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Research Article

A Comprehensive Study of Knee Injury in Different Games and Sports

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ABSTRACT

Background: Knee joint plays a very important role for the effective movement in all games and sports. It is significantly associated with health and well-being concern of the all athletes. It is the largest and most complex joint of human body. Although modern games and sports has highly improved both scientifically and medically, knee injury occurs more frequently. As a result, many players quit the game and a large number of players suffered from the prevalence of knee injuries. Therefore, knee injury analysis is an important prerequisite for examining injury and its prevention.

Purpose: The main objective of this investigation was to find out and critically analysis the nature, types and causes of knee injuries in different games and sports athletes.

Method: A total number of 420 male players who were previously injured and later return playing at standard level after appropriate treatment along with rehabilitation, were voluntarily selected as subjects from different standard sports coaching camps of West Bengal, India with age ranging from 19 to 25 years. All subjects were classified into five disciplines groups such as Football (N=100), Volleyball (N=80), Basketball (N=80), Kabaddi (80) and T&F Athletics (N=80). Each player had filled the questionnaire in connection with injuries containing two parts (General sports injury and knee injury). Out of 420 injured players only 112 knee injured players have been selected for further critically analysis.

Result: In this present investigation, after critically analysis all questionnaire, the result showed that the knee injury occurrence rate was 26.67% of all injury in games and sports. Result also revealed that the Football group was significantly superior in knee injury (34%) followed by Basketball (28.75%), Volleyball (25%), Kabaddi (23.75%) and T&F Athletics (20%). It has been observed that five specific games and sports players had common natures of injury like ligament, cartilage, patella and knee crack injuries. Ligament injury was higher in rate in comparison to other natures of injury. In respect knee ligament injury of football group was higher in rate (67.65%) followed by basketball (65%), Kabaddi (63.16%), Volleyball (60%) and T&F Athletics (56.25%). Likewise, in respect of the Knee cartilage injury, the Basketball group (21.74%) was higher rate in comparison to other games and sports.

Serious tackle was not only common but also higher rate as a cause of injury on football, Kabaddi and Basketball player because these games are body contact games in nature. The most common causes of cartilage injury were repeated jump and landing.

Conclusion: From the analysis of the finding, it can be concluded that the knee injury is very common in all Games and sports which also create certain impact on the physical and mental health of athletes. The knee injuries can be protected and cured by early diagnosis, appropriate treatment and rehabilitation programme. Therefore, this research will be focusing new insights the prevalence of knee injuries and its awareness in relation with different games and sports.

Key words: Knee injury, Football, Volleyball, Basketball, Kabaddi and T&F Athletics.

1. Introduction:

Knee joint plays a very important role for the effective movement in sports as well as smooth functioning in daily life. Knee joint is the largest and most complex joint of human body. It is a masterpiece of anatomical engineering (10). The combination of weight bearing and locomotion place considerable stress, strain, compression and torsion provide a strong functioning on the knee joint (10).

In knee joint, the tibia is the medial bone in the leg and bears much more of the body's weight and the fibula serves as the attachment. (6). The patella is a sesamoid (floating) bone contained within the quadriceps muscle group and the patellar tendon. This results is a greater mechanical advantage when performing knee extension. (6). The surface between the femur and tibia which covering the ends of the bones and protect from cushions between the bones by articular cartilage, known as the meniscus. The knee joint is well supplied with synovial fluid from the synovial cavity, which is called the capsule of the knee. (6)

The ligaments of knee joint provide stability and contractions of the quadriceps and hamstrings produce dynamic stability. The major ligament attached with the knee joint are Anterior cruciate ligament (ACL), Posterior cruciate ligament (PCL), Tibial (medial) collateral ligament (MCL), Fibular (lateral) collateral ligament (LCL), Posterior Oblique Ligament (POL). (10, 6)

Knee muscles in the Anterior or Quadriceps groups are rectus femoris, vastus intermedius, vastus medialis and vastus lateralis. In Hamstring group muscle are biceps femoris, semimembranosus and semitendinosus. Others muscles are sartorius, gracilis, popliteus and gastrocnemius. (10, 7) The movements that occur at the knee joint are primarily flexion and extension. A slight amount of rotation can take place when the knee is in the flexed position. (10)

Though modern games and sports has highly improved by the scientific coaching methods, medically supervision of the players, used of modern safety equipment and devices, standard playing surfaces, knee injury occurs more frequently in respective age, sex and level of participants. The Knee injury accounts for 41% of all sports injuries. (25) As a result, many players took untimed retirement from the game and a large number of players suffered from the fatal knee injuries. Therefore, the Knee injuries are significantly associated with health and well-being concern of the all athletes. The common sports injuries around knee are knee ligament, knee cartilage or meniscus, knee patella injury, osgood schlatters lesion, knee crack, knee effusion and knee osteoarthritis. The Anterior cruciate ligament lesion (20.3%) was very common injury in sports. (18).One fifth of them involve the anterior cruciate ligament (ACL). Anterior cruciate ligament injury is a common sports injury with a worldwide reconstruction rate of more than 200,000 per year. (19) Other injuries include meniscus tears, posterior cruciate ligament tears, articular cartilage damages and avulsion of ligaments and tendons. (25). Expert also found that the knee injury is an established risk factor for knee osteoarthritis. (29) Sometimes the anterior cruciate ligament knee abuse with a high risk of secondary joint injury and development of osteoarthritis. (32)The nature and types of Knee injuries are different according to the different games and sports. The complete anterior cruciate ligament rupture was the most common injury found in football, basketball and volleyball players, followed by meniscal injury in street runners. (21)

Overall knee injury report along with Games and Sports specific knee injury report are also important consideration for comparison. The Nature, types and risk factors of Knee Injury may differ among different games and sports. The appropriate injury rehabilitation program and return back to games and sports with full function can prevent the recurrence of previous injury. Therefore the injury management and injury prevention are most important consideration for knee injury in all games and sports.

In the previous global research, the investigators had emphasized on knee injuries in specific games and sports. But there was a dearth of information about the knee injury in relation with different games and sports. Moreover, this research aimed to fulfil this gap along with focusing new insights and enlightened the prevalence of knee injuries in relation with all games and sports. Considering the modern perspective and specificity of knee injury, the scholar felt the need of conducting the study in this light.

Now researcher is highly interested to explore the impact of prevalence knee injuries, detailing knee anatomy, common injuries, their nature, types and causes of five specific games and sports disciplines such as Football, Volleyball, Basketball, Kabaddi and T&F Athletics. Therefore, the present investigation is largely concentrated on **A Comprehensive Study of Knee Injury in Different Games and Sports.**

1.1 Purpose of the study

The prime objective of this study is to analysis the specific knee injury of athletes of different games and sports, such as Football, Volleyball, Basketball, Kabaddi and T & F Athletes.

I. Overall injury report in Games& Sports.
II. Natures and types of knee injury in different Games and Sports.
III. Causes of knee injury in different Games and Sports.

2. Methods

2.1 Subject and Design of the study:

In the present study, a total number of 420 male athletes of five separate games and sports disciplines such as Football (N=100), Volleyball (N=80), Basketball (N=80) Kabaddi (80) and T&F Athletics (N=80) were selected as subjects from different coaching camps of West Bengal with age ranging from 19 to 25 years.
Out of 420 male athletes those who had previously history of injury were directly selected as subject of the present study. The nature of the study was normative survey in which purposive sampling technique was used.

2.2 Inclusion Criteria

a) Only five games and sports disciplines were selected as Football (N=100), Volleyball (N=80), Basketball (N=80) Kabaddi (80) and T&F Athletics (N=80).
b) Previously suffered from injury in their career but after rehabilitation now practice under the expert coaches and participation in various competitions.
c) Only one major injury was included.
d) Minimum three years of training age.
e) Level of participation: state, inter university and Kolkata Division club competitions.

2.3 Exclusion Criteria

a) Except these five mentioned different games and sports, no other games and sports injuries were excluded.
b) Except knee related injury, other injuries were not directly mentioned.
c) More than one knee injury did not include.

2.4 Criterion Measures of selected Knee injury related variables

In this study, the knee injury related variables were considered as the criterion measures have been mentioned below–

I. Overall injury report in Games& Sports.
II. Natures and types of knee injury in different Games and Sports.
III. Causes of knee injury in different Games and Sports.

2.5 Questionnaire preparation

In this present study, researcher prepared a (self-made) questionnaire for collecting information regarding injury from the five different games and sports athletes. The researcher had taken several important steps for constructing questionnaires regarding the overall injury and knee injury such as consult with sports medicine doctors, coaches, physical education experts along with studied many journals and thesis. Then the researcher took pilot study with the questionnaire. After that the scholar constructed the final shape of questionnaire related knee injury.

2.6 Nature of Questionnaire

I. Basic information of the subject like name, age, height, weight, training age, level of highest participation and address along with contact number.
II. Anatomical location of sustain injury.
III. Nature and type of injury.
IV. Appropriate specific name of injury (as per medical science).
V. Cause of the knee injury.

2.7 Data collection

After getting permission from the coaching camp authority, the researcher and his assistants visited the respective venues in a prescheduled day for collecting of data from the players. All athletes himself filled the questionnaire regarding knee injury. During answering the questionnaire, the researcher was present to help and assist athletes for filling the same. Due to the players' availability and hectic schedule of numerous competitions, the researcher collected knee injury information from 420 high level sportsmen over the course of more than 2 years.

2.8 Statistics Analysis

Mean and SD of personal data along with percentage of injury parameter mentioned in the research.

3. Results and Discussion

In this observational research, the results were mentioned systematically in the below table and figure.

3.1.1 Personal Data

Tab. No. 1: Personal Data of injured athletes in five games and sports disciplines.

Groups / Variables	Football (N= 100)	Volleyball (N = 80)	Basketball (N = 80)	Kabaddi (N= 80)	T&F Athletics (N= 80)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Age (years)	22.32± 2.65	23.07± 3.06	22.16± 4.38	23.29± 3.85	23.51± 3.21
Height (cm.)	167.74 ±4.15	174.23± 5.36	173.25± 6.08	168.68± 5.53	169.17± 6.17
Weight (kg.)	62.67± 6.34	66.74± 5.69	65.18± 6.45	64.28± 5.17	63.65± 5.09

3.1.2. Overall injury report

Table 2: Overall injury report of five games & sports disciplines.

Discipline	Number of Injured Athletes		Percentage of Knee Injury
	Total Injury	Knee injury found	
Football	100	34	34%
Volleyball	80	20	25%
Basketball	80	23	28.75%
Kabaddi	80	19	23.75%
T&F Athletics	80	16	20%
Total	**420**	**112**	**26.67%**

The graphic representation of Knee injuries in different games & Sports.

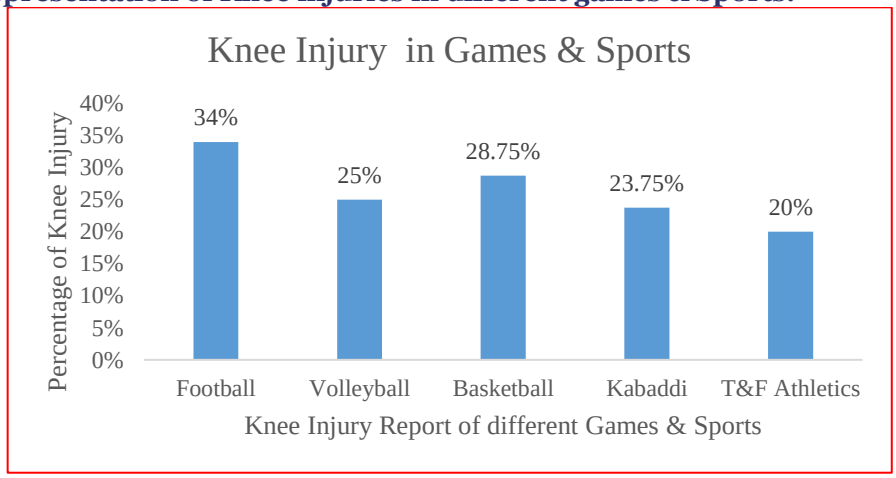

Fig. 1 Knee injury's Report of different Games & Sports

2.1.3 Natures and types of knee injury.

Table 3. Natures and types of Knee Injury.

Natures of Knee Injury	**Total Knee Injuries in Games and Sports Players. (N=112)**				
	Knee Injury in Football (N= 34)	**Knee Injury in Volleyball (N= 20)**	**Knee Injury in Basketball (N= 23)**	**Knee Injury in Kabaddi (N= 19)**	**Knee Injury in T&F Athletics (N= 16)**
1) Knee ligament injury	23 (67.65%)	12 (60%)	15 (65.21%)	12 (63.16%)	9 (56.25%)
2) Knee cartilage	6 (17.65%)	4 (20%)	5 (21.74%)	4 (21.05%)	3 (18.75%)
3) Knee patella injury	3 (8.82%)	3 (15%)	2 (8.7%)	1 (5.26%)	3 (18.75%)
4) Knee crack	2 (5.88%)	1 (5%)	1 (4.35%)	2 (10.53%)	1 (6.25%)

N= Number of subjects

Table 3 represents that the natures of knee injury in Games and Sports Players.
The Natures and types of knee injuries of different Games & Sports were graphically described below-

A) **The graphic of different natures of Knee injuries of Football players and their percentage are showed in Fig: - 2**

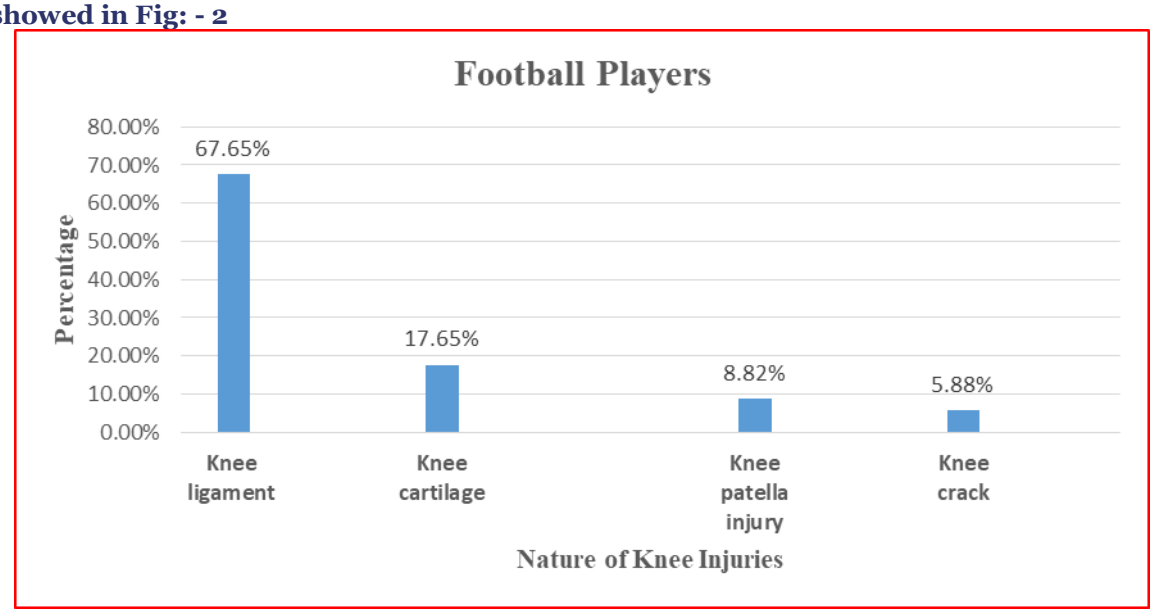

Fig. 2. Nature of Knee injuries of Football players

Fig :2 shows that the Football players had 67.65% of ligament injury,17.65% of cartilage injury, 8.82% of knee-patelle injury and 5.88% of knee crack injury respectively.

B) The graphic of different nature of Knee injuries of Volleyball players and their percentage are depicted in Fig: - 3

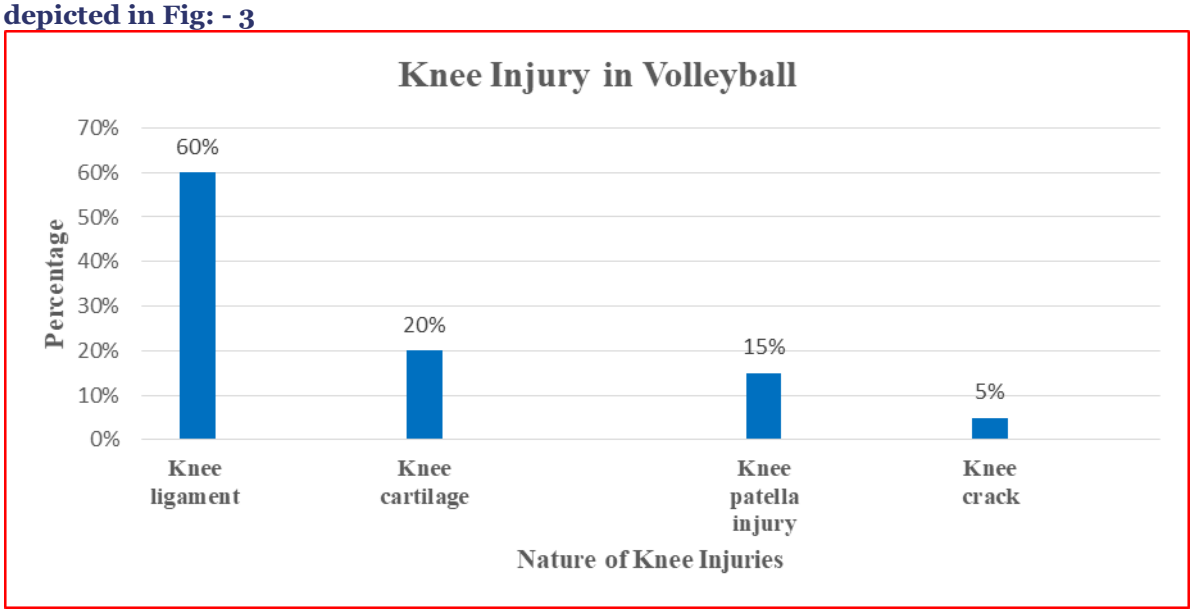

Fig:3 Nature of Knee injuries of Volleyball players.

Fig- 3 indicates that the Volleyball players had 60% of ligament injury, 20 % of cartilage injury, 15 % of knee-patelle injury and 5 % of knee crack injury respectively.

C) **The graphic of different Knee injuries of Basketball players and their percentage are depicted in the Fig: - 4**

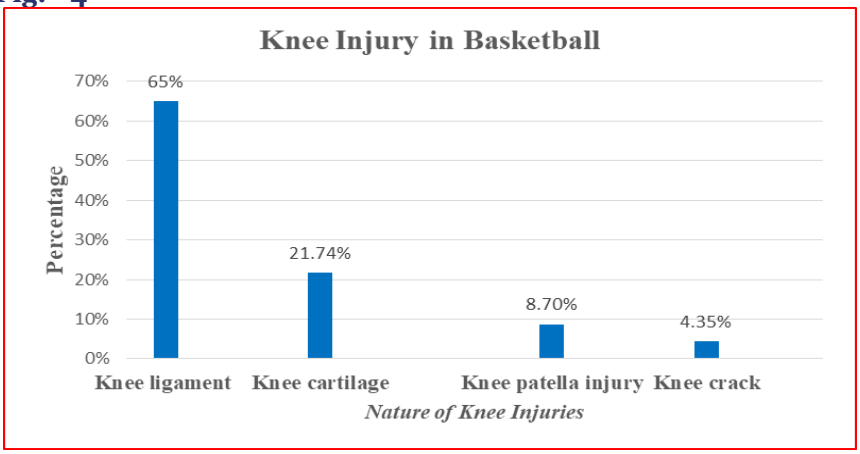

Fig:4 Nature of Knee injury of Basketball players.

Fig-4 illustrates that the Basketball players had 65% of ligament injury, 21.74% of cartilage injury, 8.70% of knee-patelle injury and 4.35 % of knee crack injury respectively.

D) The graphic of different Knee injuries of Kabaddi players and their percentage of are depicted in Fig: - 5

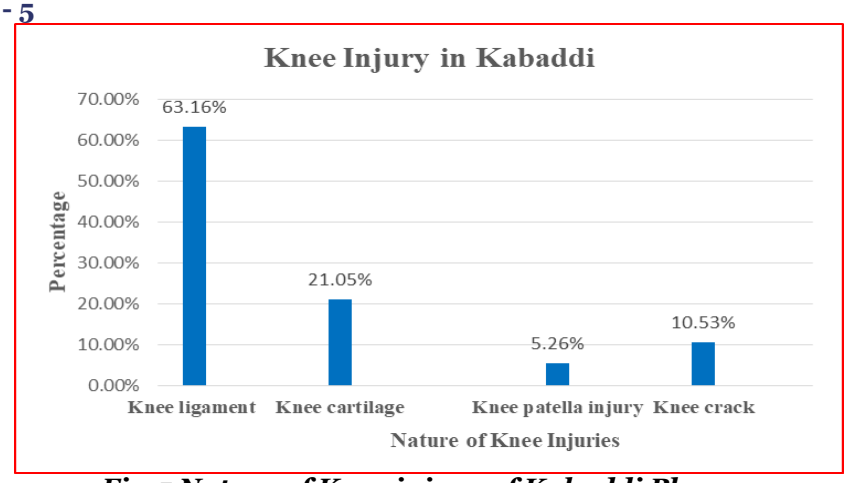

Fig:5 Nature of Knee injury of Kabaddi Players

Fig-5 shows that Football players had 61.16 % of ligament injury,21.05% of cartilage injury, 5.26 % of knee-patelle injury and 10.53 % of knee crack injury respectively

The graphic of different nature of Knee injuries of T&F athletics players and their percentage of are depicted in Fig: - 6

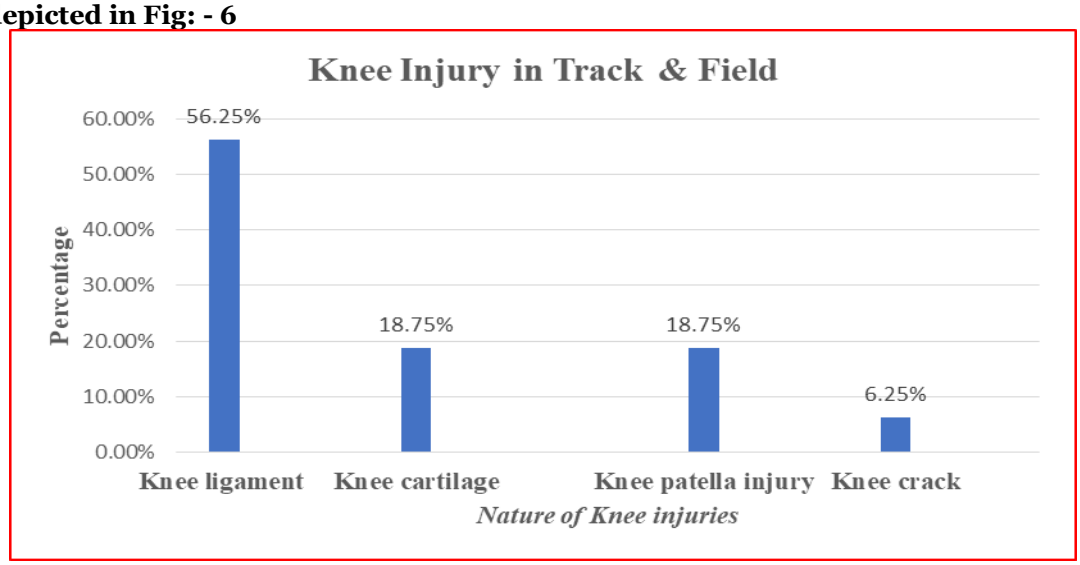

Fig:6 Natures of Knee injury of Track & Field Athletes.

Fig-6 shows that Track & Field Athletes had 56.25% of ligament injury 18.75% of cartilage injury, 18.75% of knee-patelle injury and 6.25 % of knee crack injury respectively.

3.1.4 Causes of Knee Injury in five games & sports

Table 4 Causes of Knee Injury

Natures of Knee Injury	Total Knee Injured of Games and Sports Players. (N=112)				
	Football (N= 34)	Volleyball (N = 20)	Basketball (N =23)	Kabaddi (N= 19)	T&F Athletics (N=16)
	Major Causes	Major Causes	Major Causes	Major Causes	Major Causes
1) Knee ligament injury	Serious Tackle 7 Running 2 Turning 4 Jumping 1 Landing 3 Shooting 3 Playing surface 2 Inadequate Rehab. 1	Serious Tackle 2 Jumping 4 Landing 5 Playing surface 1	Serious Tackle 6 Jumping2 Turning 2 Landing 4 Inadequate Rehab.1	Serious Tackle 8 Turning 1 Landing1 Kicking 1 Inadequate Rehab.1	Running 2 Jumping 1 Landing 3 Playing surface 2 Inadequate Rehab.1
2) Knee Cartilage injury	Serious Tackle 2 Repeated jump 3 Landing 1	Jumping 2 Landing 2	Serious Tackle 1 Repeated jump 3 Landing 1	Serious Tackle 2 Landing 1 Kicking 1	Jumping 1 Landing 2
3) Knee patella injury	Serious Tackle 1 Repeated jump 1 Landing 1	Serious Tackle 1 Repeated jump 2 Landing 1	Serious Tackle 1 Landing 1	Serious Tackle 1	Jumping 2 Landing 1
4) Knee crack	Serious Tackle 1 Landing 1		Landing 1	Serious Tackle 1 Landing 1	Landing 1

N= Number of subjects

Table represent that the causes of knee injury according to the nature of injury of different games and sports mentioned systematically.

3.2 Discussions on Finding

Knee injury is the most dangerous site which had a major concern with the health and performance all games and sports. In the present study, researcher considered the Overall injury report, natures and types of knee injury and causes of knee injury. The discussion of major finding of the knee injury in different games and sports were mentioned below-

I. Overall injury report

As per the result of this present study, Footballers was significantly superior in knee injury (34%) than that Basketball (28.75%), Volleyball (25%), Kabaddi (23.75%) and T&F Athletics(20%). Similar result has been observed by Sancheti, P., Razi, M., Ramanathan, E. B. S., & Yung, P. (2010). Likewise, Soccer player had

higher risk of knee injury followed by Hockey then Tennis players and Thelin, N., Holmberg, S., & Thelin, A. (2006). Considering the different games and sports knee injuries had closely associated risk factors for knee osteoarthritis. However, the knee injuries major factors age, sex, muscle strength of knee joint, instability and alignment of knee joint, fitness, proper technique of movement execution and adequate rehabilitation after injury. Therefore, the knee injury can minimize or prevent through early diagnosis of knee problem, use of protective and supportive knee related equipment, proper treatment and appropriate rehabilitation program.

II. Nature and type of Knee Injury

During the course of investigation, it has been observed that five specific games and sports players had common natures of injury like ligament, cartilage, patella and knee crack injuries. Ligament injury was higher in rate in comparison to other natures of injury. Considering the five specific games and sports, football players suffered ligament injury at a much higher rate followed by Basketball, Kabaddi, Volleyball and athletics. Similar result is also observed by Waldén, M., Hägglund, M., & Ekstrand, J. (2006). Likewise, the Knee injury accounts for 41% of all sports injuries. One fifth of them involve the anterior cruciate ligament (ACL). Other injuries include meniscus tears, posterior cruciate ligament tears, articular cartilage damages and avulsion of ligaments and tendons found by Sancheti, P., Razi, M., Ramanathan, E. B. S., & Yung, P. (2010).

On the other hand, the result of the previous studies were contradictory. Menicus injury is the common and also higher in rate than that ligament injury found by Nicolini, A. P., Carvalho, R. T. D., Matsuda, M. M., Sayum Filho, J., & Cohen, M. (2014). In respect of Knee cartilage injury football players was higher rate followed by Basketball, Kabaddi, Volleyball and athletics. On the other hand, Track and Field Athletes had knee patella injury was superior than that of other injury. It is opined that the street run and low quality shoes are the factors for suffering the knee patella injury.

So, from the above discussion, it is opined that the player in respect of specific games and sports need to train systematically and scientifically under the expert coaches with the proper training environment that will help to prevent injuries. Therefore, the findings in the present study regarding nature of Knee injury will help the all players, coaches and all physical trainers.

III. Causes of Knee Injury

In the present study it has been found that five specific games and sports players had common causes of injury were serious tackle, landing, running, turning, playing surface, recurrence of previous injury and others reasons. Serious tackle was not only common but also higher rate as a cause of injury on football, Kabaddi and Basketball player because these games are body contact games in nature. Cromwell, F., Walsh, J., Gormley, J. (2000) found that the most causes of injury sustained was collision. Hawkins, R. D. and Fuller, C. W. (1999) reported that player to player contact was involved in 41% of all injuries. The finding of the present study is in similar path with the other leading researchers. In case Volleyball repeated jump and landing as the causes of injury were higher in rate. It is opined that strength training, core stability exercise, proper jump and appropriate landing technique can prevent the volleyball knee injury. Considering the T&F Athletics, it is noteworthy that running, jumping, landing, playing surface and inadequate rehabilitations were the major causes of knee injury. So far, the injury prevention is concerned athletes required high quality standard shoes during practice and competitions.

The main restrictions of the former research on knee injury causes were not indicated in connection to specific games and sports. So, a comprehensive study is necessary to provide a multidimensional approach to scrutinize the real causes of knee injury of five specific games and sports players. The above analytical description gives the impression that the player with due respect to specific games and sports desire to up skill methodically and scientifically under expertise with appropriate instructive environment that will help to resist the particular causes of knee injury. The outputs in the present investigation regarding the major reasons of knee injury will help to eradicate injury of five specific games and sports players and provide valuable information to the players, coaches and teachers.

4. Conclusion

1. Overall injury report

In the present study it has been observed that the knee is most common injury site in all games and sports. The result found that the knee injury rate was 26.67% out of all injury in five games & Sports.

A) Knee injury of Football group: The knee injury of football group was most frequent site. Out of total injury, 34 % injury associated with knee location.

B) Knee injury of Volleyball group: The knee injury of Volleyball group was 25% out of all injuries.

C) Knee injury of Basketball group: The knee injury of Basketball group was dominating site which was 28.75% out of all injuries.

D) Knee injury of Kabaddi group: The knee injury of Kabaddi group was 23.75 % out of all injuries.

E) Knee injury of T&F Athletics group: The knee injury of T&F Athletics group was 20% out of all injuries.

2. Natures and types of Knee Injury

In the present study it has been observed that the most common natures of knee injury were knee ligament, knee cartilage and knee patella and knee crack injuries.

A) **Nature of injury of Footballers:** The most common natures of injury of footballers group were knee ligament (67.65%) and cartilage (17.65%). In respect of the knee ligament injury, the footballers group was higher rate in comparison to other games and sports.

B) **Nature of injury of Volleyball:** The most common natures of knee injury of volleyball group were knee ligament (60%), knee cartilage (20%) and knee patella injury (15%).

C) **Nature of injury of Basketball:** The most common natures of knee injury of Basketball group were knee ligament (65%), knee cartilage (21.74%) and knee patella injury (8.7%). In respect of the knee cartilage injury, the Basketball group was higher rate in comparison to other games and sports.

D) Nature of injury of Kabaddi: The most common natures of knee injury of Kabaddi group were knee ligament (63.16%), Knee cartilage (21.05%) and Knee crack (10.53 %).

In respect to Knee crack injury, Kabaddi group was higher in rate than that of other games and sports players.

E) **Nature of injury of T&F Athletics:** The most common natures of knee injury of T&F Athletics group were knee ligament (56.25%), knee cartilage (18.75%) and knee patella injury (18.75%).

3. Causes of Knee Injury.

In this investigation, it is found that the common causes of knee injury were serious tackle, jumping, landing, running, turning, playing surface and recurrence of previous. Serious tackle was most common and also higher in rate as a cause of football injury.

A) Causes of Knee injury of Football group:

I. Knee Ligament injury: The most common causes of ligament injury of football group were serious tackle, turning, landing, shooting, running and playing surface.

II. Knee Cartilage injury: The most common causes of cartilage injury of football group were serious tackle, repeated jump and landing.

III. Knee patella injury: The most common causes of patella injury of football group were serious tackle, repeated jump and landing.

IV. Knee crack: Serious tackle and landing is most common causes of knee crack injury of football group.

B) Causes of Knee injury of Volleyball group:

I. Knee Ligament injury: The most common causes of ligament injury of volleyball group were landing, jumping and playing surface.

II. Knee Cartilage injury: The most common causes of cartilage injury of volleyball group were repeated jump and landing.

III. Knee patella injury: The most common causes of patella injury of volleyball group were repeated jump and landing.

C) Causes of Knee injury of Basketball group:

I. Knee Ligament injury: The most common causes of ligament injury of basketball group were serious tackle, landing, turning, running and playing surface.

II. Knee Cartilage injury: The most common causes of cartilage injury of basketball group were repeated jump, landing and serious tackle.

III. Knee patella injury: The most common causes of patella injury of basketball group were repeated jump and serious tackle.

IV. Knee crack: Serious tackle and landing were most common causes of knee crack injury of basketball group.

D) Causes of Knee injury of Kabaddi group:

I. Knee Ligament injury: The most common causes of ligament injury of kabaddi group were serious tackle, turning and landing.

II. Knee Cartilage injury: The most common causes of cartilage injury of kabaddi group were serious tackle and landing.

III. Knee patella injury: The most common causes of patella injury of kabaddi group was serious tackle.

IV. Knee crack: Serious tackle and landing were most common causes of knee crack injury of kabaddi group.

E) Causes of Knee injury of T&F Athletics group:

I. Knee Ligament injury: The most common causes of ligament injury of T&F Athletics group were running, landing, jumping, playing surface and inadequate rehabilitation.

II. Knee Cartilage injury: The most common causes of cartilage injury of T&F Athletics group were repeated jump and landing.

III. Knee patella injury: The most common causes of patella injury of T&F Athletics group were repeated jump and landing.

IV. Knee crack: Fault jumping and landing were most common causes of knee crack injury of T&F Athletics group.

5. Recommendation for Practical Application

In order to apply the present research work in practical applications, the following suggestions for the prevention of knee injury in games and sports can be considered -

I. Coaches, sports trainer who are involved in competitive games and sports should take into account prevalence of knee injury, they should also place equal weight on games related knee injury that can be assumed from the results of the current study.
II. Early diagnosis of knee injury, treatment and active rehabilitation help to prevent recurrence of previous injury.
III. Strength training after postoperative treatment and active rehabilitation are very important consideration for quickly returning sports.
IV. Physical fitness, scientific training and conditioning, use of protective along with supportive equipment and standard playing surface can help prevention of knee injury.
V. Lastly, the findings of the study can be used to forecast future research regarding preventive strategies for safeguarding players' knee health and enhancing their games and sports performance.

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