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Review Article

Physiotherapy Section

Preventive Methods for Karate Injuries- A Review

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ABSTRACT

Sports injury is a major concern for athletes. Karate is a form of martial art that is practiced widely across the world. Injuries are inherent in karate as it is a combative sport. Therefore, there is a need of implementation of preventive strategies which play a great role in reducing the injuries. This review aimed to identify common injuries and preventive strategies for injury prevention in karate athletes. An electronic search in Google Scholar, MEDLINE, PubMed, Web of Science and Scopus was conducted by using following keywords: karate athletes, common injuries, prevention and protective equipment. Studies on injury prevention in karate athletes and studies published in English language were included in this review. Reviews and studies with free access to only abstract have been excluded. Protective equipment like mouthguards, groin guards, knuckle protection, gloves and proper padding help in prevention of injury. Strict implementation of rules and specific conditioning programs were found to be effective in injury prevention and should be encouraged for injury prevention in karate athletes. Athletes, parents and coaches should be educated regarding evolving injury prevention methods. Also, it was found that there were very few number of RCTs done in regards to preventive training programs in martial arts and karate.

Keywords: Conditioning programs, Martial art, Mouthguards, Protective equipment

INTRODUCTION

Karate has been practiced widely for more than 40 years across the world. Karate is basically an unarmed sport "bare hand technique" of self defense which was developed in Okinawa in Japan [1]. The word karate has been derived from modern-day Japanese that means "empty hand" that is a fight without weapon [2]. There are two broad ways to practice karate either kata or kumite [3]. Kumite is a highly stylised mode of practice where the karateka (athlete who practices karate is known as karateka) practices a set of fixed or choreographed movements that are supposed to emulate actual combat situations. But, kata refers to an imaginary and an idealised combative fight without engaging in actual combat [4]. Karate practice leads to development of self-esteem, self-discipline and spirituality [5]. Participation in martial arts has been shown to improve participants cardiovascular endurance, strength, body fat composition, socialisation, agility, reaction time and self-confidence [6-9]. Many injuries have been reported in karate practice or competition [10,11]. Despite the large number of literature on the epidemiology of injuries in karate worldwide, there is scarcity of literature on role of specific training programs and implementation of prevention strategies in karate [11-14]. Present literature is not conclusive about the role of injury prevention methods in karate. Thus, the most important way of prevention of injury is to recognise the common sport related injuries and their associated risk factors. The aim of this review was to identify common injuries and prevention strategies or methods for injury prevention in karate athletes.

LITERATURE SEARCH

An electronic search in Google Scholar, MEDLINE, PubMed, Web of Science and Scopus was conducted. The keywords were: karate athletes, common injuries, prevention and protective equipment.

Inclusion criteria: Studies on injury prevention in karate athletes and studies published in English language.

Exclusion criteria: Articles which are not open access. The study designs varied, though most were either cross-sectional studies or survey, cohort studies, descriptive studies, randomised control trials, comparative studies and prospective studies.

Injures in Karate

Due to the combative nature of the sport, there is a major risk of injury in contact sports. In karate, the risk of injury is intermediate. In combat sports, the head and neck were the most frequently injured anatomical region in boxing (84%), karate (74%), mixed martial arts (64%), and kickboxing (55%) [12]. According to a study, injuries mainly occur to three main areas: the head and neck, the abdominal region and the limbs [2]. Lacerations, abrasions, nose bleeds and black eyes were the most common injuries in head and neck regions. Direct blows, punches, and kicks were the cause of abdominal and lung damage. The round house kicks were found to be vulnerable for the liver, spleen, kidneys and the pancreas. The hands and feet were found to be injured commonly in karate for example, Bennet's fracture, radial nerve injury or lateral collateral ligament avulsion fractures and dislocation of the thumb were reported in extremities. Due to uncontrolled kicks, testicular injury is one of the causes of retirement of the athlete from competition [2]. A study found that in karate competition, most of the injuries were contusion (47%) followed by epistaxis (20%) and then lacerations (10%). There were 66% of face injuries and 34% external hemorrhage during competition [13]. Trauma is the most common to head and neck followed by upper limb and the cause of injury was opponents punch [14]. A study reported that the injuries were most commonly located in the head and face (49.3%) associated with muscle contusion (60%) and hemorrhage (21.3%). Maximum pressure and stress were found to be the main reasons of injury in the last minutes of competition and injuries in third minutes were also less than first minute [15]. A study has also found that 90% of injuries occurred during bout practice, 6% during fitness and 4% during kata. Head and neck followed by trunk, lower and upper limb were the most common location of injury. Weight less than 70 kg and lower sport experience were another cause of injury. Higher injuries have been reported in athletes with lower experience and lower weight [16]. Males have a slightly higher incidence rate than females and senior competitors have a higher incidence rate than juniors [17].

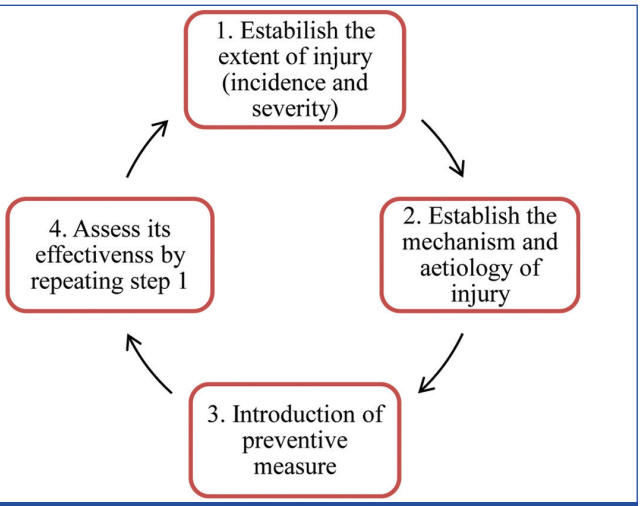
Prevention of Injuries

Prevention of sport injuries plays a great role to increase a physically active lifestyle, sports participation and to maximise the physical and mental health [18]. It is better to understand past and current sports injury prevention interventions because that is the first step towards prevention of injury [19].

Injury prevention has been divided into three broad categories [20]:

Primary prevention, Secondary prevention, Tertiary prevention.

The goal of most prevention activities is primary prevention, which involves the avoidance of injury. For example, ankle braces should be worn by entire team or even those with no history of ankle sprain. 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 Rest, Ice, Compression, Elevation (RICE) treatment of an ankle sprain. The third category is tertiary injury prevention in which the main focus is on the rehabilitation to reduce and correct an existing disability. 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 [20]. Another factor that may lead to injury is the presence of risk factor. Overcoming these factors will prevent injury. For instance, a strengthening program for muscle weakness or balance re-training for poor proprioception [20]. In 1992, van Mechelen W et al., described a sequence of injury prevention research as a four-step sequence [Table/Fig-1]. Identification of injury is the first step which is described in terms of the incidence and severity of sports injuries, followed by identification of the risk factors and injury mechanisms and lastly introduction of measures to reduce the risk and severity of sports injuries [21]. Aetiological factors and mechanism of injury identified in the second step to form a measure. Finally, by repeating the first step, evaluate the effect of the measures [22].



[Table/Fig-1]: Four steps of injury prevention model.

Furthermore, a standard approach in injury prevention strategies is based on three factors such as: teaching, engineering, and execution. The first factor is teaching factor which focuses on the behavioural intervention to prevent the behaviour which causes injury. Active protection play an important role in reduction of injury related to martial arts. Second factor is engineering factor which mainly focus on the environmental changes to reduce the number and intensity of injuries by the inactive protection approaches. For example, tatami and other protection tools are considered as the inactive protections. Third factor is execution factor in which the coaches and referees efforts are needed for the safe practice. Instructions for safety competition and practice can help in the injury reduction [23]. By implementing effective preventive strategies, many sport-related injuries can be prevented.

Methods of Prevention of Karate Injuries

A new discipline of prevention is emerging. Cohen L and Swift S described a framework of spectrum of prevention for developing multi-faceted approaches to injury prevention. This spectrum consists of six inter-related action levels [24]:

- Strengthening individual knowledge and skills;
- Promoting community education;
- Education of providers;
- Fostering coalitions and networks (to assure an initiative's success);
- Change organisational practices;
- Policy and legislation (encourage the use of safety equipment, safe practice and implementation of safety standards can prevent injuries).

Assessments of causative factors also have a crucial role in successful prevention of childhood and adolescent injuries that protect them from being injured [24]. The basic step to develop an effective preventive strategy is the identification of risk factors [25]. Johannsen HV and Noerregaard FO analysed the effect of knuckle protection on karate injuries. It has been found that use of fist pad decreased the number of injuries of extremities and head injures severity has also been reduced [26]. Johnson JL and Johnson Johnnie L invented a protective karate glove for martial arts athletes like karate and kung-fu. As it is known that during training in karate, the hands and fingers can be badly bruised and injured. The protective glove covers the entire hand. A padded palm area and a heavily padded backing restricts the lateral movement of the fingers while allowing them sufficient freedom of inward movement for easily grabbing an opponent. The gloves allow thumb to be freely folded under the palm hand for executing various blows and techniques [27]. McLatchie G recommended the use of proper groin guards that decrease the testicular injuries in males [2]. As reported by many studies, head and face are the most common areas to be injured, the mouthguards have essential role in preventing orofacial injuires in karate [28]. To avoid injuries, there should be a greater focus on diminishing rough and violent contacts between athletes. Measures like improved or modification of game rules should always be incorporated. The use of protective equipment and supervision of the rules play an important role in injury prevention or decreasing injuries during competitions and training sessions in athletes [29]. McLatchie GR and Morris EW mentioned three methods for injury prevention in karate: (a) Prevention by control; (b) Prevention by using protective padding or clothing; and (c) Medical examination before fight. All these methods help in reducing the incidence of injury in karate competitions. Protective clothing includes padding for fists, arms, feet and shins, gum shield, groin guards and head guards [30]. It was found that padded flooring decreases serious head injuries [31,32]. Educational strategies or programs should be implemented in combination with legislation which may be the best approach to increase or encourage the use of protective equipment in some sports [33].

There are many training programs which were found to be effective in prevention of injuries. A neuromuscular training program which includes flexibility, strength, landing skills and plyometrics help in reducing injury in adolescent basketball, soccer, and volleyball [34,35]. In prevention of injuries, the role of sport-specific balance training program in the reduction of anterior cruciate ligament injuries and ankle injuries have been reported [36]. Propioceptive training programs have important role in injury prevention [37,38]. A home-based balance training program by using a wobble board and pre-season balance training program exert a greater protective role in prevention of injuries [39,40]. Longer a prevention program with components of balance training is employed, the greater

the prophylactic benefit [41]. Thus, prevention strategies should include educational programs, rule changes, safety equipment, and preseason and in-season conditioning programs. In addition to this, traditional warm-up and cool-down stretching exercises have been a standard routine in competitive sports [42]. For a martial arts athlete, a proper strengthening and conditioning program should include a planned warm-up, cool-down, and stretching components [43]. As compared to the passive warm-up, an active warm up improves performance, reduce muscle soreness and aid in the prevention of injuries [44-46]. Macan J et al., suggested the role of strict implementation of rules in prevention of injuries in martial arts. Heavy penalties for uncontrolled blows and strict implementation of rules can significantly decrease the risk of injury in younger athletes [47].

DISCUSSION

The present review outlined the common injuries and preventive methods in karate injuries. It was found that head and neck were the most common injured site in karate followed by the extremities [12]. There are several factors which play an important role in injury prevention in karate athletes. The first factor is the use of protective equipments during practice and competition. It was found that there is a great role of protective equipment like karate glove, mouthguards, padding, knuckle protection and proper groin guards in prevention of head or neck injuries and extremities injuries [2,26,28]. Strict control and protective padding are being used more frequently [30]. Serious head injuries were reported by previous studies in many games like golf, karate, horse riding and boxing. The second important factor was identification of risk factors. The recognition and assessment of causative factors of injuries can help in prevention of injuries in karate [24,25]. Prevention strategies should potentially target risk factors for example, limitations inflexibility, strength, endurance, and proprioception/balance. Finally, the third factor was implementation of injury prevention strategies. Prevention strategies like neuromuscular training, propioceptive training, balance training and specific rehabilitation programs were found to be effective in reducing injuries in karate [34-36,39]. Another major risk factor of injury was found to be violation of existing rules. Therefore, strict implementation of rules by referee could be an effective and important step in prevention of injuries [11,13,47].

Education strategies can be considered as an important factor and the best approach in injury prevention. By educating athletes, coaches, referee and tournament directors about the common injuries and their preventive strategies will definitely helps in prevention of injuries [23,48-50]. Proper instruction and knowledge should be given to them about the mechanism of injury, treatment and prevention of injuries [51]. To implement any prevention strategy or program, it is important to test their efficacy first which is typically done in a controlled research setting with extensive monitoring and measurement of compliance with the intervention [20].

CONCLUSION(S)

It has been concluded that implementation of strict rules, use of safety equipment and participation in specific conditioning programs have a great role in reducing injuries in karate athletes. Education of athletes, parents and coaches must continue regarding evolving injury prevention methods that will help in prevention of common injuries in karate athletes. Sports trainers and supervisors should be aware of the mechanism and prevention of head or neck and lower limb injuries. Due to combative nature of karate, there is a need of specific injury monitoring and implementation of preventive strategies in karate. Thus, an urgent need of implementation of prevention strategies is required to reduce the injuries in this sport.

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