

## Cruciate ligament injury among students of Northern Border University, Saudi Arabia

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**Background:** cruciate ligament consists of the anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) and they go from the femur to the tibia. The cruciate ligaments function is mainly to stabilize the knee and these ligaments have a risk to be injured in the athletes as well as non-athletes. **Objective:** address the prevalence of cruciate ligament injuries and its association with different types of injuries among Northern Border University students, Arar, KSA. **Methods:** A cross-sectional study was conducted among a representative sample of Northern Border University students in Arar City, Kingdom of Saudi Arabia, during the academic year 1439–1440. The students received the questionnaire to complete it. The parameters included in the questionnaire included age, sex, cause of cruciate ligament injury as during football playing, motor car accident, side and type of injury, type of treatment whether surgical treatment, physiotherapy or medical treatment. **Results:** This study reported the prevalence of cruciate ligaments injury among the studied Northern Border University students in Arar city, Kingdom of Saudi Arabia was 5.7%. The age of the studied ACL injury cases ranged from 18 to 30 years with mean age ( $\pm$ SD) was  $23.0 \pm 4.2$  years. Most of cases (98.6%) were males. Playing football was the most common cause by 78.9% followed by motorcar accidents 7%, fall from stairs 5.6%, swimming 4.2% and fall from height 2.8%. As regards the side of the injured cruciate ligament, 60.6% had anterior cruciate ligaments injury, 8.5% had posterior cruciate ligament injury, and 18.3% had injury in both sides. In the majority (54.9%) of cases, ACL tear was complete; partial in 38.0%. 14.1% received medical treatment, surgical treatment and physiotherapy by the same percent 32.4%, medical treatment and physiotherapy 15.5%. As regards outcome of treatment, this study reported 74.6% of patients become good and stable, 23.9% still complaining and 1.4% suffering from disability. **Conclusion:** This study reported the prevalence of cruciate ligaments injury among the studied Northern Border University students in Arar city, Kingdom of Saudi Arabia was 5.7%. Most of cases (98.6%) were males. Playing football was the most common cause by 78.9% followed by motorcar accidents 7%. As regards outcome of treatment, this study reported 74.6% of patients become good and stable, 23.9% still complaining and 1.4% suffering from disability. **Keywords:** cruciate ligament injuries, students, Northern Border University, Arar, playing football, accidents.

### Introduction:

Knee joint is the largest joint of the body. Stability of the knee joint is very important, depends mainly on four ligaments namely; medial, and lateral collateral ligaments, anterior and posterior cruciate ligaments<sup>[1]</sup>.

Cruciate ligament consists of two large ligaments each about the size of little finger inside the knee that cross deep inside the joint. They are called the anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) and they go from the femur to the tibia. The cruciate ligaments function is mainly to stabilize the knee and these ligaments have a

risk to be injured in the athletes as well as non-athletes. The ACL is the ligament in the front. It is one of the main static and functional stabilizing structures of the knee, the one most commonly injured, and its reconstruction is frequently performed<sup>[1]</sup>. The incidence of anterior cruciate ligament injury, which accounts to be involved in the majority of cruciate ligament injury by 100,000 to 200,000<sup>[2,3]</sup>. ACL reconstruction is essential to restore the rotational stability of the knee, but its role in prevention of knee joint degeneration remains unknown<sup>[4]</sup>.

In the study of **Alrubayyi et al.** [5] who aimed to estimate the prevalence and mechanism of anterior cruciate ligament injury among Makkah City, Saudi Arabia. It was found that the most common injury of ACL was sport (n=181). ACL injury occurred due to a rapid increase in running (n=18) and due to sudden deceleration (n=20). Sixteen were listed as road traffic accidents and 14 was related to their work.

Another study carried out by **Alghamdi et al.** [6] it was found that, the prevalence of Cruciate Ligaments Injury among Physical Education Students of Umm Al-Qura University was 5.3%, most of the injuries involved the anterior cruciate ligaments, which were 60%, while 10% were involved the posterior and the remaining 30% do not know the injured ligament, right knee was involved in 70% injuries while 30% were left knee.

In this study we addressed the prevalence of anterior cruciate ligament injuries and its association with different types of injuries among Northern Border University students, Arar, KSA.

#### **Participants and methods:**

A cross-sectional study was conducted among a representative sample of Northern Border University students in Arar city, Kingdom of Saudi Arabia, during the academic year 1439–1440. The sample size was calculated using the sample size equation:  $n = z^2 \cdot p(1 - p) / e^2$ , considering the prevalence of cruciate ligament injury in Northern Border University is 50%, target population more than 1000, and study power 95%. The minimum size required was 300 students.

The students received the questionnaire to complete it. The parameters included in the questionnaire included age, sex, other important data such as faculty and educational grade, Dominant foot and the Dominant hand. Cause of cruciate ligament injury; during football playing, motor car accident, during swimming, other sports, motor car accident, fall from stairs and fall from a height. side of the injured cruciate ligament. Type of CL injury; complete or partial. Type of treatment; surgical treatment; physiotherapy or medical treatment.

#### **Ethical considerations:**

Data collector gave a brief introduction to the students by explaining the aims and benefits of

the study. Informed written consent was obtained from all participants. Anonymity and confidentiality of data were maintained throughout the study. There was no conflict of interest.

#### **Statistical analysis:**

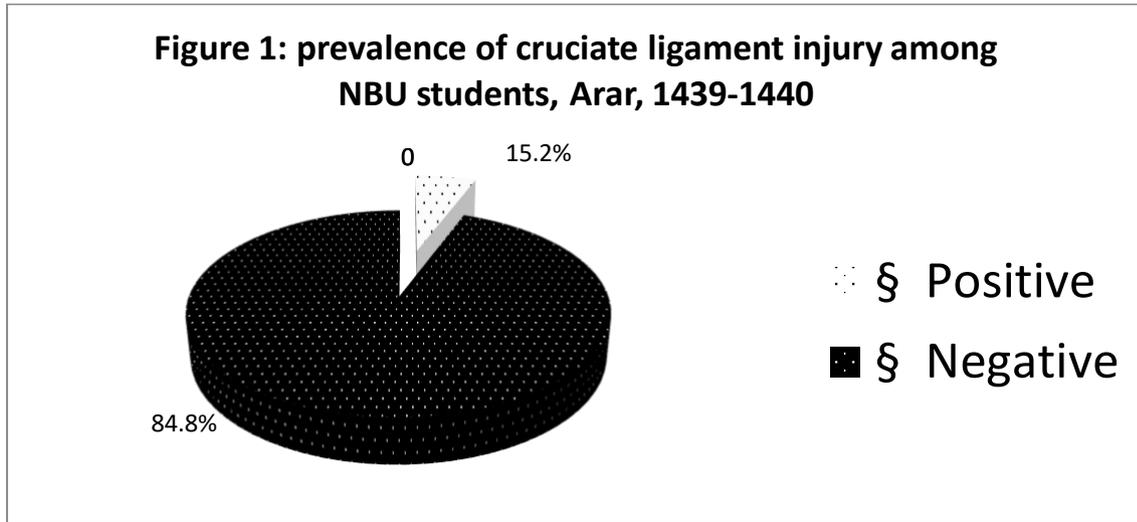
We utilized the statistical package for social sciences, version 16 (SPSS Inc., Chicago, Illinois, USA) to analyze the study data. The results were displayed as counts and percentages. The w2 and independent sample t-tests were used as a test of significance, and differences were considered significant at P value less than 0.05.

#### **Results:**

**Figure 1** illustrated the prevalence of cruciate ligament injury among NBU students, Arar, 1439-1440. It is clear that, the prevalence of cruciate ligaments injury was 5.7% of studied students. **Table 1** showed the characteristics of students with cruciate ligament injury, Northern Border University, It is clear from our table that, the age of the studied ACL injury cases ranged from 18 to 30 years with mean age ( $\pm$ SD) was  $23.0 \pm 4.2$  years. Most of cases (98.6%) were males. Dominant foot was the right in 78.9% and the Dominant hand was right in 87.3% of students. **Table 2** showed the characteristics of cruciate ligament injuries among students of Northern Border University. Regarding the cause of cruciate ligament injury, playing football was the most common cause by 78.9% followed by swimming 4.2% and 1.4% for other sports. Other causes like motor car accidents 7%, fall from stairs 5.6% and fall from height 2.8% as regards the side of the injured cruciate ligament, it is clear from the table that 60.6% had anterior cruciate ligaments injury, 8.5% had posterior cruciate ligament injury, 18.3% had injury in both side and 12.7% don't know the side of injury. In the majority (54.9%) of cases ACL tear was complete, partial in 38.0% and only 7% do not know type of injury. Associated injuries were found in the majority (73.2%) of cases. Type of associated injuries were twisting of the knee 22.5%, twisting of the foot in 11.3%, fracture hand in 1.4% and fracture femur in another 1.4% of cases. **Table 3** illustrated the characteristics of treatment of cruciate ligament injuries among students of Northern Border University. As regards the type of treatment, surgical treatment and Physiotherapy by the same percent 32.4%, medical treatment 14.1%,

medical treatment and Physiotherapy 15.5%, surgical treatment and Physiotherapy 4.2% and surgical, Medical and Physiotherapy 1.4%.As regards outcome of treatment this study reported 74.6% of patients become good and stable, 23.9% still complaining and 1.4% suffering from disability. **Table 4** illustrated the relationship between outcome of treatment and

type of cruciate ligament tear, side of cruciate ligament tear and side of injured knee among students of Northern Border University. There was insignificant relationship between outcome of treatment and side of Type and side of cruciate ligament tear and side of injured knee ( $P>0.05$ ).



**Table 1: characteristics of students with cruciate ligament injury, Northern Border University, 1439-1440, KSA (N=71)**

Characteristic	Frequency (No.)	Percent (%)
<b>Gender of the injured</b>		
• Male	70	98.6
• Female	1	1.4
<b>Age</b>		
• Range	30-18	
• Mean (Std. Deviation)	23 ( $\pm 4.2$ )	
<b>Faculty name</b>		
• Education	10	14.8
• Engineering	11	15.4
• Medicine	12	16.9
• Business	11	15.4
• Science	8	11.3
• Applied Medical Science	5	7.0
• Others	13	18.3
<b>Dominant foot</b>		
• Right foot	56	78.9
• Left foot	15	21.1
<b>Dominant hand</b>		
• Right hand	62	87.3
• Left hand	9	12.7

**Table 2: characteristics of cruciate ligament injuries among students of Northern Border University, 1439-1440, KSA (N=71)**

Cruciate ligament injury among students of Northern Border University, Saudi Arabia

Characteristic	Frequency (No.)	Percent (%)
<b>Cause of cruciate ligament injury</b>		
• During football playing	56	78.9
• Motor car accident	5	7.0
• During swimming	3	4.2
• Other sports	1	1.4
• Motor car accident	5	7.0
• Fall from stairs	4	5.6
• Fall from a height	2	2.8
<b>Affected knee side</b>		
• Right	43	60.6
• Left	28	39.4
<b>Side of the injured cruciate ligament</b>		
• Anterior	43	60.6
• Posterior	6	8.5
• Both	13	18.3
• Don't know	9	12.7
<b>Type of CL injury</b>		
• Partial	27	38.0
• Complete	39	54.9
• Don't know	5	7.0
<b>Associated injuries in the body</b>		
• Yes	52	73.2
• No	19	26.8
<b>Type of associated injuries</b>		
• Contusions in the knee	36	50.7
• Twisting of the knee	16	22.5
• Twisting of the foot	8	11.3
• Wounds in the knee	6	8.5
• Wounds and contusions in the body	3	4.2
• Fracture hand	1	1.4
• Fracture femur	1	1.4

**Table 3: characteristics of treatment of cruciate ligament injuries among students of Northern Border University, 1439-1440, KSA (N=71)**

Type of treatment	Frequency (No.)	Percent (%)
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• Surgical treatment	23	32.4
• Medical treatment	10	14.1
• Medical treatment and Physiotherapy	11	15.5
• Surgical, Medical and Physiotherapy	1	1.4
• Physiotherapy	23	32.4
• Surgical treatment and Physiotherapy	3	4.2
<b>Response to treatment</b>		
• Good response	29	40.8
• Weak	15	21.1
• No response to treatment at all	3	4.2
• Moderate response	24	33.8
<b>Outcome of treatment</b>		
• Disability	1	1.4
• Still complaining	17	23.9
• Good and stable	53	74.6

**Table 4: relationship between outcome of treatment and type of cruciate ligament tear, side of cruciate ligament tear and side of injured knee among students of Northern Border University, 1439-1440, KSA (N=71)**

		Outcome of treatment			Total (n=71)	P value
		Disability (n=1)	Still complaining (n=17)	Good and stable (n=53)		
Type of cruciate ligament tear	Partial tear	0	7	20	27	0.278
		.0%	41.2%	37.7%	38.0%	
	Complete tear	1	7	31	39	
		100.0%	41.2%	58.5%	54.9%	
Don't know	0	3	2	5		
	.0%	17.6%	3.8%	7.0%		
Side of cruciate ligament tear	Anterior	1	11	31	43	0.758
		100.0%	64.7%	58.5%	60.6%	
	Posterior	0	2	4	6	
		.0%	11.8%	7.5%	8.5%	
	Both	0	1	12	13	
		.0%	5.9%	22.6%	18.3%	
	Don't know	0	3	6	9	
		.0%	17.6%	11.3%	12.7%	
Side of injured knee	Left	1	5	22	28	0.309
		100.0%	29.4%	41.5%	39.4%	
	Right	0	12	31	43	
		.0%	70.6%	58.5%	60.6%	

**Discussion:**

This is across sectional study conducted among students of Northern Border University, Saudi Arabia. The study aim to address the prevalence of anterior cruciate ligament injuries and their association with different types of injuries among Northern Border University students, Arar, KSA. This study reported the prevalence of cruciate ligaments injury was 5.7% of studied students. Our results was consistent with results reported in a study conducted among 375 students in Umm Al-Qura university which found that 5.3% of students had cruciate ligament injury [6]. Another study conducted among 978 patients reported that

approximately 11% of all cases had cruciate ligament injury [7]. A prospective hospital investigation during a 1-year period reported that 10% of all cases had cruciate ligament injury [8]. A population-based cohort of Finnish population; (0.6%) persons of all population had cruciate ligament injury of the knee giving an injury incidence of 60.9 (95% CI: 53.6-68.2) per 100,000 [9]. In Sweden, a Population-Based Nationwide Study found that, the overall incidence of CL injury in Sweden was 78 per 100,000 persons [10].

As regards side of the injured cruciate ligament, our study found that 60.6% had anterior

cruciate ligament injury, 8.5% had posterior cruciate ligament injury, 18.3 % had injury in both side and 12.7 % do not know the side of injury. Another study reported most of the injuries involved the anterior cruciate ligaments, which were 60%, while 10% were involved the posterior and 30% do not know injured ligament <sup>[6]</sup>. Another study found that 63.35% of cases had anterior cruciate ligaments injury, 21.1% had posterior cruciate ligament injury and 15.65% had both side injury <sup>[7]</sup>.

The anterior cruciate ligament (ACL) is the most commonly injured knee ligament, for which reconstruction is frequently performed. **Alshewaier** <sup>[11]</sup> reported that the prevalence of ACL injury in Riyadh is about 31 per 100,000 individuals. He reported that ACL injury is the most prevalent knee related injury (53%). In Olmsted County, Minnesota, USA an epidemiology study reported ACL injury in 58.6 % of the cases <sup>[12]</sup>. PCL injuries are less common than anterior cruciate ligament (ACL) injuries, and they often go unrecognized. A retrospective study reported, the prevalence of PCL injury alone was 15.3% <sup>[12]</sup>. **La Prade et al.** <sup>[13]</sup> assessed knee ligament injuries and observed that PCL rupture occurred in 14.4% of the cases.

Regarding to Cause of cruciate ligament injury this study found that playing football was the most common cause by 78.9% followed by swimming 4.2% and 1.4% for other sports. Other causes like motor car accidents 7%, fall from stairs 5.6% and fall from height 2.8%. Another study reported that sports injuries were considered to be the most frequent causes of cruciate ligament injuries of the knee, with (52.3%) cases, followed by those caused by traffic accidents, 31 (28.4%) cases <sup>[7]</sup>. In Makah city, Saudi Arabia, a cross-sectional study reported; 68.8% of injuries was due to sports from them football represents 78.2% while 7.6% occurred due to stop running suddenly, 6.8% occurred due to a sudden increase in running, on other hand, 6.1% of cases were listed as road traffic accident and 5.3% of cases as related to environmental injury (i.e. work related ) <sup>[5]</sup>. Another study demonstrated that Sports injuries as the most frequent cause of anterior cruciate ligament injuries were recorded in 88% of patients, injuries occurring in everyday activities in 11% and in traffic only in 1% of patients <sup>[14]</sup> reported; in most cases (56.9%), the right side of the body was the most affected.

Regarding to type of CL injury this study reported, 54.9% was complete injury, 38% was partial and only 7% do not know type of injury. **Alrubayyi et al.** <sup>[5]</sup> reported injury as the following: partial anterior cruciate Ligament injury 23.7%, complete anterior cruciate ligament injury 37.9%, partial posterior cruciate ligament injury 6.3% complete posterior cruciate ligament injury 4.5%, lateral Collateral Ligament injury 13.8% <sup>[5]</sup>. Another study reported the most common knee injuries were incomplete ligament tears (32.0%), contusions (15.2%), and complete ligament tears (13.2%) <sup>[13]</sup>. another study reported complete injury by 81.3%, partial by 12.7% and 6% unknown <sup>[12]</sup>.

According to type of treatment, this study reported surgical treatment and Physiotherapy by the same percent 32.4%, medical treatment 14.1%, medical treatment and Physiotherapy 15.5%, surgical treatment and Physiotherapy 4.2% and surgical, Medical and Physiotherapy 1.4%.

Another study found that cases were treated by physiotherapy alone 37.6%, surgery 14.1%, combination of physiotherapy and surgery 39.7% and 8.5% of the cases still not receive a medical support with unknown reason <sup>[5]</sup>. In Sweden, a population-based study by **Nordenvall et al.** <sup>[15]</sup> found that the non-operative treatment for CL injury was the most common type of treatment by 61% followed by operative treatment by 39%.

As regards outcome of treatment, this study reported 74.6% of patients become good and stable, 23.9% still complaining and 1.4% suffering from disability. Another study reported, from cases had surgical treatment 67 % of them had an excellent result with normal CL, 27% were classified as good and 7% as poor <sup>[15]</sup>. Another study conducted among 72 patients with complete anterior cruciate ligament (ACL) tears, which had non-operative treatment, overall results were 11% excellent, 20% good, 15% fair, and 54% poor and 35% had ACL reconstruction during the follow-up period <sup>[17]</sup>. Another study carried out among 25 patients treated non-operatively with isolated posterior cruciate ligament (PCL) injuries reported; (80%) were satisfied with their knees at follow up, (68%) had full return to their previous athletic functions without disability, (16%) returned to their previous sports, but felt their levels of performance were not quite as good as before the injury <sup>[16]</sup>.

**Conclusion:**

This study reported the prevalence of cruciate ligaments injury among the studied Northern Border University students in Arar city, Kingdom of Saudi Arabia was 5.7%. Most of cases (98.6%) were males. Playing football was the most common cause by 78.9% followed by motorcar accidents 7%. As regards outcome of treatment, this study reported 74.6% of patients become good and stable, 23.9% still complaining and 1.4% suffering from disability.

**References:**

1. **Samuel L (2017):** Functional anatomy of the knee: movement and stability. Interactive Biology. <http://www.interactive-biology.com/3992/functional-anatomy-of-the-knee-movement-and-stability/>
2. **Margo BJ, Radnay CS and Scuderi GR (2010):** Anatomy of the knee. In: The knee. Scuderi, G. R. and Tria, A. J. editors. World Scientific Publishing, pp: 1-17.
3. **Gordon MD and Steiner ME (2004):** Anterior cruciate ligament injuries. In: Orthopaedic Knowledge Update Sports Medicine III, Garrick JG. (Ed), American Academy of Orthopaedic Surgeons, USA.
4. **Albright JC, Carpenter JE, Graf BK et al. (1999):** Knee and leg: soft tissue trauma. In: Orthopaedic Knowledge Update. Beaty JH. (Ed), American Academy of Orthopaedic Surgeons. pp: 533-539.
5. **Alrubayyi M, Alzahrani S, Alotaibi A et al. (2018):** A survey of injuries to the anterior cruciate ligament among Makkah population, Saudi Arabia: prevalence and observations on injury mechanism. *Int. J. Adv. Res.*, 6(5): 814-819.
6. **Alghamdi W, Alzahrani A, Alsuwaydi A et al. (2017):** 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. *American Journal of Medicine and Medical Sciences*, 7(1): 14-19.
7. **Junior B, Zosimo R, KAWANO et al. (2008):** Chronic multiple knee ligament injuries: epidemiological analysis of more than one hundred cases. *Clinics*, 63(1):3-8.
8. **Nielsen AB and Yde J (1991):** Epidemiology of acute knee injuries: a prospective hospital investigation. *The Journal of Trauma*, 31(12):1644-1648].
9. **Parkkari J, Pasanen K, Mattila V et al. (2008):** The risk for a cruciate ligament injury of the knee in adolescents and young adults a population-based cohort study of 46,500 persons with 9-year follow-up. *British Journal of Sports Medicine*. doi: 10.1136/bjism.2008.046185
10. **Nordenvall R, Bahmanyar S, Adami J et al. (2011):** A Population-Based Nationwide Study of Cruciate Ligament Injury in Sweden, 2001-2009: Incidence, Treatment, and Sex Differences. *The American Journal of Sports Medicine*, 40(8):1808 – 1813.
11. **Alshewaier S (2016):** Developing a standardized preoperative physiotherapy programme to improve the outcomes of patients undergoing anterior cruciate ligament reconstruction in Riyadh (KSA). PhD Thesis. Manchester Metropolitan University.
12. **Schilaty ND, Nagelli C, Bates NA et al. (2017):** Incidence of second anterior cruciate ligament tears and identification of associated risk factors from 2001 to 2010 using a geographic database. *The Orthopedic Journal of Sports Medicine*, 5(8): 2325967117724196.
13. **La Prade RF, Wentorf FA, Fritts H et al. (2007):** A prospective magnetic resonance imaging study of the incidence of posterolateral and multiple ligament injuries in acute knee injuries presenting with a hemarthrosis. *Arthroscopy*, 23:1341-1347.
14. **Ristić V and Sar I (2010):** Causes of anterior cruciate ligament injuries. *Med. Pregl.*, 7: 541-545.
15. **Nordenvall R, Marciano A, Adami J et al. (2015):** The effect of socioeconomic status on the choice of treatment for patients with cruciate ligament injuries in the knee: a population-based cohort study. *The American Journal of Sports Medicine*, 45(3):535 - 540.
16. **Barrack RL, Bruckner JD, Kneisl J et al. (1990):** The outcome of non-operatively treated complete tears of the anterior cruciate ligament in active young

adults. *Clinical Orthopaedics and Related Research*, (259):192-199.

**17. James M and John A (1986):** Long-term results of non-operative treatment of

isolated posterior cruciate ligament injuries in the athlete. *The American Journal of Sports Medicine*, 14(1):35 - 38.