper investigations and thereafter returned to training before full recovery.
Recommendations: Establishing a Sports Care Centre that will institute measures for preventive strategies, early diagnosis and management of RRMI by sports physicians.

Key words: Running-Related Musculoskeletal Injuries (RRMI), Kenyan runners

INTRODUCTION

The history of running and sports in general is rich and timeless (1). Running has become popular with increasing numbers of participant runners especially those with intention of seeking healthier lifestyles at low cost (2). In Kenya, professional running begun in the 1950s during the intercontinental races under the British Colonial Rule and currently is a key socio-economic activity especially in the North Rift region where most of the prominent athletes come from (3).

With the onset of competition in this field, so did the risk and development of Running-Related Musculoskeletal Injuries (RRMI). Varying worldwide incidences of RRMI have been quoted in literature ranging from 26% to 92.9% (4,5). This wide range may be as a result of varying definitions of RRMI (6) and the fact that most examination methods used to define or diagnose these injuries have not been scientifically evaluated hence may not be reproducible (7). Nevertheless, almost all studies agree that most RRMI are of overuse in nature, affecting the musculoskeletal system of the lower limbs and especially the knee (8).

In reference to local literature, the demographic characteristics of elite Kenyan runners has been described as being composed of a group of people from the Rift Valley province of Kenya, of the Kalenjin ethnicity, Nandi sub-tribe and from the Nilotic origin who mainly used running as the mode of travel to school (3).

Men have been linked to more RRMI than females (ratio of up to 4:1) in most of the studies (9). It has also been noted that training errors account for up to 60%-72% of the injuries (10) which explains why experienced runners are less prone to injuries, a condition that has been termed as "survival phenomenon" (5). There is as an assumption by runners also popularly known as "mileage mania" that the more distance they run during training the better their performance which in contrast has been linked to higher incidences of RRMI (11). Other risk factors that have been associated with RRMI include greater age, training hours, speed, history of

previous injuries and biomechanical factors like limb length discrepancies, Q-angle abnormalities and foot arch malpositions (12).

Very few studies have looked into treatment modalities of RRMI due to the mere fact that these vary greatly according to the injury types and the physicians' choice of management (13). Treatment options may include use of Rest, Ice, Compression and Elevation (RICE), therapeutic drugs, use of orthotics like braces and surgery (open or arthroscopic) (14). Most studies emphasise on rest as a mode of treatment through adequate recuperation time to regenerate and strengthen muscles fibres (15).

MATERIALS AND METHODS

This was a cross-sectional descriptive study carried out at the various training camps within the North Rift region of Kenya. Following approval by the Institutional Research and Ethics Committee of Moi University, and signing of an informed written consent by the runners, an interviewer-administered questionnaire was used to collect data from the runners. A total of 10 camps were selected from 3 counties namely; Uasin-Gishu, Nandi Hills (Kapsabet), and Elgeyo Marakwet (Iten) following multi-staged sampling technique. Sample size estimation was calculated using the Cochrane formula and corrected for finite population to reach at 98 as the minimum number of runners for the study. Runners who were minors, non-Kenyan or with disabilities (Special-Para-Olympics) were excluded from the study.

Collected data included bio data, runners' training schedules, injury history, treatment and physical examination. Limb length discrepancies, foot arch malpositions and Q-angles were assessed using the standard techniques described in most orthopaedics and sport medicine books. Measurements such as height and weight were taken using the standard weighing machine and heightometer then recorded for calculation of BMI. This process was undertaken in a span of eight weeks during the months of January to March 2016 after the December holidays considered by many of the runners as "off-season". Data was analyzed using software for statistical analysis and computing known as R version 3.2.4 (16).

RESULTS

A total of 108 participants were included in the study. The male to female ratio was approximately 5:1. This is shown in Table 1.

The median number of years the runners had spent in the field of running was 5 years. Table 2 also demonstrates that majority of the runners were involved in long distant running.

Table 1
Socio-demographic characteristics

Variable		Mean ± SD or Median (IQR) or n (%)
Age (years)		26.5 ± 4.1
Males		91 (84.3%)
Females		17 (15.7%)
Education level	Primary	28 (25.9%)
	Secondary	61 (56.5%)
	College	19 (17.6%)
Married		45 (41.7%)
Have children		49 (45.4%)
Number of children (n = 49)		2.0 (1.0, 2.0)
Weight (Kgs)		56.8 ± 6.5
Height (meters)		1.7 ± 0.1
BMI (Kgs/m^2)		19.4 ± 1.6

Table 2
Type of running event

Variable		Median (IQR) or n (%)
Years in the field		5.0 (3.5, 7.5)
Ever competed in any national/international event		101 (93.5%)
Have family history of running		48 (44.4%)
Type of event performed	Short distance (<1500m)	13 (12.0%)
	Medium (>1500 – 10000m)	67 (62.0%)
	Long (>10000 – 42000m)	95 (88.0%)

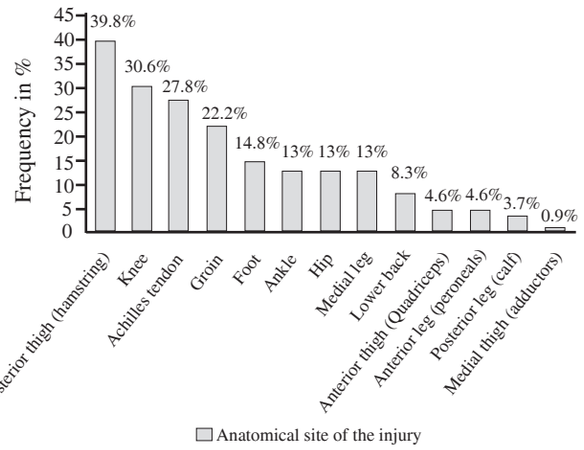
Most runners participated in more than one event of running while almost half of the runners had a family history of running. The training environment and schedules for the runners is summarized in Table 3.

Table 3
Training environment/ schedules

Variable		n (%)
Hours of training per week	<15	36 (33.3)
	≥15	72 (66.7)
Distance of training per week (km)	<150	26 (24.1)
	≥150	82 (75.9)
Have a qualified coach		73 (67.6)
Train as a team		101 (93.5)
Train on both hilly/ rugged terrain and flat ground (track)		108 (100.0)
Shoes used	All were soled shoes	108 (100.0)

The anatomical sites of injury sustained by the runners are demonstrated in order of occurrence (Figure 1).

Figure 1
The anatomical sites of RRM sustained by the runners



The most common site of injury sustained by the runners was the posterior thigh region or hamstring while the least injured site was that of the medial thigh or adductor group of muscles. Table 4 shows comparison of gender across the different sites of injuries sustained by the runners. Only significant p-values have been included in the table.

Table 4
Comparing gender across the sites of RRMI (n=108)

Site of injury	Female (n=17)	Male (n=91)	P – value
Hip	7 (41.2%)	7 (7.7%)	0.001[f]
Groin	0 (0.0%)	24 (26.4%)	0.012[f]

"t" – two sample t-test; "f" – Fisher's exact test

Among all the RRMI, the hip and groin injuries showed significant differences across gender. More female runners sustained hip injuries than male while more male runners sustained groin injuries than females.

The first aid modality most commonly used by the runners was the use of rubbing medicated ointments over the injury site then followed by use of ice. First aid was done mostly within the training camps performed either by the injured runner or by a training mate.

The main type of treatment the participants received regardless of the anatomical site of the injury was physiotherapy blended with massage. Physiotherapy was predominantly done within the camps at non-specific times following injury and was performed by mostly a physiotherapist who was permanently available or one who would often visit then charge a fee per session per runner.

Almost all the participants (93.9%) who suffered injuries got back to usual training activities before

completely healing, that is, they still had symptoms of pain and discomfort.

DISCUSSION

The mean age of 26.6 years in this study suggests that most of the participants were a little older as compared to other regions like in the USA which had a mean age of 21.6 years (17). Runners younger than 34 years of age have been found to be more prone to sustaining injuries (12). This was originally termed as "survival phenomenon" whereby older athletes sustain fewer injuries due to their experience level (5).

Most of the runners (88.0%) have a predilection for long distance running (10,000m-42,000m). This may be explained by the mean age of the runners discussed above (26.6 years) in that, there is a trend in running whereby the younger runners tend to favour short distance running while the older runners go for the long ones.

Majority of the runners train as a team and about two thirds have a coach for training though it was seen that each coach would have to train a big group of runners hence he/she will not have ample time to spend with each runner. The recommended coach to runners' ratio is not clear in literature though most articles agree that the ratio depends on the characteristics of the runners including age, event type, experience and so on (14).

Evidently from this study, two thirds of the runners train for more than 15 hours per week while more than three quarters run more than 150km every week. Training for more than 60km per week has been associated with RRMI (18). Furthermore, it has been suggested that a weekly distance of more than 62km, a pace less than 5 min per km or running more than 6 to 7 times every week are associated with increased risk of RRMI (19).

Of all the injuries, the knee has been reported to suffer the most as compared to other sites of the lower limbs (20). In this study on the contrary, it was found that the thigh specifically posterior thigh (hamstring) injuries were most common at 39.8% followed by the knee at 30.6%. A comparison with some of the other studies mentioned above is demonstrated in Table 5.

Table 5

Comparison of common RRMI among different studies

Injury site/Occurrence	This study	DeHaven *et al* (17)	Lopes *et al* (2)	van Gent *et al* (21)	van Mechelen *et al* (8)
1	Hamstring (Thigh)	Knee	MTSS	Knee	Knee
2	Knee	Ankle	Achilles tendinitis	Leg	Foot
3	Achilles tendinitis	Thigh	Foot	Foot	Thigh
4	Groin	Foot	Knee	Thigh	Achilles tendinitis
5	Foot	-	Thigh	-	-

Hamstring and tendon injuries are usually seen in sprinters due to their fast running pace (22). A contrasting picture is seen in the current study whereby hamstring injuries are common among the participant runners who are mainly involved in long distant running. This could be explained by the fact that during international racing competitions throughout the year, these runners end up breaking international records every now and then. Thigh injuries have been associated with increased training hours/week while increased training distance/week is protective against sustaining knee injuries (21). Another explanation of the differences in injury occurrences is the fact that different studies have their own definitions of RRMI as well as study population with different characteristics and running/training environments hence this may produce the above picture.

An interesting finding in this study was that of groin injuries (22.2%) that were third in occurrence after knee and Achilles tendon injuries. Most other studies have reported far lower rates or no interest at all concerning these injuries. A systemic review by de SA *et al*. (23) gave a male to female ratio of 4:1 with an equal intra-articular versus extra-articular causes of groin pain. The most common pathology was femoro-acetabular impingement. These injuries have also had different "diagnostic labels" like osteitis pubis, athletic pubalgia and sportsperson's hernia as described in one the sports books (14). The need for multidisciplinary approach in managing these injuries cannot be overemphasised due to the fact that the "innocent periarthritic disease" may actually cause permanent debilitating hip condition and even joint fusion and be rendered career ending (24).

The risk factors assessed in this study included age, gender, BMI, event types being performed by the runners, years of experience in the field and availability of a coach. This study depicted that two of the RRMI had a gender predilection. These were groin injuries that were more common in males and hip injuries that were more common in females. This was agreeing especially for the female factor with a study by Satterthwaite *et al*., (5) who found that women were at a higher risk of sustaining hip injuries than men while men had a higher risk for hamstring and calf injuries. Murphy *et al*., (25) suggested hormonal influence on the joints in female runners may bring about this behaviour. For the groin injuries in men, this study is consistent with that of de SA *et al*., (23) which reports a ratio of 4:1 in favour of men sustaining more groin injuries than women though no attributable cause has yet been found. The researcher thought that the differences in anatomy of the pelvis could explain this in that the males usually have a smaller pelvis hence shorter groin distance as compared to the wider female pelvis which has a bigger space to accommodate the contents of the groin region including the inguinal ligament as well as both superficial and deep muscles. The rest of the other factors assessed did not yield any statistical significance differences hence a different study design may be used in future to ascertain the associations.

Majority of the injured runners (63.5%) used first aid treatment following an injury. Rubbing with medicated ointments was the commonest first aid modality used probably due to its availability over the counter and being affordable. It was seen that most runners would resume their training schedules within the first week following an injury with a median number of 6 days (4.0, 12.0). This is a short period for recuperation and facilitation of muscle regeneration (25). A day of rest every week for 4 to 6 weeks before a break has been recommended (15). The study also cautions runners of the injury prone "post-break period" hence gradual intensity training schedules on return should be used. Interestingly, the article demonstrates that longer breaks do not reduce rates of RRMI as previously thought.

The fact that the hamstring injuries topped the RRMI list in this study suggested that their treatment and prevention methods should be well understood by local clinicians. Pain or discomfort arising from the back of a runner's thigh is usually as a result of hamstring muscles overuse injuries. If not properly managed, fibrous adhesions develop between the tendons and the sciatic nerve to produce chronic irritation that has been referred to as the "hamstring syndrome" in the book by Khan (14). It is important to diagnose these injuries during the acute phase as it may be referred pain from the sacroiliac joint or lumbar region of the spine. The book also suggests need for adhesiolysis as a treatment option for these injuries.

This being a cross-sectional study, in order to mitigate recall bias, reported injuries were limited to only 3 years prior to data collection, use of credible medical records e.g. X-ray films and physical examination for therapeutic marks.

CONCLUSION

The most common injuries reported by the runners were hamstring injuries at 39.8% followed by the knee at 30.6% and Achilles tendon injuries at 27.8%. Groin injuries were more common in men than women while hip injuries were more common in women. First aid use of medicated ointments followed by treatment of almost all injuries with physiotherapy within the training camps without adequate evaluation for diagnosis was noted.

REFERENCES

1. Popkin, C.A., Gundry, C.R., Larson, C.M. and Murnaghan, M.L. Remembering our roots: Eponyms in sports medicine. *The Amer J Sports Med*. 2013; **41**(7): 1703-1711.
2. Lopes, A.D., Hespanhol Junior, L.C., Yeung, S.S. and Costa, L.O. What are the main running-related musculoskeletal injuries? A systematic review. *Sports Med*. 2012; **42**(10): 891-905.
3. Onywera, V.O., Scott, R.A., Boit, M.K. and Pitsiladis, Y.P. Demographic characteristics of elite Kenyan endurance runners. *J Sports Sci*. 2006; **24**(4).
4. Kluitenberg, B.M. Middelkoop, D.W. Smits, E. Verhagen, *et al*., The NLstart2run study: Incidence and risk factors of running related injuries in novice runners. *Scandinavian J Med Sci Sports*. 2015; **25**(5): 515-523.
5. Satterthwaite, P.N., Larmer R. and Robinson, P.E. Risk factors for injuries and other health problems sustained in a marathon. *Br J Sports Med*. 1999; **33**(1): 22-26.
6. Rachun, A. *Standard nomenclature of athletic injuries*, ed. C.o.t.M.A.o.S.S.o.C.o.S. Injuries. 1976: The American Medical Association.
7. Kjaer, M., *Textbook of Sports Medicine*. 2003.
8. van Mechelen, W., Hlobil, H., Kemper, H.C.G., Voorn, W.J., *et al*. Prevention of running injuries by warm-up, cool-down, and stretching exercises. *The Amer J Sports Med*. 1993; **21**(5): 711-719.
9. Owoeye, O.B. Pattern and management of sports injuries presented by Lagos state athletes at the 16th National Sports Festival (KADA games 2009) in Nigeria. S*marttjournal*. 2010; **2**:3.

10. Gallo, R.A., Plakke M. and Silvis M.L. Common leg injuries of long-distance runners: anatomical and biomechanical approach. *Sports Health*. 2012; **4**(6): 485-495.
11. James, S.L., Bates B.T. and Osternig L.R. Injuries to runners. *The Amer J Sports Med.* 1978; **6**(2): 40-50.
12. Taunton, J.E., Ryan M.B., Clement D.B., McKenzie D.C., *et al*. A retrospective case-control analysis of 2002 running injuries. *Br J Sports Med*. 2002; **36**(2): 95-101.
13. Macera, C.A., Pate R.R., Powell K.E., Jackson K.L., *et al*. Predicting lower-extremity injuries among habitual runners. *Arch Intern Med.* 1989; **149**(11): 2565-68.
14. Khan, P.B.a.K., *Clinical Sports Medicine*, ed. 3RD. 2008.
15. Orlando, C., Levitan E.B., Mittleman M.A., RSteele R.J., *et al*. The effect of rest days on injury rates. *Scandinavian J Med Scie Sports*. 2011; **21**(6): e64-e71.
16. R-CORE, R.C.T., *A language and environment for statistical computing R Foundation for Statistical Computing, Vienna, Austria.* 2016. p. R-CORE.
17. DeHaven, K.E. and Lintner, D.M. Athletic injuries: Comparison by age, sport, and gender. *The Amer J Sports Med.* 1986; **14**(3): 218-224.
18. Van Middelkoop, M., Kolkman J., Van Ochten J., Bierma-Zeinstra S.M., *et al.* Risk factors for lower extremity injuries among male marathon runners. *Scand J Med Sci Sports*. 2008; **18**(6): 691-697.
19. Nielsen, R.O., Buist, 1., Sørensen, H., Lind, M., *et al*, Training errors and running related injuries: A systematic review. *IJSPT*. 2012; **7**(1): 58.
20. Van Middelkoop, M.J., Kolkman, M., Van Ochten, S.M.A., Bierma-Zeinstra *et al.*, Prevalence and incidence of lower extremity injuries in male marathon runners. *Scandinavian J Med Sci Sports*. 2008; **18**(2): 140-144.
21. Van Gent, R.N., Siem, D., van Middelkoop, M., van Os A.G., *et al.* Incidence and determinants of lower extremity running injuries in long distance runners: a systematic review. *Br J Sports Med*. 2007; **41**(8): 469-480.
22. Lysholm, J. and Wiklander, J. Injuries in runners. *The Amer J Sports Med*. 1987; **15**(2): 168-171.
23. de SA, D., Hölmich, P., Phillips, M., Heaven, S., *et al.* Athletic groin pain: a systematic review of surgical diagnoses, investigations and treatment. *Br J Sports Med.* 2016; **50**(19): 1181-1186.
24. Muschaweck, U., GollwitzerH., and Conze, J. Sportsmen's groin. Definition, differential diagnostics and therapy. *Orthopade*. 2015; **44**(2): 173-185; quiz 186-187.
25. Murphy, D.F., Connolly, D.A.J., and Beynnon, B.D. Risk factors for lower extremity injury: a review of the literature. *Br J Sports Med*. 2003; **37**(1): 13-29.