

Awareness and knowledge about anterior cruciate ligament injury among the general adult population of Saudi Arabia

Elsayed S Gharbawi¹, Mohammed S Al-Mubaddil², Ghusoon F Al-Moaibed³,
Shoq O Al-Shammri⁴

¹Department of Orthopedics, Al-Imam Abdulrahman Al Feisal Hospital, Riyadh, ²Medical Intern, College of Medicine, Shaqra University, Shaqra, ³Medical Intern, College of Medicine, King Faisal University, Alahsaa, ⁴Medical Student, Imam Abdulrahman Bin Faisal University, Dammam, Kingdom of Saudi Arabia

ABSTRACT

Background: The literature shows that data regarding the Saudi public's knowledge about anterior cruciate ligament (ACL) injury is still limited. **Aims:** This study aimed to determine the knowledge toward ACL injury in the general population of Saudi Arabia, as well as to investigate the main sources of information about ACL among the public. **Materials and Methods:** A cross-sectional online survey was conducted among a sample of 408 participants from all regions of Saudi Arabia. All participants completed an anonymous self-administered questionnaire, which included questions about their sociodemographic details and a structured tool to measure their knowledge about ACL injuries. **Results:** The present study showed that among 408 participants, 233 (57.1%) had adequate knowledge about ACL injuries, and 253 (62.0%) appreciated the seriousness of ACL injuries. The level of knowledge about ACL injuries was significantly associated with higher educational level ($P = 0.000$), but not with sex ($P = 0.424$) and region of residence ($P = 0.404$). Most of the participants agreed that ACL injury is a multi-factorial condition that results from a combination of factors, including sports, lack of warm-up before exercise, car accidents, old age, and lifting heavy objects. Internet, TV, and books were the most common sources of information about ACL injuries. **Conclusions:** While over half of the participants were aware of ACL injury, its seriousness, and its common risk factors, there are still knowledge gaps regarding ACL injury symptoms. Therefore, we recommend increasing public awareness about ACL injury, specifically through health education websites and TV programs.

Keywords: ACL injury, knowledge, Saudi Arabia

Introduction

A torn anterior cruciate ligament (ACL) usually occurs as the result of an acute non-contact deceleration injury, forceful hyperextension, or excessive rotational forces about the knee.^[1,2] The ligament may be completely torn, partially torn, or avulsed from its origin or insertion. The ACL is the primary restraint to excessive anterior translation and rotation of the tibia on

the femur; therefore, complete ACL disruption typically results in dynamic knee instability or the inability to respond to quick changes in the position.^[3]

The estimated US incidence is 100,000 to 200,000 ACL tears per year, with 100,000 ACL reconstructions per year.^[4] The female-to-male ratio has generally ranged from 2:1 to 8:1 and varies across sports.^[5-8] Although the exact cause of the relatively higher risk of injury in females remains unclear, several factors have been suggested to explain this association, including leg

Address for correspondence: Dr. Mohammed S Al-Mubaddil, Shaqra University, Shaqra, Kingdom of Saudi Arabia. E-mail: md.sm@outlook.com

Received: 10-10-2019

Revised: 04-12-2019

Accepted: 12-12-2019

Published: 28-01-2020

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_877_19

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Gharbawi ES, Al-Mubaddil MS, Al-Moaibed GF, Al-Shammri SO. Awareness and knowledge about anterior cruciate ligament injury among the general adult population of Saudi Arabia. J Family Med Prim Care 2020;9:379-84.

alignment, notch width (less space for ACL in females), hormonal factors, and neuromuscular control.^[4] Furthermore, structural features in the knee may increase the risk of ACL injury among females; these changes include femoral notch stenosis and meniscus integrity.^[9] Non- or minimal-contact injuries account for the majority of ACL injuries (up to 70%), especially in females.^[10-12] One recent study showed a higher rate of ACL injuries in white European American basketball players than in non-white players.^[13]

Two studies have been conducted in Albaha city and Aseer region, Saudi Arabia,^[14,15] and both studies showed a reasonable awareness of the general population about the seriousness of ACL injury, but there were gaps in their information about risk factors other than sports, dangerous actions that increase incidence of ACL injuries, and the characteristic symptoms of ACL injury. There is a stressing need for increasing health education, raising awareness, and implementation of prevention programs for ACL injuries.

Studies have shown that as much as 80% of ACL injuries are attributed to low-velocity non-contact injury.^[16,17] Contact injury with rotational movement can lead to an ACL injury, and these injuries are mostly secondary to excessive valgus stress, hyperextension, and twisting.^[16,17] Diagnosis of ACL tear can be merely achieved by focused history and physical examination without any further evaluation.^[18] The most important key points in history which indicate ACL injury are the mechanism of injury (mostly non-contact), presence of audible pop, swelling due to hemarthrosis, and incapability to return or resume normal activities after injury.^[17] Lachman test is the most sensitive test for ACL injury in the acute phase, with a sensitivity of 93.5%. Test accuracy increases with anesthesia, especially in females.^[19] Plain radiographs are not a useful tool to diagnose ACL injury as false-negative results are common; instead, it might be helpful to show specific findings that are associated with ACL injury.^[17] The most widely used imaging technique to confirm the diagnosis is magnetic resonance imaging (MRI), with a sensitivity and specificity of 86% and 95%, respectively, and an accuracy of 93%.^[18] In addition, MRI helps in identifying bone bruising, which is found in 95% of ACL injuries.^[17]

ACL can be managed by surgical and non-surgical approaches; however, physicians have to counsel patients and evaluate factors that may affect treatment outcomes, such as age and pre-injury activity. ACL reconstruction is usually referred for young adults and those who wish to return to pre-injury activity; however, there is a debate whether surgery can reduce the risk of reinjury as well as increase the likelihood of returning to sports.^[16] According to the Delaware Oslo cohort study, surgically treated patients had a significantly increased risk of knee reinjury compared to non-surgically treated patients, but no significant difference was found with respect to improvement of knee function in the first year.^[9] Non-operative treatment options are usually reserved for older patients or less active individuals who want to participate in level-II sports.^[9] The goal of non-operative treatment is to resume

the range of motion (ROM) and strength by modifying the level of activity and avoiding demanding physical occupations.^[17]

The recognition of high incidence of osteoarthritis after an ACL injury, which increases by approximately 15%–20% in the first 10 to 20 years following the injury, and the high risk of injury in female athletes warranted the development of preventive programs.^[11,16] These programs rely on six essential principles suggested by Sugimoto *et al.* (2015).^[16] These principles include age, biomechanics, compliance, dosage, feedback, and exercise.^[16] Briefly, these programs focus on starting on early age, comprehensive neuromuscular training by balance exercises to increase muscle firing and dynamic knee stability, moreover, compliance with the program is vital to decrease ACL injury rates.^[16] Sessions should last for 20–30 min and should be performed multiple times per week for 6 weeks as minimal to get optimal benefits.^[16,18]

Patients with a history suggestive of an ACL injury will generally seek care from a primary care physician. Raising the awareness of ACL injuries through public health policies permits prevention by screening and promotes public health. However, only a limited number of studies have investigated the awareness of ACL injuries and sources of information in the general population. Therefore, this study aimed to determine the knowledge toward ACL injury in the general population of Saudi Arabia, as well as to investigate the main sources of information about ACL injury among the public.

Materials and Methods

This is a cross-sectional community-based study targeting the general population of Saudi Arabia to determine the knowledge toward ACL injury, as well as to investigate the main sources of information about ACL among the public. Inclusion criteria were being a male or female, aged 18 years or above and residing in any of the five main regions of Saudi Arabia. Those who failed to meet the inclusion criteria were excluded from the study.

The sample size was calculated using the following formula:

$$n = ([z^2 \times p \times q]) / d^2$$

Where: P = prevalence of knowledge 50%, Z = 95% confidence interval, d = error \leq 5%, and q = nonresponse rate 50% nonresponse rate.

Therefore, a sample of 408 participants was calculated for the purpose of the current study.

Participants were invited to fill out an electronic online Arabic questionnaire which was based on the previous study with comparable aims.^[12] The first part of the questionnaire included nine questions on the sociodemographic data of the participants, and the second part consisted of 12 questions on the knowledge and awareness of ACL injuries. Two questions

covered the sources of information about ACL injury and the most common symptoms of ACL injury. Correct answers were given a score of 1, whereas incorrect answers were given a score of 0. The knowledge score was categorized into two levels, namely, adequate knowledge for those who correctly answered seven questions or more and inadequate knowledge for those who correctly answered less than seven questions.

Prior to statistical analysis, data mining was done to check for the completeness of responses and coding errors. Categorical variables were presented as frequencies and percentages. Continuous variables were presented as means and standard deviations (SD). Chi-square or Fisher's exact test was used for comparison between two categorical variables. Differences were considered significant if $P > 0.05$. Data were analyzed using the Statistical Package of Social Sciences (SPSS) Version 20 (SPSS Inc., Chicago, IL).

All participants were informed of their rights to participate and that their information would be kept anonymous and only used for this study. Ethical approval was obtained from the local ministry of health's IRB (number: H-01-R-009) 04/09/2019.

Results

A total of 403 responses were met our selection criteria. Our dataset had an almost equal proportions of participants from either sex, with 50.5% males ($n = 206$) and 49.5% females ($n = 202$). The majority ($n = 267$; 65.4%) belonged to the 18–25-year old age group. The sample included participants from all regions of Saudi Arabia, with the majority of them being from the central region ($n = 154$; 37.7%), followed by western region ($n = 85$; 20.8%), eastern region ($n = 66$; 16.2%), southern region ($n = 55$; 13.5%), and northern region ($n = 48$; 11.8%). The marital status-wise distribution of respondents was as follows: 326 respondents (79.9%) were single, 77 married (18.9%), and 5 divorced/widowed (1.2%). As for the job status, 59 were employed in a health-related facility (14.5%), 69 were employed in a non-health-related facility (16.9%), and 101 had no job (24.6%), and 178 were students (43.6%). For the education level, 208 respondents (51.0%) had a bachelor's degree or above and 135 (33.1%) completed high school. Finally, 234 respondents (57.5%) self-reported exercising regularly [Table 1].

Respondents with a total score of ≥ 7 on the 12 questions assessing knowledge about ACL were considered having adequate knowledge and those who scored > 7 were considered having inadequate knowledge. Table 2 shows the frequencies and percentages of respondents with adequate knowledge, representing 57.1% ($n = 233$) of the sample. A total of 253 (62.0%) appreciated the seriousness of ACL injuries. Among males, 122 respondents (59.2%) had adequate knowledge about ACL versus 84 among females (40.8%; $P = 0.424$). With respect to participants' perception of the seriousness of ACL injuries, 128 of males (62.1%) and 125 of females (61.9%) perceived ACL injuries as medically serious ($P = 0.238$). No significant difference was detected in both the level of knowledge about ACL and its seriousness ($P < 0.05$).

Table 1: Sociodemographic characteristics of the study sample

Characteristics	n	%
Sex		
Male	206	50.5
Female	202	49.5
Region of residence		
Central	154	37.7
Western	85	20.8
Eastern	66	16.2
Southern	55	13.5
Northern	48	11.8
Marital status		
Single	326	79.9
Married	77	18.9
Separated	5	1.2
Job type		
Health-related	59	14.5
Non-health-related	69	16.9
Student	178	43.6
Not employed	101	24.6
Regular exercise		
Yes	234	57.4
No	174	42.6

Table 2: Distribution of knowledge about ACL in the study sample according to sex

Characteristics	Male, n (%)	Female, n (%)	P
Knowledge level			
Adequate	122 (59.2)	111 (55.0)	0.424
Inadequate	84 (40.8)	91 (45.0)	
Are ACL injuries serious?			
Yes	128 (62.1)	125 (61.9)	0.238
No	42 (20.4)	31 (15.3)	
Not sure	36 (17.5)	46 (22.8)	

Tables 3 and 4 summarize the level of knowledge about ACL and perception of its seriousness according to residence. No significant differences were detected ($P < 0.05$).

As can be seen in Table 4, there was a statistically significant association between knowledge about ACL and level of education ($P = 0.000$). Respondents who had a bachelor's degree or above were more knowledgeable (69.7%, $n = 145$) than were those who had lower levels of education. As well, higher education level was associated with a better perception of ACL injuries seriousness, but this was not statistically significant ($P < 0.05$).

Respondents thought that ACL injuries are caused by sports (61.5%), lack of warm-up before exercise (48.1%), car accidents (44.7%), contact sports injury (30.8%), low fitness level (30.5%), old age (27.8%), using the stairs (21.6%), lifting heavy objects (18.1%), and kneeling (in Islamic prayer, 8.4%) [Table 5].

As shown in Table 6, respondents took their information about ACL injuries from Internet (27.5%), TV (22.3%), books (20.3%),

Table 3: Distribution of knowledge about ACL in the study sample according to residence

Characteristics	Central, n (%)	Western, n (%)	Eastern, n (%)	Southern, n (%)	Northern, n (%)	P
Knowledge level						
Adequate	82 (53.2)	48 (56.5)	36 (54.5)	37 (67.3)	30 (62.5)	0.404
Inadequate	72 (46.8)	37 (43.5)	30 (45.5)	18 (32.7)	18 (37.5)	
Are ACL injuries serious?						
Yes	98 (63.6)	55 (64.7)	43 (65.2)	29 (52.7)	28 (58.3)	0.634
No	27 (17.5)	17 (20.0)	11 (16.7)	9 (16.4%)	9 (18.8)	
Not sure	29 (18.8)	13 (15.3)	12 (18.2)	17 (30.9)	11 (22.9)	

Table 4: Distribution of knowledge about ACL in the study sample according to the level of education

Characteristics	Intermediate or below, n (%)	High school, n (%)	Diploma, n (%)	Bachelors' or above, n (%)	P
Knowledge level					
Adequate	1 (25.0)	64 (47.4)	23 (37.7)	145 (69.7)	0.000
Inadequate	3 (75.0)	71 (52.6)	38 (62.3)	63 (30.3)	
Are ACL injuries serious?					
Yes	1 (25.0)	76 (56.3)	39 (63.9)	137 (65.9)	0.370
No	1 (25.0)	26 (19.3)	11 (18.0)	35 (16.8)	
Not sure	2 (50.0)	33 (24.4)	11 (18.0)	36 (17.3)	

Table 5: Causes of ACL injuries*

Characteristics	n	%
Sports	248	61.5
Lack of warm-up before exercise	194	48.1
Car accidents	180	44.7
Contact sports injury	124	30.8
Low fitness level	123	30.5
Old age	112	27.8
Using the stairs	87	21.6
Lifting heavy objects	73	18.1
Kneeling (in Islamic prayer)	34	8.4

*Multiple answers were allowed.

Table 6: Source of respondents' knowledge about ACL injuries

Characteristics	n	%
Internet	111	27.5
Television	90	22.3
Books	82	20.3
Healthcare provider	55	13.6
Awareness campaigns	43	10.7
Relative who suffered ACL injury	40	9.9
Sport coach	24	6.0
I myself experienced ACL injury	13	3.2

a healthcare provider (13.6%), awareness campaigns (10.7%), a relative who had an ACL injury (9.9%), sport coach (6.0%), and personal experience (3.2%).

Figure 1 illustrates the respondents' answers about the question regarding common ACL symptoms. As can be clearly seen, the majority of participants agreed that imbalance, swelling, crepitus, leg weakness, knee stiffness, knee pain, and knee locking are common symptoms in patients with ACL injuries.

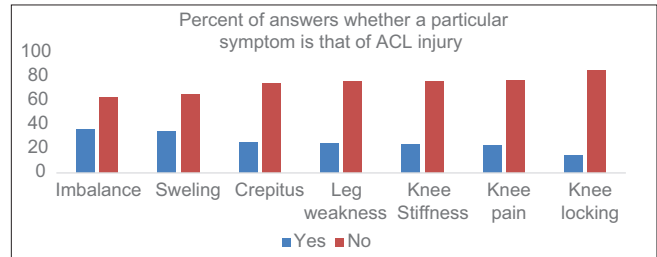


Figure 1: Answers about respondents' knowledge regarding the common ACL symptoms

Figure 2 illustrates the respondents' answers about the question regarding the single most important treatment of ACL injuries. More than half of the participants (52.0%) thought that surgery is the most important treatment of ACL injuries, followed by physiotherapy (38.0%), medications (13.0%), and herbs and alternative medicine (7.0%).

Discussion

The main purpose of the present study was to evaluate Saudi adults' knowledge and awareness toward ACL injury. The current sample consisted of 403 respondents from all regions of Saudi Arabia. The proportion of participants who self-reported having experienced ACL injury was 3.2%, which is consistent with the previous reports that found the risk of ACL injury to be quite low in general population as compared to sports players^[20,21]

Our analysis showed that 57.1% of participants were aware of ACL injury and 60.0% appreciated its seriousness. This is lower than what was found in a recent study by Shaker *et al.* in Aseer region, Saudi Arabia (84%).^[22] This difference could be attributed to sample-specific variations between the two studies. Unfortunately, similar studies are lacking in Saudi

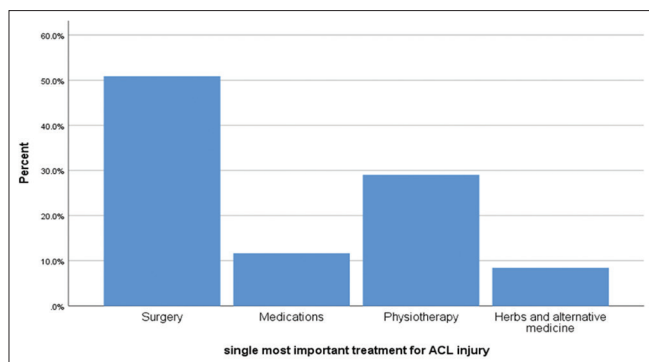


Figure 2: Answers regarding the expectation of the most important treatment for ACL injuries

Arabia, making it difficult to compare our findings to local studies. In addition, these findings indicate gaps in the current public knowledge about ACL injury and should warrant further efforts in increasing awareness about the subject among the public.

Regarding factors associated with awareness of ACL injury in the current sample, there was a significant difference in education level (i.e. higher education levels correlated with more awareness). This could be reasonably explained as awareness is mainly dependent on knowledge gained by education.

The results showed that the majority of participants (61.5%) were aware of the role of sports as a risk factor for ACL injury, which is consistent with the current literature that suggests a significantly increased risk of ACL injury among sports players, especially sports that involve overuse of knee joint.^[23-25] Participants were also aware of other risk factors for ACL injury, such as lack of warm-up before exercise and car accidents.

Awareness of ACL injury symptoms among our sample was generally poor. The percentage of participants who correctly identified the listed common symptoms of ACL injury did not exceed 36%. Having a good knowledge about symptoms of ACL injury is of high importance to the public health as it may help in appreciating the seriousness of the condition and warrants patients to quickly seek medical assessment and management.

The study showed that Internet and television were the sources of knowledge about ACL in almost half of participants, a finding that is consistent with that of other studies.^[26] This could be attributed to the fact that our participants live in a modern society, in which much of their knowledge comes from social media and Internet. Future interventions are recommended to reach out to the public through websites and TV programs designed and managed by health organizations.^[27,28]

Some limitations to this study should be addressed. Although we used a community-based sample, the final sample was not sufficient to be representative of Saudis from all regions. Hence, given the sample size and nature of the study, findings of the present study should be interpreted with caution and should

not be generalized to all Saudi adults. We adopted the study questionnaire from a previously published study; however, it has not yet been validated for use in Arabic-speaking population.

Conclusions

While over half of the participants were aware of ACL injury, its seriousness, and its common risk factors, there are still knowledge gaps regarding ACL injury symptoms. Therefore, we recommend increasing public awareness about ACL injury, specifically through health education websites and TV programs.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Ettlinger CF, Johnson RJ, Shealy JE. A method to help reduce the risk of serious knee sprains incurred in alpine skiing. *Am J Sports Med* 1995;23:531-7.
- Boden BP, Dean GS, Feagin JA, Garrett WE. Mechanisms of anterior cruciate ligament injury. *Orthopedics* 2000;23:573-8.
- Gokeler A, Neuhaus D, Benjaminse A, Grooms DR, Baumeister J. Principles of motor learning to support neuroplasticity after ACL injury: Implications for optimizing performance and reducing risk of second ACL Injury. *Sports Med* 2019;49:853-65.
- Accousti WK, Willis RB. Tibial eminence fractures. *Orthop Clin North Am* 2003;34:365-75.
- Agel J, Arendt EA, Bershadsky B. Anterior cruciate ligament injury in national collegiate athletic association basketball and soccer: A 13-year review. *Am J Sports Med* 2005;33:524-30.
- Mihata LCS, Beutler AI, Boden BP. Comparing the incidence of anterior cruciate ligament injury in collegiate lacrosse, soccer, and basketball players: Implications for anterior cruciate ligament mechanism and prevention. *Am J Sports Med* 2006;34:899-904.
- Hootman JM, Dick R, Agel J. Epidemiology of collegiate injuries for 15 sports: Summary and recommendations for injury prevention initiatives. *J Athl Train* 42:311-9.
- Weitzel PP, Richmond JC, Altman GH, Calabro T, Kaplan DL. Future direction of the treatment of ACL ruptures. *Orthop Clin North Am* 2002;33:653-61.
- Paschos NK, Howell SM. Anterior cruciate ligament reconstruction: Principles of treatment. *EFORT Open Rev* 2016;1:398-408.
- Ireland ML, Ott SM. Special concerns of the female athlete. *Clin Sports Med* 2004;23:281-98, vii.
- Giugliano DN, Solomon JL. ACL tears in female athletes. *Phys Med Rehabil Clin N Am* 2007;18:417-38, viii.
- Myer GD, Ford KR, Hewett TE. Methodological approaches and rationale for training to prevent anterior cruciate ligament injuries in female athletes. *Scand J Med Sci Sports* 2004;14:275-85.

13. Krosshaug T, Nakamae A, Boden BP, Engebretsen L, Smith G, Slauterbeck JR, *et al.* Mechanisms of anterior cruciate ligament injury in basketball: Video analysis of 39 cases. *Am J Sports Med* 2007;35:359-67.
14. Trojian TH, Collins S. The anterior cruciate ligament tear rate varies by race in professional Women's basketball. *Am J Sports Med* 2006;34:895-8.
15. Shea MA, Coppola GW. Knee pain, swelling, and instability. *Phys Sportsmed* 2003;31:31-3.
16. Nessler T, Denney L, Sampley J. ACL injury prevention: What does research tell us? *Curr Rev Musculoskelet Med* 2017;10:281-8.
17. Hewett TE, Lynch TR, Myer GD, Ford KR, Gwin RC, Heidt RS. Multiple risk factors related to familial predisposition to anterior cruciate ligament injury: Fraternal twin sisters with anterior cruciate ligament ruptures. *Br J Sports Med* 2010;44:848-55.
18. Makhmalbaf H, Moradi A, Ganji S, Omid-Kashani F. Accuracy of lachman and anterior drawer tests for anterior cruciate ligament injuries. *Arch bone Jt Surg* 2013;1:94-7.
19. Gammons M, Schwartz E. Anterior Cruciate Ligament Injury Treatment and Management 2016 [cited 2019 Jun 20]. Available from: <https://emedicine.medscape.com/article/89442-treatment#showall>.
20. Waldén M, Häggglund M, Werner J, Ekstrand J. The epidemiology of anterior cruciate ligament injury in football (soccer): A review of the literature from a gender-related perspective. *Knee Surg Sports Traumatol Arthrosc* 2011;19:3-10.
21. Alghamdi W, Alzahrani A, Alsuwaydi A, Alzahrani A, Albaqra O, Fatani M, *et al.* Prevalence of cruciate ligaments injury among physical education students of umm al-qura university and the relation between the dominant body side and ligament injury side in non-contact injury type. *Am J Med Med Sci* 2017;7:14-9.
22. Shaker A, Alshehri MSM, Alshehri FS, Alshahrani MM, Alshahrani MS, Alamri OM. Knowledge and awareness toward anterior cruciate ligament (ACL) injury among population of Aseer region, Saudi Arabia. *J Fam Med Prim care* 2019;8:812-7.
23. Bjordal JM, Arnly F, Hannestad B, Strand T. Epidemiology of anterior cruciate ligament injuries in soccer. *Am J Sports Med* 25:341-5.
24. Adickes MS, Stuart MJ. Youth football injuries. *Sports Med* 2004;34:201-7.
25. Vauhnik R, Morrissey MC, Rutherford OM, Turk Z, Pilih IA, Perme MP. Rate and risk of anterior cruciate ligament injury among sportswomen in Slovenia. *J Athl Train* 46:92-8.
26. Nagano Y, Yako-Suketomo H, Natsui H. Anterior cruciate ligament injury: Identifying information sources and risk factor awareness among the general population. Burns JS, editor. *PLoS One* 2018;13:e0190397.
27. Jiménez-Pernett J, de Labry-Lima AO, Bermúdez-Tamayo C, García-Gutiérrez JF, del Carmen Salcedo-Sánchez M. Use of the internet as a source of health information by Spanish adolescents. *BMC Med Inform Decis Mak* 2010 Jan 29;10:6.
28. Beck F, Richard J-B, Nguyen-Thanh V, Montagni I, Parizot I, Renahy E. Use of the internet as a health information resource among French young adults: Results from a nationally representative survey. *J Med Internet Res* 2014;16:e128.