



Common Musculoskeletal Injuries in Athletes and Its Relation with Body Mass Index (BMI) in Jeddah Society

D. Nagadi¹, B. Z. Shakhreet^{1*}, S. Jastaniah¹, K. Khashoggi² and A. Elkhedr¹

¹Department of Diagnosis Radiology, Faculty of Applied Medical Sciences, King Abdulaziz University, P.O.Box 80324, Jeddah 21589, Saudi Arabia.

²Department of Radiology, King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

Authors' contributions

This work was carried out in collaboration between all authors. Authors DN, SJ and KK designed the study, wrote the protocol and wrote the first draft of the manuscript. Author BZS performed the statistical analysis and managed the analyses of the study. Author AE managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2016/24500

Editor(s):

(1) Ashish Anand, Department of Orthopaedic Surgery, GV Montgomery Veteran Affairs Medical Center, Jackson, MS, USA.

Reviewers:

(1) Andrea Borghini, CNR Institute of Clinical Physiology, Pisa, Italy.

(2) Anonymous, Malaysia.

(3) Nitin Gupta, NIMS Medical College, Jaipur, India.

Complete Peer review History: <http://sciencedomain.org/review-history/13384>

Original Research Article

Received 23rd January 2016
Accepted 10th February 2016
Published 22nd February 2016

ABSTRACT

Aims: To study the types of sports injuries in different age groups and its prevalence in the Saudi society, especially in the city of Jeddah, thus comparing them with the BMI of the different age groups.

Study Design: A prospective study with a special questionnaire to collect data.

Place and Duration of Study: Subjects: Department of Radiology (X-ray unit), King Abdulaziz University Hospital, Jeddah, Saudi Arabia, for 3 months.

Methodology: A questionnaire developed by the authors was used to collect data. The questionnaire had two parts. The first part was used to collect demographic data, and the second part was used to determine the incidences and regions (knee, upper and other lower limb regions) of sports injuries. The subjects of the survey were athletes competing in football, basketball,

*Corresponding author: E-mail: bshakhreet@yahoo.com

handball, volleyball and daily athletics. Then, SPSS 15.0 for Windows was used for statistical analyses. Data are presented using descriptive statistics and were analyzed using the chi-squared test.

Results: The majority of injured subjects were youth. The upper limb region had the highest incidence of injury (38%) as well as the knee (36%), while the lower limb region had the lowest (26%) injury. The injuries in a knee were the highest (50%) in the adult subjects compared with the other age categories. The highest percentage of the upper limb and other regions of lower limb injuries were concentrated in the pediatric (47%) and youth (67.5%) age groups. There is a highly significant relationship ($p < 0.05$) between the BMI and athletic injuries for the studied age groups. The most common type of injuries that have presented a highly statistical significance were the upper limb ($p = 3.44 \times 10^{-6}$) as well as the other type of injuries for the degree of freedom ($df = 6$).

Conclusion: It is confirmed that there is a lack of awareness in nutrition habits in this culture and society, which leads to obesity and overweightness, thus causing injuries when practicing sports.

Keywords: BMI; sports injuries; musculoskeletal; age groups; image findings.

1. INTRODUCTION

The musculoskeletal system is divided into three components; the trunk, the upper extremity and the lower extremity. Each component is further classified into bones, joints, ligaments, tendons and muscles.

Thus, the musculoskeletal system consists of three general components that rely on each other in order to function properly. Injury to one component may lead to dysfunction and ultimately to the deterioration of the other two components. In addition, the musculoskeletal system relies on and supports the circulatory system and the nervous system. Musculoskeletal injuries can result in damage to either of these two systems, and damage to the circulatory and/or nervous system can result in dysfunction or deterioration of the musculoskeletal system [1].

The skeletal system is mostly made of bones and cartilage. The bones are connected together by a number of joints to form the skeleton of the body. The bone is a hard connective tissue. This is due to its high content of calcium salts.

Generally, participation in sports activities promotes health and reduces the risks of developing chronic diseases such as hypertension, heart disease, cancer and diabetes; however, it also carries the risk of injuries. Soft tissue, bone, ligament, tendon and nerve injury can occur in athletes of all ages. Among children, there is a risk of injury at the epiphysis, the growth plate of the bone, because the musculoskeletal system is not fully developed. Moreover, injury may occur in children with an immature musculoskeletal

structure due to an imbalance between muscle strength and flexibility. Sports injuries and disabilities generally occur at the knee, ankle, hip, shoulder, elbow and wrist joints, or the vertebrae. Sports injuries are common at the ankle and knee. Age, gender and the type of sports activity affect the incidence of injury. To prevent injuries among athletes, it is necessary to examine the history of injuries in athletes and to perform a physical evaluation before they participate in sports. The foot-ankle region showed the highest incidence of injury, whilst the hip-femur region had the lowest [2].

Participation in sports has been linked to many health benefits including improved cardiovascular, musculoskeletal, and psychosocial health but participation is also associated with a potential risk of injury. The shoulder has been reported as the joint most frequently injured, followed by the elbow. Adolescent athletes present a particular challenge when injured, as they are most often during or just after periods of rapid growth [3].

Musculoskeletal injuries account for most sports-related injuries. Overuse-musculoskeletal injuries account for more than half of all sport-related injuries in adolescents and young adults. Overuse injuries can result in chronic or intermittent symptoms, depending on the athlete's level of activity. Acute muscle injuries (sprains, contusions, and lacerations) can bring significant structural or functional damage to the muscle [4].

Studies of gender-specific rates showed that males aged 5 - 24 years were managed for a musculoskeletal injury more than twice as often as females from the same age group (5.9 vs. 2.7

per 100 encounters). An age breakdown found that those aged 5 - 9 years experienced the lowest management rate of musculoskeletal injuries in the group (2.3 per 100 encounters) while those aged 10 - 14 years were managed almost three times more often (6.2 per 100 encounters) [5].

Injuries to the lower extremities are most common, with the majority of injuries resulting from no body-contact. Ankle injuries account for 16% to 29% of these injuries and are more frequent in male players. Knee injuries occur in 7% to 36% of injured players and are seen more frequently in females. The lower leg (5% – 6%), upper leg (9% – 22%) and groin/torso (5%) are less commonly affected. Contusions and sprains/strains of the lower extremities are the most common injury types. More sprains and strains are seen in the emergency department setting than contusions/abrasions or fractures. The musculoskeletal system is the structural movement-generating component of the body. [6]

2. MATERIALS AND METHODS

An ethical approval was received by KAUH ethics commission to give permission for the authors to start their survey to collect the required data at the department of radiology in KAUH till the completion of the study.

The investigators held continuous meetings to set a study plan for this project to have a data-capture form which included an appropriate questionnaire for the patients. This form covered mainly prospective studies of randomly selected patients who came to an emergency unit and the outpatient from other departments at KAUH in Jeddah.

Due to the natural lifestyle as well as the customs and traditions in the Saudi society that imposes many restrictions on women in the practice of sports activities, the study subjects were only males and were investigated randomly by collecting data from the PACS unit at the radiology department in KAUH.

The participants had a mean age of 22.5±1.64 years, a mean height of 164.49±3.46 cm, a mean weight of 70.43±4.58 kg, and a mean BMI of 25.82±1.52 kg/m². All of the study subjects participated in sports and were performing training 5 times a week. A questionnaire developed by the authors was used to collect data. The questionnaire had two parts. The first

part was used to collect demographic data, and the second part was used to determine the incidences and regions (knee, upper and other lower limb regions) of sports injury. The subjects of the survey were athletes competing in football, basketball, handball, volleyball, and daily athletics. Then, SPSS 15.0 for Windows was used for statistical analyses. Data are presented using descriptive statistics and were analyzed using the chi-squared test.

The BMI was calculated by measuring the height in centimeters divided by body weight in kilograms (using a suitable meter-machine and balance that was available in the department). After that, the calculations were categorized into underweight (under 18.5), normal weight (18.5 to 24.9), overweight (25 to 29.9) and obese (over 30) [7].

3. RESULTS AND DISCUSSION

The participants had a mean age of 22.5±1.64 years, a mean height of 164.49±3.46 cm, a mean weight of 70.43±4.58 kg, and a mean BMI of 25.82±1.52 kg/m². The obtained data were distributed according to the age groups, into four main categories i.e. pediatric (<15), youth (15-25), adults (25-40) and elderly (40<), as described in Table 1. It was found that the majority of the subjects were the youths, who are considered as active-aged people, while the elderly people had a rare possibility to be injured by activities and sports for age reasons.

Table 1. The distribution of age groups

Category	Range of age	Frequency	~%
Pediatrics	0 - 15	40	24
Youths	15 - 25	72	44
Adults	25 - 40	50	31
Elderly	40 - 60	1	1
Total		163	100

The results of injury-occurrence and region are presented in Table 2. The upper limb region showed the highest incidence of injury (38%) as well as the knee (36%), and the lower limb region had the lowest (26%).

Table 2. Types of Injuries

Type	Frequency	%
Upper limb	62	38
Knee	58	36
Other regions of lower limb	43	26
Total	163	100

It was found that the injuries in the knee were the highest (50%) in the adult subjects compared with the other age categories, whereas it was the lowest in the pediatrics (0%) as seen in Table 3.

It appears from the data in Table 4 and Table 5 that neither upper nor lower limb injury cases existed in the elderly people. That means that the elderly subjects do not perform exercises or any kinds of sport in this location. Thus, the highest upper and lower limb injuries were concentrated in the pediatric (47%) and youth (67.5%) age groups, respectively.

Our study showed that injuries are common in age groups which are active and fit to participate in sports, whereas it is less or negligible in the elderly who do not participate in sports for various reasons, or they may be more careful than younger age groups to avoid injuries.

Table 6 displays the relationship between age groups and body mass index (BMI) as it is one of the objectives of this project.

Tables 6 and 7 illustrate the prevalence and significant relationship ($p=3 \times 10^{-5}$) between the BMI and athletic injuries in most of the age groups, except in the elderly. The most common type of injury that has significant association with the BMI are the upper limb ($p=3.44 \times 10^{-6}$) as well as the other types of injuries.

The causes of injuries can be personal reasons and environmental grounds. Among the personal reasons: Weak in bones and muscle structure,

physiological distortions in the body, background of surgical treatments and injuries in the past, infection and chronic diseases that afflict the body, psychological problems, gender and age that do not commensurate with the exercised sport, and the lack of adequate knowledge of the exercised sport. The environmental causes are "inadequate sports and technology used in the training, ill-used clothing and materials, non-compliance with the rules, lack of 139 exercise in suitable places and proper climatic conditions. The low prevalence of the elderly on sports in our study could be many reasons. They may not be fit to do exercises, lack interest and lack the knowledge that exercise is good for the health. However, the lower injury rate in them might be because they are careful and know what sports are suitable for them. Young people on the other hand, especially the pediatric group, are very active, competitive and may not know the dangers and risks of injuries.

The sports that cause injuries are in team-based sports such as football, basketball and wrestling. On the other hand, sports that are practiced in high speeds like cycling and car racing, as well as skiing, are rarely practiced in the Kingdom of Saudi Arabia (KSA).

Our study showed that most of the people who practice athletics do not have enough knowledge or awareness about how to practice or execute different kinds of sports. For this reason, the subject must undergo to a comprehensive medical examination and education such as a regular medical check-up as well as a warm-up

Table 3. The possibility of knee injuries with regards to the age groups

	Age group				Total
	Pediatrics	Youths	Adults	Elderly	
Frequency	0	24	29	5	58
%	0	42%	50%	8%	100%

Table 4. The possibility of upper limb injuries with regards to the age groups

	Age group				Total
	Pediatrics	Youths	Adults	Elderly	
Frequency	29	24	9	0	62
%	47%	39%	14%	0	100%

Table 5. The possibility of other regions of lower limb injuries with regards to the age groups

	Age group				Total
	Pediatrics	Youths	Adults	Elderly	
Frequency	10	29	4	0	43
%	23%	67.5%	9.5%	0	100%

Table 6. Relationship between athletic injuries and BMI for the given age groups

BMI	Age group				
	Pediatrics	Youths	Adults	Elderly	Total
≤ 18.5	19 (12%)	15 (9%)	5 (3%)	0	39
18.5 - 24.9	13 (8%)	29 (18%)	9 (6%)	0	51
25 - 29.9	0	24 (15%)	15 (9%)	4 (2%)	43
≥ 30	5 (3%)	25 (15%)	0	0	30
Total	37 (23%)	93 (57%)	29 (18%)	4 (2%)	163

Table 7. Relationship between each athletic injuries and BMI for the given age groups: (a) Upper limb injuries; (b) other regions of lower limb injuries; (c) knee injuries

BMI	Age group				
	Pediatrics	Youths	Adults	Elderly	Total
(a) p-value = 3.44 × 10⁻⁶, df = 6					
≤ 18.5	14	0	0	0	14
18.5 - 24.9	9	9	5	0	23
25 - 29.9	0	5	5	0	10
≥ 30	5	10	0	0	15
Total	28	24	10	0	62
(b) p-value = 0.0055, df = 6					
≤ 18.5	5	5	5	0	15
18.5 - 24.9	4	10	0	0	14
25 - 29.9	0	9	0	0	9
≥ 30	0	5	0	0	5
Total	9	29	5	0	43
(c) p-value = 0.0041, df = 6					
≤ 18.5	0	10	0	0	10
18.5 - 24.9	0	10	4	0	14
25 - 29.9	0	10	10	4	24
≥ 30	0	10	0	0	10
Total	0	40	14	4	58

and cramping routine for 15 - 20 minutes before the exercise. These people should have an adequate awareness and knowledge regarding the quality of the sport that will be exercised and the use of appropriate clothing, footwear and related materials.

Our study revealed that athletics can be practiced by all age groups: Pediatrics, youths, adults, and the elderly under strict conditions. It means that our society does exercises with or without the knowledge of good health practices because in the nineteenth century, the daily physical activities for people in KSA were 92% and became less than 30% in the developed modern societies, resulting in high prevalence of obesity, heart disease, blood vessels and osteoporosis.

The proper healthy child at the pre-school age (0 - 6 years) is considered to be active. From the age of 6 onwards, they should be prevented from spending their time in front of the TV and computer at home and school.

Health education on healthy diets such as the avoidance of fast foods like hamburgers, toast and soft drinks (i.e. Cola, Pepsi, etc.) must be encouraging to substitute the soft drink with milk is mandatory at personal, community and national levels. In our study, 80% of adults or youths who are overweight are noted to be overweight since childhood.

Our study showed that a majority of the people practice athletics in the youth stage (44%), followed by the adult stage (31%), the pediatric stage (24%) and lastly, the elderly stage (1%). This indicates that the culture of sports is low at the childhood stage, as a majority of children tend to watch TV, play with electronic devices and do other sedentary activities that affect their body, thus increasing the percentage of obesity and overweightness in the pediatric society. On the other hand, even the children who do practice sports do not have a good knowledge of the proper method to exercise, as supported by our study in which the percentage of the injuries in them was 24% as shown in Table 1.

Therefore, it is suggestible for people to do the sports activities accordingly as the age increases. For example, in the age of 5 - 7 years, children are directing toward individual activities such as running, climbing, swimming and choreography. They can move gradually to the activities that require more energy and strength as the age advances. However, they should be advised not to over-practice despite their passion in their respective sports. This is also applicable to other age groups when they do not have enough knowledge about the nature and impact of exercises which affect their health and injure themselves by one of the three types of injuries which are noted in this study such as the upper limb (38%), other regions of the lower limb (26%) and the knee (36%).

Due to the particular traditional behaviors in food in this society favoring for overweightness, our study also identified that there is a significant relationship between the BMI and the type of injuries in most of the age groups ($p < 0.05$, $df = 6$) for all types of injuries. So, it is strongly suggestible to promote civic health consciousness of overweight-related sports injuries.

4. CONCLUSION

Our study highlighted that there is a significant association between high BMI and sports injuries in most of the age groups. The prevalence of athletes and also the incidence of injuries is lower amongst the elderly. Although our study does not represent the whole nation of Saudi, it highlights that overweight and obese athletes should be informed of the risks of injuries, and all the preventive measures of risks are essential at all levels of performers; age, body weight, types of sports and equipment used in sports including the shoes and clothing, proper medical check-up and advice by sports physicians and health-

consciousness on overweight-related sports injuries.

CONSENT

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Salter RB. Text book of disorders and injuries of the musculoskeletal system. 3rd ed. Lippincott Williams & Wilkins; 1999.
2. Simon R, Gilyoma J, Dass R, et al. Pediatric injuries at Bugando Medical Centre in Northwestern Tanzania: A prospective review of 150 cases. J Trauma Manage Outcomes. 2013;7(1):10.
3. Shanley E, Thigpen C. Throwing injuries in the adolescent athlete. International Journal of sports physical therapy. 2013;8(5):630.
4. Almekinders L. Anti-inflammatory treatment of muscular injuries in sport, an update of recent studies. Sports Med. 1999;28(6):383-8.
5. Radelet M, Lephart S, Rubinstein E, et al. Survey of the Injury rate for children in community sports. Pediatrics. 2002;110(3):e28.
6. Lerner K, Lerner B. World of sports science. Detroit, Mich.: Thomson Gale. 2007.
7. Aim for healthy weight. National heart, Lung and Blood institute. U.S. Department of Health and Human Services. Available:http://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm

© 2016 Nagadi et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://sciedomain.org/review-history/13384>