



Original Article

Incidence, Patterns, and Risk Factors of Knee Injuries Among Football Players: A Two-Team Comparative Study

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ABSTRACT

The knee joint is the most complex joint which involves different structures like bone, ligaments, muscles, cartilage, tendons. ACL (Anterior cruciate ligament) is the most crucial ligament of knee joint which maintains the stability. The ACL tear is the most common injury of knee joint. It results in loss stability of knee joint leads to buckling of knee during walking and running conditions. This injury is common in sports like soccer, football and basketball. Football has high risk of injury than the other sports. Particularly, the injuries between the footballers are continuously being determined. This is the cross-sectional descriptive and exploratory research study involved two clubs or teams in super league and division 1. 216 players were randomly selected and the survey questionnaire was organized for eligible team players. The anatomical, MRI Retrospective study and Anthropometric measurements were measured. The results showed that the different anatomical features above have no significance on the ACL risk injury. A focus on the strengthening of muscles around the knee joint like quadriceps and hamstrings is suggested to prevent lifelong disability in a active and young participants.

Keywords: ACL injury, football players, super league, division 1

INTRODUCTION

Football also called as soccer is the global most familiar sport with 270 million approximately registered participants observed by 204 FIFA (International Federation of Association Football). Football is a team games played with a spherical ball among the two teams of 11 players. An adult standard football match contains two 45 minute halves interspaced generally by a 15 min break (Griffin et al.2006). This sport involved intermittent walking, running, sprinting and jogging and has greater occurrence of injuries compared to field hockey, boxing, volleyball, rugby, swimming, basketball and cycling.

The injuries of sports are contemplate among the most usual risk that face athletes and the growth of sports related to sports territory and health aim to decrease the injuries of sports because of the false effect of several athletics and decrease their achievement of sports. The injuries of sports are also reviewed the chief important factors that hand out the excluding athletes from competitions and sports training commitments (Lohmander et al.2004). So they are called between the major problem in the sports territory, it was required to recognize the factors that contributing the emergence of injuries of sports, their sites and causes.

There are two risk factors such as extrinsic and intrinsic those are conducted for football injuries. The intrinsic risk factors are relates to separate psychological or biological property of person like instability of joints, weakness of muscles, muscle strength, prior injuries, rehabilitation adequacy, psychological stress and muscle weakness. The extrinsic factors relates to environments like sports level of game exercise amount and training false position is played instruments like taping, shoes and shin guards playing foul play and field rules. Age is also one of the factors that caused an injury of soccer (Kanamori et al.2002).

The injuries of ACL (Anterior cruciate ligament) have high morbidity of the knee injury for footballers and results in the most of the time lost. The injuries of ACL occurred result of combination of twisting and deceleration on planted foot with near or extend knee. The result is valgus or varus strain combined with external or internal rotation with anterior translation force. The player commonly described a feeling of popping with sensation giving way (Slauterbeck et al.2002).

This study carries to understand the descriptive epidemiology of raised injuries of knee sustained by the football players at the aim to provide required proofs to make effective preventive measures for injury.

METHODOLOGY

Study design and data collection

This analysis was made in association with a collection of data by Research Center of Sports of Medicine, Chennai (Sri Ramachandra Centre for Sports Science (SRCSS), Porur, Chennai, Tamilnadu). The injury of players and data of background was a part of an analysis of large football injury formed by the SRCSS Institute and the Chennaiyin Football Club, a Chennai elite women and men football player that was proposed to analyze the injuries incidence and illness in the top leagues. The early study has been accompanied in the Women's National league from the period 2020 until the period that is ongoing 2022 on this study duration and also many old junior level teams in the two periods. In the Men's National league, the early study was conducted for the period 2021 only.

Participants' Selection

The enrolled eligible participants were participated for the interview of face to face mainly considered the inclusion criteria who were participate at least twelve months as a professional player. Each subject has the rights to withdraw and refuse from the accepted study. All the ethical documents and questioner translated into English. Anthropometric measurements observed from every player include weight and height by the standard equipments and checked every day before noticed the subject's measurements.

Questionnaire

A detailed self made questionnaire was allowed to all participants football players at the period of regular season. The data collection prior to the study was explored to every participants in an understanding language. All the participants were allowed to an interview consists of baseline characters, information about injury, physical activities, therapy seeking behaviors and psychological terms outcome measurements.

MRI Retrospective study

Patients having knee injury manuals were identified and investigated further to detect if they received MRI at diagnostic progress. This study group having patients whose ACL was partially torn or torn depends on the MRI radiologists'sense. All the scans of MRI were carrying out using Signa MRI Scanner. The 4mm thick cuts of T1 weighed images were assessed depends on the image integration.

Anthropometric measurements

The anthropometric measurements were conducted using the standard procedures (Lohman et al., 1988) on participants wearing barefoot with light clothes, body weight, stature, sitting height and bicristal breadth – BMI was examined from height and weight, calculated length of subischial leg as sitting height.

Anatomical measurements

The notch and femoral condyle width measurements were measured in the same T1 coronal cut with each other from the NWI (Notch Width Index).

This procedure was replicated as described by Domzalski et al. 2010, which explains the NWI as being the ratio of the intercondylar notch width at the range of bicondylar to the popliteal groove width at the same range. The measurement of sagittal ACL length and width were taken in the cut of ACL full length. This range was extrapolated in the MRI contains an ACL partial tear or tear. The width of sagittal ACL was measured at centre. The coronal ACL was measured in ACL slice crossed the posterior cruciate ligament (PCL) that midsubstance of ACL could be monitored.

Statistics analysis

SPSS Statistics 28.0 was used to investigate the statistical analysis in the study. The baseline descriptive statistics were done using standard deviation and mean.

RESULTS

Demographic Profile of participants

The study sample comprised 216 players enrolled by two divisions that are super league and division 1. The sample was dependent formed of young players. The young player who was 16 was playing for the division 1 and it was anticipated. The mean age was 24 (SD ± 4.5). There was no variation among the median and sample's model ages (Table-1). Examine the profile of age ranges, it was proved that many players $n = 150$ would have long playing careers includes age between

16 to 24 than those n= 83 aged from 25 to 36. This is described out of prime playing time in Chennai. However, football is the most familiar sport, in this study sample, the footballers recognize themselves as high, moderate or lower paid.

Table-1: Age range profile of football players N = 216

Age range	Frequency
15 -20	48
21-25	97
26-30	57
31-36	17

Rates of injuries

In this study sample, many participants were right footed n= 111 (50.7%), left footed n= 33 (15.7%) or than both n=72 (33.6%). At the period, the record was being composed, n= 70 (31.7%) football players were on the record of injury. Of these 70, n= 14 were from super league and n= 56 were from the first division (Table-2). There was so no correlation among the level of football playing it be in the super league or first division is being hurted i.e. value = 0.330, df= 1 and the measured p values was noted as 0.566 and it was greater than the α values 0.05.

Table-2: Rate of injury

	Response type	Super division	Division 1	Total
Do you have injury at the moment?	Yes	14	56	70
	No	33	111	144
Total		47	167	214

MRI Retrospective study

In this study, the retrospective portion, there are 70 patients were undergone MRI from the period 2019. Likewise, a sample from the data of gait was higher subset that contains 175 healthy participants, out of which 14 were super league and the remaining 56 were division 1. But, the mean age of both team sites were similar at 35 years old.

The information from demographics presented in table-3. There was no notable variation among the control group and study groups among the gender, injury site, BMI or mechanisms. A cut of 25 was used to classify the BMI among the overweight, obese and normal weight.

The measurements of MRI were compared among the non torn and torn participants and normal weight (BMI was <25) and obese and overweight was (BMI was >25) (Table-4). The ACL length in the sagittal plane was significantly different among both teams (p=0.000). The NWI was also significantly differ among the non torn and torn participants (p=0.033). But, the NWI was not significantly varied among the genders (p=0.35).

Table- 3: MRI Retrospective study

Demographic		Study	Control	Test variable	P value
Total number of cases		30	42		
Gender	Male	20	27	Chi = 0.1575	0.803
	Female	10	11		
Side	Right	16	21	Chi = 0.646	0.477
	Left	15	16		
Age	Average Range	31 11-60	34 11-75	T = -2.080	0.42
Mechanism	Contact	11	8	Chi = 2.765	0.101
	Non contact	13	25		
BMI	Unknown	5	4	Chi = 0.167	0.693
	< 25	7	10		
	≥ 25	13	18		
	Unknown	9	10		

Anatomical measurements

The sensitivity analysis execute that injury of ACL is a function of forces assumed the linear connection among the pull out failure and applied forces of the ACL. The ACL injury risk for assuming population was n= 2000 from anatomical measurement data of participants showed forces from 0 to 100% torn risks at given NWI. The forces acting ligament can be performed as Anterior and posterior forces on tibia rotation or tibia. The tensile force extends can be results of ACL injury. Other parameters like AP width, length and width of sagittal and NWI.

Table-4: Comparison of anatomical measurements between groups

Gender			P value	BMI		P value
	Female	Male		<25	≥ 25	
Super league	6.80	7.00	0.608	7.25	6.90	0.532
Division 1	34.95	40.15	0.000*	35.70	38.30	0.35
Standard deviation	0.02	0.02		0.02		

Anthropometric measurements

The age average between the teams was 34.30 and 54.90 for both division 1 and super league teams respectively. The values found in the both teams were from 20 to 50 years old. Absence of statistical significance variation of weight, forward velocity, age, height, BMI, step width and cadence were found among the both teams. They walked at higher cadence and narrow step width was $p < 0.05$. So it is mainly to understand the variation in mechanics of walking among teams, joint force normalization and moments have been excited to eliminating the difference that exists among the weight and height. The viewpoint for moment of joints and joint force normalization includes force or dividing moment by body mass (Table-5).

Table-5 : Anthropometric measurements

	Super league	Division 1	P value
N	51	165	-
Average age	34.30	54.90	0.68
Height (cm)	175.27	164.99	-
Weight (kg)	77.2	64.09	-
BMI	23.22	23.58	0.13
Forward velocity	125.67	126.9	0.7
Cadence	107.8	119.3	<0.06
Step width	12.44	11.98	0.003

DISCUSSION AND CONCLUSION

The main investigation of this present research was that the occurrence of ACL injury was significantly raised in female elite players. Female players were also noteworthy younger than male players when affect their ACL injury and the female-to male ratio was decreased when adjustment for age. In addition, this study also confirmed that match playing is correlated with a considerably higher ACL injury risk compared to practices

Opposite to our investigation where 28.13% of injuries in knees were observed between athletics (Ballegaard et al.2014) and a study with increased size of samples,almost the same findings were noted in the lower limbs, the 29.9% of knee however much increased 44.44% of the injuries in ligaments affected the knee out of 45 injuries in ligaments that support out study.

These results were agreed with the findings investigated by previous authors (Taimela et al.1990b) though not all, found that ADFKF ROM considered for an estimated 20% of the differentiation in Y-BT in physically active participants. This research may accept that altered hypothesis ADFKF ROM may influenced UDB through mechanical because of insufficiency of ligamentous and instability of functional neuromuscular control. This hypothesis has been fortified by data demonstration that each participant with chronic instability of ankle has decreased reach distance at Y-BT than the health control counterparts.

The injury risk of ACL has in several analyses been described to be greater at the best range of playing than the lower levels. In spite of this fact, the injuries of ACL are relatively unusual though at best level than the strains of thigh muscles or sprains in ankles irrespective of the team studies (Bradley et al.2010). In this present determination, a super league team at the higher playing levels can expect about 0.5 ACL injuries per season and a division 1 team was 0.7ACL per season. The two teams' ACL injury frequency and incidence of ACL injury was in line with several past injuries observation studies in football. But, in previous study analyzed on the German's women elite league at 2003 to 2004 season (Di Salvo et al.2009). The injuries of ACL were determined all of that at match playing period results in a incidence of 2.2 injuries of

ACL per 1000 matches hours that is greater compared to present study. A repeated research finding in all studies at professional or best levels and also in few studies on collegiate football in USA, the injury incidence of ACL has been considered greater at match playing and also observed in this study higher at 10 to 20 times higher.

The analytical findings related to those n- 70 football players were on the injuries list. Of these 70, n= 14 were from the super league and n=56 were from the division 1. There was nevertheless, no correlation among the levels of football playing be it in the super league or division 1 in being injured. The value = 0.330, df=1 and the p value observed was = 0.560 and this was greater than the alpha value 0.06. 22.5% of those who are all got injured actually participated in several trainings.

A preliminary research findings were reported related to the many times of footballers may have affected by a same injury. It was determined that some footballers n = 171 (78.4%) had not affected by same injury before at training period than who had affected from any injury n=46 (20.40%) (Abreu et al.2008).

Anatomical shaped ligaments have proved that super league had a smaller Von Mises stress for all the leading conditions than the division 1 counterparts. In both teams, the maximum stress was noticed in the posterior areas of ACL tibial insertion. The higher stress between the cylindrical shaped ligaments was established to be nearest the femoral intersection area of the ACL wraps around the bone when the load is appealed.

The anatomical presentation results had showed a maximum principal stress of 15.75 MPA was greater than the found in same study by (Williams et al.2013). It was determined a maximal principal stress of 14 MPa. The cylindrical shaped ligament results had showed the maximum principal stress of 11 MPa. But, there is some variation from our findings to that of previous studies. The model incorporation of all four knee ligaments also as meniscus. This may leads to loads on ACL to be shared by some other ligaments. Our knee model had only made up of ACL that allowed for the load ligaments applied. Same in past research findings, the ACL model was caused using the collected data from MRI (Magnetic Resonance Imaging) of every individual case.

The measurements of MRI were compared among the non torn and torn participants and normal weight <25 and obese and overweight was >25. The ACL length in the sagittal plane was significantly different among both teams had p=0.000. The NWI was also notably differ among the non torn and torn participants p=0.033 but, the NWI was not notably varied among the genders p=0.35.

In our study we have noticed variation in the anthropometrics, biomechanics of walking and characteristics of stride among the super league and division 1, that were calm accordant with literature. Notably, increased stride length determined between division 1 can because of variation in height. This variation in length stride disappeared when stride length would be common with height.

In our research study, the super league physique was remarkably lower was $P < 0.05$ however ANCOVA demonstrate that their short length of leg could not be one of the team property of gait of division 1. The super league width of pelvic that was broad as of super league could be considered as higher than that of super league with the similar height. Thus, broad pelvis can influenced the higher joints below pelvis especially in coronal plane.

From the present study results concludes that it could be help in the prevention of injuries of knee by designing the specific exercise regimes and developed the conditions of playgrounds. The higher number of injuries of knee between both teams' players is alarming. The increased percentage of injuries of knee challenged physiotherapists and medicine of sports professionals to measure the patterns of injury and causes like conditions of ground, age, player to player higher speed collisions, specific exercise and physiological factors such as stress management.

Further research studies to be done with a higher population to strengthen the data validity. The ACL injuries have been calm prevalent, particularly among the young athletes who were participate in different sports.

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