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EXAMINATION OF KNEE OSTEOARTHRITIS IN RETIRED PROFESSIONAL ATHLETES AND NONATHLETIC INDIVIDUALS

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ABSTRACT

Background & Aims: *Nowadays, advantages of participating in physical activities have been recommended to prevent chronic diseases such as osteoarthritis. However, the risks that severe physical activity might have on the musculoskeletal system of athletes are still unperceived. The current study aims to investigate the comparison of knee osteoarthritis grade, knee pain, symptoms and physical function in daily, sport, and recreation activities, and life quality of retired professional athletes and nonathletic individuals.*

Materials and Method: *In this cross-sectional study, 60 former elite male athletes who were practicing soccer, wrestling, and track and field, with a mean age of 50-65 years were purposefully selected as study subjects and divided into four equal groups (each one with 15 males).The diagnosis was confirmed by clinical symptoms and radiological (Kellgren-Lawrence) orthopedic doctors. Besides, a globalized and localized questionnaire of Knee Injuries and Osteoarthritis Outcomes (KOOS) was used in this study. To analyze our data, two statistical tests of variance analysis (ANOVA) and Tukey Post Hoc Test at $p \leq 0.05$ were applied.*

Results: *Lower means of knee pain, symptoms, physical function in daily, sport, and recreation activities, quality of life coupled with the upper mean knee osteoarthritis grade in the in athletes in three studied groups (soccer, wrestling, and track and field) than nonathletic individuals showed a statistically significant difference ($P<0.05$).*

Conclusions: *Sports in professional level results in increasing knee osteoarthritis in former elite athletes. These outcomes are much more evident in the sports having a combination of strength and endurance activities than endurance sports.*

KEYWORDS: *Knee Osteoarthritis, Retired Professional Athletes, Nonathletic Individuals*

Article History

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INTRODUCTION

Osteoarthritis is among most common musculoskeletal system illnesses which is expressed as degenerative changes in synovial joints with new osteogenesis and is divided into two main groups: 1- initial osteoarthritis o idiopathic 2 – secondary osteoarthritis (Silva, 2007). This illness makes more severe disability and clinical symptoms in knee rather other parts of the body and according to the available evidence is regarded as a serious global health problem [2].

Aging is an overall process which involves all degrading and irreversible changes in the body through increase of the age [3]. Musculoskeletal pain is a common problem in the elderly [4]. According to some researchers aging changes are along with the reduction in several main musculoskeletal characteristics which result in lowering physical performance and disability; so, it is obvious that many health problems are induced by aging phenomenon [5]. Maybe, osteoarthritis is the most important factor leading to the elderlies' incompetence [6]; some studies show that the incidence of knee osteoarthritis as a factor causing musculoskeletal pains in 65 years old individuals is about 60 % to 90 % [7]. This illness is one of the important reasons for performance deficiency and has a significant effect on people's lives in terms of their motion, and daily activities and results in the limitation of their recreational, sport and vocational activities [8].

Overloads and excessive use of or impacts of the joints are among factors leading to injuries and dissolution of the joints and incidence of osteoarthritis disease [9]. Different sports such as soccer, wrestling, and track and field, due to their particular features and their emphasis on special factors such as strength, endurance, etc. have different impacts on athletes' physical conditions [10]. Wrestling is among strength sports in which fewer numbers of actions are repeated, but a high deal of pressure is inserted on joints; Marathon run in field and track sports is an endurance sport where the big numbers of actions are repeated; and finally soccer is as a sport which includes both high numbers of actions and big deal of pressure inserted in the joints – as well as a great deal of damages inserted in the joints.

Reaching to higher performance, capacity and superiority over the rivals in the matches is one of both athletes and their coaches' goals [12]. Since in the current and former elite athletes of sports such as soccer, wrestling, and track and field some pain is reported in their knees, it is probable that professional engagement in these sports brings damages to the athletes knees during their retirement. Despite abundant benefits of physical activities, dangers along with sports activities are not fully perceived yet [13]. Spector et al (1996) and Sezoeke et al (2006) mentioned that physical activities and risk of osteoarthritis are in a close relationship [14, 15]. In addition, Felson et al (1990) and Hootman et al (2003) stated that physical activities may do not cause osteoarthritis [16, 17]; while, White et al (1993) and Rogers et al (2002) reported that physical activities can protect the knee joint from degenerative changes [18, 19]. In another study conducted by Spector et al (1996) it was concluded that retired tennis elite athletes have more pain in their knee joint compared with the control group. Their study revealed that in sports in which athletes have to bear their body weight the chance of having osteoarthritis is 2 to 3 times higher than control group members [13]. However, Talin et al (2005) studied knee osteoarthritis in sky athletes in comparison with a control group and reported that there is no significant difference in the incidence of osteoarthritis between these two groups [11].

Using the available databases, it was found that there is no study about this subject in Iran; however, the few studies conducted in other countries show contradicting results. The researchers of this study examined three main factors in the incidence of osteoarthritis including high pressures, excessive use of knees, and strikes on knees) which enhance the risk of osteoarthritis in wrestling, track and field, and soccer, respectively. Therefore, along minimizing the number of individuals with this illness and the social and economic losses caused by that, it seems that examination of the risk of incidence or exacerbation of knee osteoarthritis and detecting its causes and consequences in athletes, especially professional ones, is of great importance.

Hence, this study aims to compare knee osteoarthritis grade, knee pain, symptoms and physical function in daily, sport, and recreation activities, and life quality of retired professional athletes and nonathletic individuals.

METHOD AND MATERIALS

This research is a practical qualitative-local study. The statistical community of this research was retired male athletes in soccer, wrestling, and track and field versus nonathletic individuals. The name of athletes was obtained from concerning Federations and Boards of Tehran Province for soccer, wrestling, and field of the track. First, a questionnaire designed by the researcher was distributed among the participants. The questionnaire involves questions such as physical activity experience and level, history of illness or taken drugs, and having or not having any injuries, stroke, or surgery in the knee.

The criteria to participate in this study included:

- Engage in national, club, and championship level in the youth time, 2. Achieving national or international rewards in Elderly level, 3. Having professional sport experience of 3 to 5 years, and 4. Having the age of 50 to 65.

So, all samples became homogenous in terms of age, gender, and professional sport experience. On the other hand, the criteria for leaving the study were:

- Having no injury history, damage or surgery, and bone breakage in the lower part of the body, 2. Having a body mass index (BMI) index of less than 30, 3. Having no history of threatening diseases of the joints (e.g. osteonecrosis, diabetes, osteoporosis, rheumatoid arthritis, neuromuscular diseases, and having any experience of disease such as collagen vascular, arthritis, psoriasis, and arthritis induced by gout and pseudo gout), 4. Having no long-term experience of taking drugs affecting the musculoskeletal system, and 5. Constant addiction.

The number of participants in track and field, soccer, and wrestling was 15, 18, and 15, respectively. Besides, the nonathletic population of this study included 60 to 65 year old males who were not professionally active in sports and had the qualifications to participate in this study. Since there was a limitation in the number of retired professional athletes with participation and leave criteria and in order to determine the number of samples in a particular range, it was decided to choose 15 samples from each group and finally 60 samples with mean age 57 ± 7 year, height 178.72 ± 5.78 cm, and weight 77.9 ± 6.42 kg were purposefully selected and divided into four equal groups, including soccer, wrestling, and track and field sports, and nonathletic individuals, each with 15 participants. In the next step, global and localized KOOS questionnaire was offered to the individuals. The questionnaire is applied to measure knee pain, symptoms, and mobility performance problems in daily, sport, and recreational activities, and life quality in those suffering knee pains. KOOS questionnaire had 42 patients-center questions around 5 concepts, pain (9 questions), other symptoms of the illness (7 questions), daily life activities (17 questions), sport and recreational activities (5 questions), and life quality in relationship with knee problems (4 questions). The participants answered the questions using 5-choice scale of Likert. In this scale, each category is separately estimated using the visual Analogue Scale (VAS) in the range of 0 to 100, where 0 implies the worst situation and 100 stands for situation without any problem [8].

The participants answered the questions in front of researchers and then were examined by orthopedic specialized doctors in Sport Medical Federation in terms of clinical symptoms. By approval of the doctors and gaining participants' informed consent athletes were subjected to take radiology photos from their knees in two views (back and front and by side). All photos were examined by radiology expert and checked based on Kellgren-Lawrence criteria and then each view's situation was reported [20].

Afterward, clinical and radiological symptoms, altogether, were categorized by the specialized doctor and the following categories emerged for knee osteoarthritis: 1. No pathologic symptom of finding is obvious, 2. The findings imply slight knee degenerative changes (osteoarthritis), 3. The findings imply mean knee degenerative changes (osteoarthritis), and 4. The findings imply progressed knee degenerative changes (osteoarthritis).

To analyze the merged data, qualitative statistical methods were used to arrange data and description of samples characteristics. Also logical, statistical method was used to analyze obtained data through the SPSS16 software package. In qualitative statistic section, mean and variance were used respectively as a central tendency index and dispersion. Moreover, for the logical statistic part, regarding Kolmogroff- Smirnov results which imply normal distribution of the data, unidirectional variance analysis was applied to examine significant differences between the means of the groups. In the case the difference was significant ant Tukey Post Hoc test was used ($p \leq 0.05$).

RESULTS

The data introduced in table 1 indicate that the samples in all 4 groups are in the same basic condition in terms of demographic and physical characteristics and have no significant difference ($p>0.05$).

Table 1: Individual Characteristics in 4 Studied Groups in Terms of their Homogeneity

Group / Variable	Age (year)	Height (cm)	Weight (kg)
Soccer	58.2 ± 2.35	178.40 ± 5.42	87.60 ± 5.95
Wrestling	57 ± 7.5	178.60 ± 5.95	78 ± 8.02
Track and field	58.5 ± 2.1	178.67 ± 5.38	76.23 ± 6.42
Nonathletic	57.2 ± 2.17	179.20 ± 6.58	78.33 ± 6.42
Significance level	0.127	0.985	0.855

Based on radiological criteria of Kellegren-Lawrence, the greater levels of osteoarthritis equal to the worst osteoarthritis situation. Besides, considering the criteria defined in the questionnaire, the lower score of the samples indicates their more severe state of osteoarthritis. As figure 1 illustrates, in terms of radiology view degree three athletic groups of soccer, wrestling, and field and track have respectively higher mean scores, while regarding the questionnaire these three athletic groups have lower means (Figure 1).

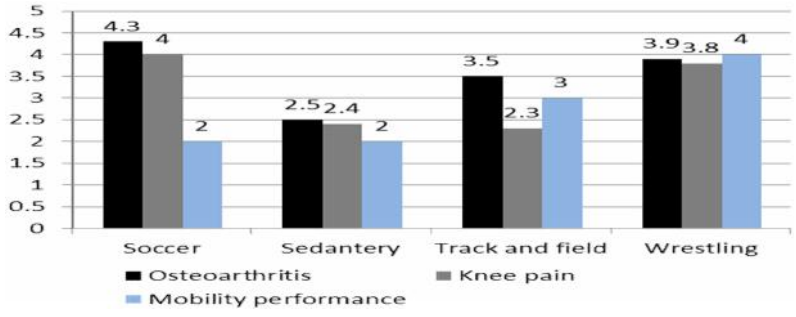

Figure 1: General Information of Comparing Knee Osteoarthritis Grade, Pain Level, Symptoms, Mobility Performance in Daily, Sport, and Recreational Activities, and Life Quality in Both Athletic and Nonathletic Groups

The results of this study revealed that the higher mean of knee osteoarthritis and lower mean of knee pain level and symptoms, mobility performance problems, in daily, sport, and recreational activities in three athletic groups (soccer, wrestling, and field and track) show significant differences ($p<0.05$) compared with nonathletic group. The mean and variance for 4 mentioned groups ,plus the results of the unidirectional variance analysis are introduced in table 2.

Table 2: Comparing the Osteoarthritis Grade, Knee Pain Grade, Symptoms, Mobility Performance in Daily, Sport, and Recreational Activities and Quality of Life in 4 Studied Groups

Variable	Group	Mean	Variance	P Value	Variable	Group	Mean	Variance	p Value
Osteoarthritis	Soccer	2.47	0.64	0.001	Mobility performance in daily activities	Soccer	62.29	23.51	0.000
	Wrestling	2.12	0.83			Wrestling	75.30	22.28	
	Field and track	1.80	0.94			Field and track	83.77	15.84	
	Nonathletic	1.27	0.70			Nonathletic	94.29	5.23	
Pain	Soccer	61.62	25.52	0.000	Mobility performance in sport and recreational activities	Soccer	46.67	25.68	0.000
	Wrestling	76.12	19.94			Wrestling	57.33	26.98	
	Field and track	83.97	14.39			Field &track	71.33	24.16	
	Nonathletic	92.50	7.54			Nonathletic	92.67	7.52	
Symptoms	Soccer	55.24	9.72	0.000	Life quality	Soccer	71.52	13.09	0.000
	Wrestling	59.29	12.13			Wrestling	78.89	13.56	
	Field and track	65.00	8.97			Field and track	87.55	12.83	
	Nonathletic	71.68	4.38			Nonathletic	90.65	9.27	

The findings through Tukey Post Hoc test imply that for pain mean, symptoms, and mobility performance problems in daily activities there are significant differences ($p<0.05$) between soccer and nonathletic group, wrestling, and nonathletic group, and soccer and track and field (table 3). Furthermore, considering knee osteoarthritis grade, there is a significant difference ($p<0.05$) between soccer and nonathletic group and wrestling and nonathletic group ($p<0.05$). In addition, regarding mobility performance problems in sport and recreational activities, there was observed a significant difference between wrestling and nonathletic and track and field and nonathletic group ($p<0.05$). Finally, for life quality, there was seen no significant difference ($p<0.05$) between soccer and nonathletic group and soccer and track and field group (table 4).

Table 3: Tukey Post Hoc Test Results for Comparison of Knee Osteoarthritis Grade, Knee Pain Intensity, and Symptoms in Four Studied Groups

Variable	Group	Mean Difference	Variance	P-value
Pain	Soccer-nonathletic	30.87	6.86	0.002*
	Wrestling-nonathletic	16.38	5.50	0.045*
	Track and field-nonathletic	8.52	4.19	0.270
	Soccer-wrestling	14.49	8.36	0.429
	Soccer-track and field	22.34	7.56	0.042*
	Track and field-wrestling	7.85	6.35	0.766
Symptoms	Soccer-nonathletic	16.43	2.75	0.000*
	Wrestling-nonathletic	12.39	3.33	0.009*
	Track and field-nonathletic	6.67	2.57	0.095
	Soccer-wrestling	4.04	4.01	0.889
	Soccer-track and field	9.76	3.41	0.046*
	Track and field-wrestling	5.71	3.89	0.611
Mobility performance in Daily activities	Soccer-nonathletic	32.09	6.22	0.001*
	Wrestling-nonathletic	19.08	5.91	0.030*
	Track and field-nonathletic	10.61	4.30	0.130
	Soccer-wrestling	13	8.36	0.548
	Soccer-track and field	21.47	7.32	0.041*
	Track and field-wrestling	8.47	7.06	0.788

*: significant difference in the level of $P < 0.05$

Table 4: Tukey Post Hoc Test Results for Comparison of Mobility Performance in Daily, Sport, and Recreational Activities and Life Quality in Four Studied Groups

Variable	Group	Mean Difference	Variance	P-Value
Osteoarthritis	Soccer-nonathletic	1.20	0.28	0.001*
	Wrestling-nonathletic	0.86	0.28	0.020*
	Track and field-nonathletic	0.53	0.28	0.260
	Soccer-wrestling	0.33	0.28	0.655
	Soccer-track and field	0.66	0.28	0.107
	Track and field-wrestling	0.33	0.28	0.655
Mobility performance in Daily and recreational activities	Soccer-nonathletic	46.00	6.91	0.000*
	Wrestling-nonathletic	35.33	7.23	0.001*
	Track and field-nonathletic	21.33	6.53	0.026*
	Soccer-wrestling	10.66	9.61	0.840
	Soccer-track and field	24.66	9.10	0.064
	Track and field-wrestling	14	9.35	0.589
Life quality	Soccer-nonathletic	19.13	4.49	0.000*
	Wrestling-nonathletic	11.75	4.49	0.054
	Track and field-nonathletic	3.09	4.49	0.901
	Soccer-wrestling	7.37	4.49	0.365
	Soccer-track and field	16.03	4.49	0.004*
	Track and field-wrestling	8.65	4.49	0.229

*: significant difference in the level of $P < 0.05$

DISCUSSIONS

Based on the findings and testing the assumption of this research it can be concluded that the lower mean of knee pain intensity, symptoms, mobility performance problems in daily, sport and recreational activities, and life quality plus higher means in knee osteoarthritis grade in three athletic groups (soccer, wrestling, and field and track) compared with nonathletic individuals indicate significant differences. The results of this study are in agreement with those obtained through other studies [14, 22, 24, and 26].

Spector et al (1996) examined knee osteoarthritis in sports in which athletes have to tolerate their body weight and concluded that these sports increase risks of knee osteoarthritis 2 to 3 times [14]. One of the reasons explaining these results, which also confirm the findings of this research, is increase of joint injury risks which intensify the risk of osteoarthritis in the lower part of the body [21].

Kujala et al (1994) analyzed the data gathered through 21 years of retired elite athletes and control group's examination due to knee arthritis. Indeed, their research focused on athletes who were suffering the worst state of osteoarthritis as they have been visited in hospital by the doctors. The researchers of this study mentioned that endurance, combinational, and strength athletes have come to hospitals more frequent because they have had knee osteoarthritis. These results are also in agreement with those obtained with the current study [22].

In the study conducted by Kujala et al (1994) about knee osteoarthritis in heavy sports it was reported that elite athletes indicate more frequent symptoms such as pain and mobility limitations than samples without osteoarthritis [22]. A reason to justify this finding, which is also consistent with this research results, is the dissolution of joint cartilage and expansion of periosteum induced by osteoarthritis, which is followed by joint tightness and mobility limitation which becomes worse as the activities progress [23].

In a research done by Shepard et al (2003),the incidence of osteoarthritis in retired soccer athletes was compared with the control group. A reason offered for these results, which confirmed those obtained by the current study, is the constant pressure inserted on athletes' joints which may induce some micro-traumas on their joints which in turn leads to dissolution of joint cartilage. As a result, rigorous activities in heavy sports, particularly after a long time, at professional level might increase the risk of osteoarthritis incidence [25].

Shojaedin et al (2011) studied knee osteoarthritis in wrestling and stated that there is a significant difference in mean knee osteoarthritis grade between anathletic and nonathletic group and this mean was higher for an athletic group. Besides, they mentioned that there is a significant difference in mean pain level, symptoms, score of mobility performance problems in daily, sport, and recreational activities, and life quality between athletic and nonathletic groups; the mean score was lower for an athletic group, confirming the findings of this study. One reason for this lower mean is the inappropriate absorption of forces inserted in the joints during daily, sport, and recreational activities which causes micro-fractures in sub-cartilage tissue and, in turn, activates of secondary osteogenesis centers. This process causes joint cartilage to be thinner and increases the joint cartilage dissolution. As a consequence of bone density increase under the cartilage, shock absorbing property decreases under the cartilage and the risk of osteoarthritis enhances [27]. Nevertheless, the finding of this research is not in agreement with the results of the study conducted by Telin et al (2005) who compared knee osteoarthritis in sky players with the control group and found no significant difference. The possible answers for this inconsistency can be owing to this fact that in the current study parameters such as height, weight, and knee injuries are not controllable [11].

In this regard, Lane et al (1986), who conducted a research on running athletes, also reported results inconsistent with those of the current study. In their study the runners were compared with control group, no significant difference was found between two groups in term of osteoarthritis incidence, either clinically or radiologically; and the only difference was a female runners' higher amount of subchondral sclerosis in their knees. They mentioned that the possible reasons for this difference might be the fact that the samples with health problems or parameters such as participants' job were uncontrollable [28]. In general, some researchers reported that the rate of osteoarthritis incidence in professional athletes in close relationship with injuries in the related joints and when they removed injured samples the rate of osteoarthritis incidence decreased. However, there are other injuries related to excessive use of joints which are not related to the injuries brought in soft tissues, e.g., tendon rupture or Minsk, but are because of micro-traumas gradually inserted into the joints which deteriorate them. So, sports activity, enhances the risk of micro-trauma expansion to joint cartilage; which in turn may change the way of forces insertion on the joints as well as their transfer and as a result increase the chance of next injuries. Besides, it may change the way of forces transfer to the adjacent joints and makes this the susceptible to the injuries [29].

CONCLUSIONS

Regarding the findings of this research, it can be claimed that professional and elite sport enhances the risk of knee osteoarthritis incidence in retired professional athletes; and this risk is higher for sports which are a combination of strength and endurance compared with endurance sports. Hence, it is suggested that the experts, athletes, and coaches in these sports and other sports involving these fitness factors, do the necessary measures for offering strategies about doing bodybuilding exercises or changing specific training to prevent knee osteoarthritis in these athletes.

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