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A Literature Review on Common Injuries and Their Prevention in Kabaddi

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ABSTRACT

Kabaddi is a very famous and ancient National game that originated in India. Kabaddi is a game of speed, strength, stamina and agility. Due to the combative nature of Kabaddi, there is high prevalence of injuries. The purpose of the study is to provide a comprehensive literature review on common injuries in Kabaddi and their preventive measures. A literature review was conducted utilizing the following databases of MEDLINE, Science direct, The Web of Science, PubMed, SPORT Discus and Google Scholar with using of following keywords in combinations: Kabaddi, Kabaddi competition, injuries, epidemiology, causes and prevention. A total of thirteen studies were analyzed according to common injuries and preventive measures in Kabaddi. The studies published from 2000 to the month of March 2020 were included in this review. The current evidence showed that Kabaddi is a game which is highly prone to injuries. Knee injuries were found to be very common in Kabaddi players followed by the ankle. It was found that there is a great role of mouthguards and improvement in playing technique in prevention of injury. There is a lack of epidemiological studies and prevention strategies in the Indian context in this sport. Thus injury prevention strategies are required to be implemented and put into practice for a successful sports safety framework. More epidemiological researches are needed to maximize the understanding of mechanisms of injury, risk factors for injury, optimal prevention strategies, complete and appropriate treatment and long-term effects of injury in youth sport.

Keywords: Sport related injury, Epidemiology, Prevalence, Preventive measures, Combat sport, Indian game.

INTRODUCTION

In India, kabaddi is so popular, which is played all over India. In terms of success, this game is also getting a good status in Asian sports and is classified as a team-game [1]. There are a few games in our country in which we have world-class success. Kabaddi is one of them and India is the defending champion in it. Kabaddi which originated in India has been chosen the National game of the country. It is a low-cost-no-cost game and today with the other criteria of games and sports, the word “power” has added and it has change into “power games” and “power sports” and became “combat” in nature [2]. It is also known as the “Game of the masses,” since spectators totally involve themselves and give a great deal of encouragement to the players [3,4]. It is an outdoor game which is played almost in all regions of India. Kabaddi is an intermittent type of game that involves rapid and forceful movement of the body as a whole with tremendous physical stamina and quick reflexes [5]. This sport requires a high amount of physical fitness in the players to execute offensive push, falls, turns, sudden change of direction holding, bending, jumping, leg and hand touch, and maintaining hold and respiration. An athlete of this sport should have physical stamina, agility, individual proficiency, neuromuscular coordination, mental toughness with the presence of mind on both attackers and defenders [6]. It is a team game of speed, stamina, endurance, strength and skill and has gained fame all over the world. Kabaddi is an attacking and defensive game [7]. Kabaddi is a combative team game that is played with absolutely no equipment, in a rectangular court with seven players on each side of the ground. The athlete score points by

entering into the opponent's court and touching as many defense players as possible without getting caught in a single breath [8]. It needs a small playing area and the dimensions of the playing field are 12.5 x 10 m (for adults) divided by a mid-line into two equal halves (each 6.25 x 10 m). Each half is divided, one for the raiders and the other for the defenders and the game is supervised by a referee, two umpires and a scorer. As the game begins, the raider takes the maximum possible inspiration and moves to the other side of the field, uttering a continuous chant 'Kabaddi' without any further inspiration, to try to touch one of the defending players. In the defensive team, the defenders try to hold the raider within their area and the raider tries to force his way back to his own side without discontinuing the chant. A point is credited to the raider's team, if the raider is able to come back to his area after touching a defender and the person touched is put out of the game. But on the other hand, a point is given to the defending group if they can hold the raider who then has to drop out. And defending group get a player of their team to rejoin who had earlier been eliminated [3]. The total duration of this game is 40 min to 45 min. To achieve success, a well-built physique is required as it is the high-intensity intermittent type of sport [9]. In kabaddi, the specific fitness enables the player to perform the unusual movements required by the concerned sport. Since strength and endurance are the primary requisites of a sportsperson, the training program should commence with physical exercises and activity. Kabaddi being a team game, every player has a specific role to play in defense and offense. The motor qualities differ from player to player and specific abilities of players occupying different positions or roles in the team game also differ. The specific fitness of a raider is slightly different from that of the main defense player. Physical Fitness is generally achieved through exercise, correct nutrition and enough rest [10]. Injuries occur in every sport and in kabaddi because of the large force involved in the movement during playing it, inevitably injuries occur. There is increasing the number of injuries in kabaddi players due to its competitive nature [5].

Common injuries in Kabaddi

Kabaddi is a vigorous body contact game. Nature of Individual defense and group offense of the sport makes kabaddi players prone to many types of injuries. Many body parts get prone to injuries due to powerful nature of the game. Kabaddi players are subjected to injuries during training as well as during competition. Knee injury is the most common type of injury sustained by both "Raiders" and "Defenders". Sudden turning and twisting movements are required by a Raider to free him/her from the stoppers. These quick and reflexive movements of starting, stopping, bending, twisting and changing direction exert extreme force on the knee resulting in injuries to the ligaments. Injury to the ligament is known as sprain. The ligament that is most affected by sudden movements in kabaddi is the Anterior Cruciate Ligament (ACL) [11]. Especially in the male athlete, anterior cruciate ligament injury is more common which has a multifactorial etiology. ACL injuries are a common and debilitating injury in competitive sports [12-15]. The knee joint is a very vulnerable joint to get injured in kabaddi. Sprain of ACL and MCL and strain of muscle and tendon is common in kabaddi. The most serious sprains involve complete tears of one or more of the knee ligaments. A strain means you have partially or completely torn a muscle or tendon [16]. Ankle sprain is the commonest sprain seen in Kabaddi. This type of injury is very common in kabaddi. An awkward step or landing on an uneven surface result in overstretching of the ligaments thus causing them to be partially or completely torn. These are the most common musculoskeletal injury that occurs in athletes, and several studies have noted that sports that require sudden stops and cutting movements cause the highest percentage of ankle injuries [17]. Being a contact sport the game involves a lot of pushing, pulling, jumping and twisting actions. These types of sporting actions are leading cause of strains. Repetitive use of certain body parts makes them even more prone to these types of injuries. Due to the contact nature of the game, ankles are very prone to fractures. While playing kabaddi, there are many instances that can lead to a fractured ankle. After tagging an opponent(s), a raider sometimes makes a sharp "U" turn towards his/her home court. This action can lead to twisting of the ankle side to side. Uneven grounds also account for many such injuries. The body's entire weight along with the force of the fall causes trauma to the ankle and results in a fracture. It has also found that calf muscle injury is also common in kabaddi Game [11]. To score a point for the raider is supposed to perform running hand touch, turning and attack, fake hand touch, fake and squat leg push, squat and double attack, back kick, side kick, roll kick. The defender performs blocking skill by running, turning and attack, blocking the raider on the spot/or with a small skipping movement. While performing this task there is a chance of injury in kabaddi players. Kabaddi being a contact sport, coupled with the rough surface of the playing mat as well as ground, the following injuries are the most common: ankle sprain, strain, shoulder subluxation or dislocation, and sometimes even fracture/fractures. The most common area of the body where kabaddi players suffer injuries is the knee, followed closely by the ankle. These injuries can be easily prevented by proper training [5,9]. These injuries in sport can occur through

contact or noncontact mechanisms and may be of an acute or overuse in nature [18]. These involve muscle, ligaments, or bone, with stress fractures being somewhat unique to sports and overuse type of injury [19].

Prevention

Injury prevention plays an important role in the promotion of safe exercise participation by identifying risk factors for injury and re-injury. There has been an increased global interest in injury prevention research over the past decade. For improving future prevention programs, it is better to understand past and current sports injury prevention interventions because that is the first step towards injury prevention [20]. There is a significant effect of sports injuries on the health and well-being of young athletes which can lead to an indirect decline in their career progress. The development of appropriate injury-prevention strategies based on well-defined epidemiological data is a moral necessity to minimize these injury effects. A multidisciplinary approach is needed to manage these injuries and their effects with the introduction of various prevention strategies [21]. Various benefits of injury prevention include greater health of the individual, longevity in the activity and reduced costs to the individual, the sport, the health care system, and society. Injury prevention is the potential for better performance. Thus, for better performance, we should try to motivate athletes, coaches, and sports teams to focus on injury prevention.

Injury prevention has been divided into three broad categories:

- Primary prevention
- Secondary prevention
- Tertiary prevention

First, we focus on primary prevention because that is the goal of most prevention activities. Primary prevention involves the avoidance of injury, for example, ankle braces being worn by an entire team, even those with no history of a previous ankle sprain is considered as primary prevention of injury. Thus, an individual will not sustain an injury in the first place. However, secondary prevention involves appropriate early diagnosis and treatment once an injury has occurred. Here the main goal is to limit the development of disability, being optimally cared and basically known as treatment like early RICE (rest, ice, compression, elevation) treatment of an ankle sprain. And the third category is tertiary injury prevention in which we focus on rehabilitation to reduce and correct an existing disability attributed to an underlying disease that is known as rehabilitation. In the case of a patient who has had an ankle sprain, this would involve balance board exercises and wearing an ankle brace while gradually returning to sport is considered as the example of tertiary prevention [22]. Once methods with potential for prevention have been identified, there is a need to carefully develop the prevention measures, assess them under ideal conditions, and consider the implementation context [23]. Therefore, the development of injury prevention programs must take into consideration more than the biomechanics of injury. It must also engage stakeholders within the sport and/or community to understand some of the behavioral aspects and norms of the environment in which sport and injury occur. If a prevention program is biologically appropriate, but not appropriate within the context of the sport, it has little hope of being adopted and therefore little chance of being effective. The principles of risk management applied to the sports setting have been described in detail by Fuller (2007). Risk management is the overall process of identifying, assessing, and controlling risks. It can be applied within and across sport in the upper levels of policy and administration, in a team, and by an individual. Injury risks have been identified in most sports. For example, participants in contact sports experience head injuries. Risk control is the process of identifying and implementing methods to control the level of exposure to hazards and/or the consequences. There are four methods for risk control which are eliminate, retain and manage, outsource, and insure [24].

There are three basic steps for the identification of the injury risks that include:

- Reviewing injury reports from at least one season
- Reviewing player turnover and availability within one or more seasons
- Reviewing the literature on injury risks in the specifically sport [22].

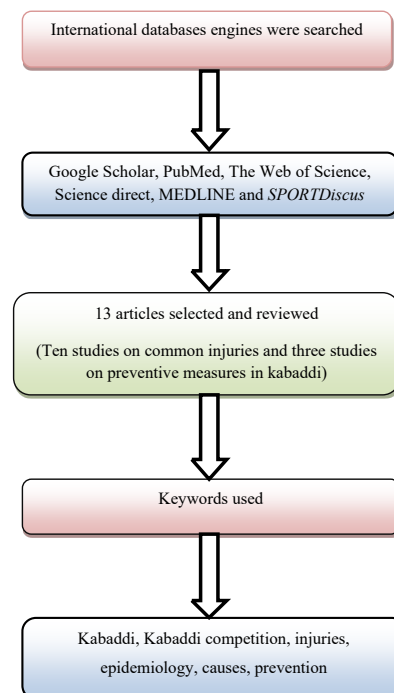
It is important to recognize that the causes of injuries in the Kabaddi game are usually multifactorial and that a single preventive action or strategy may not be successful in isolation. Rather a combined strategic approach is required to

implement a successful sports safety framework that covers all possible situations [11]. An important preventive measure could be improvement in techniques that need to be taught to players by their coaches and trainers. The poor technique may result in injuries in sports. It has found that if an athlete improves their technique of playing then the rate of injuries is seen to be reduced but learning the correct technique for a sport takes time. As athletes gain experience, their technique improves. Thus the frequency of injuries may be increased at the start of their careers. The technique of an athlete may cause injuries as well as preventing them [25]. Injury prevention generally focuses on modifiable risk factors: extrinsic factors, such as equipment, playing surface, rule changes and playing time, or intrinsic factors, such as fitness, flexibility and balance [26]. There is also a need for biomechanically oriented injury interventions that focus on modifying the loads applied externally and internally to the human body. Prevention strategies should be aimed at controlling injury risks by reducing loading levels below relevant injury tolerance criteria or improving the body's capacity to tolerate and/or react to patterns of loading. For example, a helmet will attenuate impact energy, thereby reducing the head impact force [27]. Hence, there is a need for integrated perspective prevention strategies on sports injury. The purpose of this review is to provide an overview of published articles on common injuries in Kabaddi and their prevention in this sport.

METHODS

This literature review was a comprehensive search in international databases of MEDLINE, Science direct, The Web of Science, PubMed, SPORTDiscus and Google Scholar conducted to find the results matching the keywords Figure 1 'Kabaddi', 'injury', 'prevention', 'causes', and 'epidemiology'. Ten peers reviewed studies on common injuries in kabaddi were qualified for this study and three studies of prevention of injuries in kabaddi have been reviewed. Inclusion criteria included studies on kabaddi players studies published from the year 2000 to the month of March 2020 and in English language. Studies were prospective studies, retrospective studies, cross-sectional study, case-control studies, descriptive studies and review studies. Exclusion criteria included studies published before 2000. The main purpose of this review was to summarize the study about injuries in kabaddi players and their prevention which have been reported in various previous studies.

Figure 1. Flow chart of the methodology



RESULTS

A total of 10 articles were found on injuries in Kabaddi. The review study is tabulated in Table 1 which showed the common injuries found in this sport.

Table 1: Average linear acceleration by player position

Author	Study Design	Sample Size	Common Injuries/Study Findings
Dhillon et al., 2017 [28]	Cross sectional study	76 Indian Kabaddi players	This study found that the most common injury was ACL tear (89.47%), followed by meniscus tears which were noted in 68.42% of the players. And the common cause was contact mechanism (72.37 %).
Prabhu and Kishore, 2014 [29]	Survey	30 Indian Kabaddi players	Ankle joint injured more than the knee.
Kurup and Chowdhery , 2014 [30]	Survey	Not defined	It has reported that lower limb injuries were found to be predominant and the knee (knee injuries 83.8%) being the most commonly injured site.
Moeini et al., 2011 [31]	Cross sectional survey	73 elite Iranian Kabaddi players	It has found that the most common injuries were muscular injuries (45.13%), skin injuries (26.96%), bone injuries (14.7%) and joint injuries (13.1%). The majority of injuries were recorded in the upper limb (41.55%), lower limb (32.77%), head and face (15.28%) and trunk and neck (10.3%). It also reported the common causes of injuries were 'to contact the opponent' and 'falling'.
Sen, 2004 [4]	Survey	Not defined	It reported that knees (19%) were more injury-prone followed by ankles (14%). Concussion (32%) and distortion (28%) were the predominant nature of the injury sustained. The common causes of injuries were in contact with the opponents and contact with uneven ground.
Mohamadi and Rajabi, 2017 [32]	Prospective survey	Not defined	This study reported the injury rate in 1000 hours match which was 229.9 and the most potential parts for injury were head and face (26.2%) and knee (15.5%). 48.5% of injuries are contusion, bruise, and hematoma. Contact with an opponent was the most important reason for injury.
Mondal and Ghosh, 2017 [2]	Survey	154 players	Knee and ankle ligament injuries were found to be common in Kabaddi players. Contusion, laceration, bruise, bone fracture and dislocation also found.
Belaldavar et al., 2018 [33]	Case report	1 case (male Kabaddi player)	It has reported orbital emphysema as a result of blunt trauma.
Shetty and Rao, 2013 [34]	Case report	1 case (male Kabaddi player)	It reported that a facial injury occurred during the match. Fracture of the zygomatic arch was found in the player.
Agrawal, 2010 [35]	Case report	1 case (female Kabaddi player)	Subdural hematoma occurred while playing Kabaddi and the reason for injury was head struck the ground.

There are very limited studies regarding the prevention of injuries in Kabaddi. Only three studies were found on preventive measures in kabaddi. The first, study by Gupta et al. (2018) found that a significant number of Kabaddi players sustained ACL injury due to faulty moves in Kabaddi. It found that scissor grip and directly hitting on the knee are wrong moves that are responsible for ACL tear. This study found that 27 patients sustained injury due to scissor grip out of 82 Kabaddi players and 12 patients sustained injury after being directly hit on the knee and 43 patients due to twisting of the knee. Therefore, these injuries can be prevented by banning scissor grip moves and posing current rules more strongly in Kabaddi [36]. The second study by Selva et al. (2018), a cross sectional survey, evaluated the occurrence of dental and orofacial injuries among 100 Kabaddi players. It found that only 42% of players were aware that mouthguards prevent dental injury and only 3% used mouthguards. Thus, wearing of mouthguards during sports activity should be compulsory during practice and competition events [4]. And lastly, Murthy (2016) suggested the importance of biomechanics in preventing sports injuries related to the Kabaddi technique, Kabaddi play and concepts of injury prevention. With the help of biomechanics, the technique can be improved and should be used by coaches to correct motions of players. It will help in the development of a new and more effective technique for better execution of a sport motion. It also suggested that Knee injuries can be prevented by changing the body's position with a blend of characteristics such as balance, coordination, speed, reflexes, and strength. It is also very beneficial to adapt certain exercise programs that incorporate exercises to stabilize knee joints to strengthen muscles of knee joint because that will provide greater control and reduce the incidence of knee injury [11].

DISCUSSION

There is limited research on sports injury epidemiology in India. Very few studies exist on the epidemiology of injuries in Kabaddi players or for that matter in any sport in India [28,29,30]. The level of evidence of the current literature is also low as most of these studies were results of surveys that were poorly designed. The most common finding of this review was that the lower limb was found to be more prone to injury in kabaddi, especially knee joint. Prabhu and Kishore(2014) noted in a survey that ankle and knee injuries were most common in Kabaddi. ACL injuries were the most common injury (89.47%) [29]. This finding has supported by previous studies by Dhillon et al. (2017), Mondal and Ghosh (2017), Sen (2014) and Kurup and Chowdhery (2014) that the knee joint is one of the most commonly injured joints in Kabaddi. A high proportion of ACL injuries were noted in kabaddi players which probably accounts for the heavy toll on the players' careers as ACL tears are known to have a significant detrimental effect on a sports person's career [2,4, 28-30,]. Mohamadi and Rajabi (2017) found in a prospective study that head and face was the most common site of injury followed by the knee. The most important reason for injury was in contact with the opponent [32]. One of the finding of this study was facial injury were common in Kabaddi athletes as reported by Basavaraj et al. (2018) and Shetty and Rao (2013) that orbital emphysema and zygomatic arch fracture on the face and subdural hematoma [33,34]. Muscular injuries were the most common injuries in Kabaddi as reported by Moeini et al. (2011) and also reported the common causes of injuries were 'to contact the opponent' and 'falling'. It highlighted the fact that the morbidity associated with injuries in Kabaddi is high especially knee injuries and prevention strategies need to be considered and implemented to reduce this morbidity [31]. The present study found that there was very limited research on the prevention of injuries in Kabaddi. A significant number of patients sustained ACL injury due to faulty moves in Kabaddi as Gupta et al. (2018), found knee injuries can be prevented by posing current rules more strongly and banning some of the moves like scissor grip in Kabaddi [36]. Selva et al. (2018) suggested that wearing of mouthguards helps in the prevention of dental injuries [4]. There is wide advocacy of mouthguard use as a way to reduce the injury of orofacial injury and concussions [39-41].

There is a need for high-quality scientific studies on the effects of various types of injury prevention. Soomro et al. (2016) highlighted the efficacy of injury prevention programs (IPPs) in adolescent team sports. The IPPs improve muscular strength, flexibility, and proprioceptive balance [40]. Cerulli et al. (2001) suggested that proprioceptive training must be incorporated to prevent ACL injuries. It has found that along with the knee, the ankle is an important joint to consider in the prevention of ACL injuries, as it will have a direct influence on tibial orientation and, thus, the position of the ACL [41]. Thus, proprioceptive training used as a prophylaxis to prevent ankle sprains that was first proposed by Freeman et al. [42] and suggested that proprioceptive training involves the use of devices such as tilt boards, ankle disks, balance boards, and so on, which demand the use of the muscles that pronate and supinate the

feet [43-45]. External support is the most common preventive method among athletes like taping or orthosis, should be recommended for a period of 12 months after an ankle sprain, because the risk of re-injury is increased during the first year and the ligaments need about a year to heal properly and to regain their normal strength and proprioceptive ability after an ankle injury [46]. A proprioceptive training programme and a specific technical training programme used by Bahr and his colleagues [47] to reduce the rate of ankle sprains in amateur Norwegian volleyball players [25]. It has found that balance training program reduces the rate of ankle sprains [17]. Wobble board training was effective in reducing the number of recurrent distortions and in preventing functional instability of the ankle in patients with primary ankle sprains [48]. Abernethy and Bleakley (2007) suggested that development and application of injury prevention strategies that focus on preseason conditioning, functional training, education, proprioceptive balance training and sport-specific skills, which should be continued throughout the sporting season, are effective [26]. A preseason conditioning strategy used to develop flexibility, strength, power and landing mechanics, which will help in improving biomechanics [49]. Core stabilization, eccentric training of thigh muscles, proprioceptive training, dynamic stabilization and plyometrics also have a great role in injury prevention [50]. Supervision of the rules and the use of protective equipment are important during competitions and training sessions [51]. There are very few studies and a lack of evidence in the Indian context on the epidemiology of injuries in Kabaddi. Injury prevention studies are few, thus experimental evidence is limited. There is limited RCT evidence supporting preventative training programs in specific sports to reduce the risk of injury.

CONCLUSION

In contact sports such as in Kabaddi, injuries occur very commonly especially knee injuries. High rates of sports injury have a substantial impact on the individual, their career and the health care system. Sports injury may also potentially affect future involvement in physical activity and the future health of an athlete. It is important to take into account the education of trainers and coaches. Thus injury prevention strategies are required to implement and put into practice for a successful sports safety framework.

Recommendations

- It is critical to integrate epidemiological research to maximize the understanding of mechanisms of injury, risk factors for injury, optimal prevention strategies, complete and appropriate treatment and long-term effects of injury in youth sport.
- Evidence from descriptive epidemiological studies can be utilized in targeting relevant athlete groups in designing future research examining risk factors and prevention strategies in Kabaddi sport.
- Future studies examining prevention strategies like proprioceptive and balance training is warranted.
- Future RCTs examining optimal sport-specific injury prevention strategies should quantify and control for potential risk factors for injury in sport.

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Conflict of interest

Authors declare that they have no conflict of interest.

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