



A Scientific Study on Swimming Injuries – Common Injuries and Preventive Measures with a Brief Look at India

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-ABSTRACT

Swimming is a popular sport among all generations. Participants range from those who swim only occasionally for recreational purposes to those who swim regularly for fitness and to those who compete at national and international levels. It would be logical that through participation and love of sport, injuries are as an integral part of human behavior and are bound to happen. Swimming injuries are one of the most unrecognized major public health problems as a sports injury which represents to realize significant savings in both financial and human terms. Furthermore, the injury might make the person be away from the activity.

In the Indian context, the injury situation must be graver due to lack of well-maintained playgrounds, sophisticated equipment, poor sports administration, lower budget and Malnutrition. Due to mass participation in swimming, only the natural skill are not sufficient to secure success in sport; there is a need to vigorous practice in reducing injury risk factors in swimming particularly in swimming competition and more research on swimming injuries which may decrease the injury rate through developing safety equipment and facilities. Therefore, it can be more effective if researcher from India consider this issue on the basis of "Prevention is better than Treatment of sports injuries". In this paper, the research due to recent event will prove that if the center and state government and university sports authorities establish sports injury prevention research centers for recognize the importance of sports injury prevention, it can be improved the performance of India in national and International dimension.

Keywords: Injury, Injury Prevention, Swimmers, India, Competition

1. Introduction

Swimming is a worldwide sport, where one can participate at any level. Swimming is the ideal normalize and it tends to produce the

standard human figure through acquiring a good physical development and habit of good health. Swimming also is an excellent curative treatment for many who have a



weak chest, and it is almost the only exercise for those people whose hearts are not robust. Also, adults and children who are suffering to asthma or bronchitis or who take cold easily can be made much more capable of resisting these complaints by regular swimming.¹ Alongside acquiring fitness, persons who engage in swimming will get satisfaction and joy if it would be free from injury and illness. According to recent information, in India about 1400 people get drown every year, therefore the necessity to swim for everyone is obvious and everyone should learn how to survive in water. But towards athlete swimmers, the term sport injury in the broad sense refers to the kinds of injuries that most commonly occur during sports or exercises. Injuries can occur for many reasons whether it may be by contact with other bodies, the ground and the sporting equipment, the Situations that cause a temporary loss of body control and lack of conditioning or in difficult warm up and stretching, may produce injuries ranging from minor to severe.

¹ Hemant Jivendr Akumar Verma, A Study of Swimming; Related to Injuries in Inter University Level Male and Female Swimmers, (North Maharashtra University, Jalgaon Maharashtra, Department of Physical Education Sports and Culture, 2009), p:1

Regarding to swimming injuries, most common injuries affect the shoulders, knees, hips, or back, depending on stroke of swimmers² Often swimmers demonstrate tremendous flexibility or joint laxity, which can be normal. Slight injuries and micro-trauma can cause shoulders to become unstable and lead to shoulder pain and tendinitis. Other repetitive injuries include inner knee problems and hip problems from breaststroke kicking, and back injuries from dolphin kicks or dry-land cross-training and so forth.

On the other hand, most of the injuries can be prevented with proper knowledge and awareness about the injury. If prevention is not made in an integral part of the sports curriculum the result is an increased injury.³ Therefore, through identifying an event as an accident there are the possibilities of

² Stop Sport Injuries, Swimming Injuries,2010, (accessed on: September 13, 2016), Retrieved from: <http://www.sportsmed.org/aossmimis/stop/downloads/Swimming.pdf>

³ Julie Hardt , Prevention and Management of Injury in Competitive Swimming, School of Sport Science Exercise and Health, The University of Western Australia, 2012,(accessed on : September 8, 2016), Retrieved from:[http://research-repository.uwa.edu.au/en/publications/prevention-and-management-of-injury-in-competitive-swimming\(fef80e9b-bde0-4c27-afba-2cf58b223dc4\).html](http://research-repository.uwa.edu.au/en/publications/prevention-and-management-of-injury-in-competitive-swimming(fef80e9b-bde0-4c27-afba-2cf58b223dc4).html), p:6



prevention or control depend on the seriousness of the harm.

Towards to swimming competitors those athletes who spend many hours training and competing are still susceptible to injury and they face a clear risk of overuse injury as well. Shoulder overuse injuries are reportedly the most common cause, especially for elite swimmers. It has been reported that 35 to 91 percent of senior, elite level swimmers report shoulder pain to a degree that limits their ability to train and compete effectively.⁴

In India in compare with advanced countries, there is a lacuna, not having sufficient attention to do research on sports injuries with the purpose of developing safety equipment, facilities and other situations and further it is difficult to estimate about the socio-economic cost of sports persons, due to lack of research in sports activities and in sports hazards. Due to recent increase of swimming participation

in every country particularly in India, there is a need for data on injury rates for the variety of sports particularly swimming as a popular sport among young people.⁵

The findings of the present study might provide the help to swimmers, their Trainers, Coaches, Sports administrators and the Physical Educationists in their professional work to know about the various causes of injuries in Swimming and to take preventative measures to minimize the injuries occurs during swimming. Conveniently, there is a need to consider various causes and types of injury towards swimmers and swimming competitor by following paragraphs.

2. Swimming Related Injuries

Injuries are common to all kinds of sports and it can be defined as an instance of being injured or the fact of being injured, harm or damage. When any parts of athlete's body getting the injury during sports or exercise,

⁴ Julie Hardt , Prevention and Management of Injury in Competitive Swimming, School of Sport Science Exercise and Health, The University of Western Australia, 2012,(accessed on : September 8, 2016), Retrieved from:[http://research-repository.uwa.edu.au/en/publications/prevention-and-management-of-injury-in-competitive-swimming\(fef80e9b-bde0-4c27-afba-2cf58b223dc4\).html](http://research-repository.uwa.edu.au/en/publications/prevention-and-management-of-injury-in-competitive-swimming(fef80e9b-bde0-4c27-afba-2cf58b223dc4).html), p:7

⁵ Johnson, Gauvin, & Fredericson, Swimming biomechanics and injury prevention: new stroke techniques and medical considerations, 2003, (accessed on: September 9, 2016), Retrieved from: <http://www.ncbi.nlm.nih.gov/pubmed/20086441>



the term is usually reserved for injuries that involve musculoskeletal system.⁶

The recent Study on Male and female swimmers who had participated in the All India- Maharashtra, Inter-University or similar tournament who were selected as subject for the study and their age were ranged between 17 to 25 years old, reveals that, male Swimmers have more injuries as compared to female Swimmers in respect to their sex differences in India. According to this research, shoulder was the most predominant location of injury sustained to male swimmers and elbow was the second highest injury location and also leg and Head were the most frequent location of injury for female swimmers and the right side was the most predominant side of swimming injury to male and female swimmers.⁷

⁶ Hemant Jivendr Akumar Verma, A Study of Swimming; Related to Injuries in Inter University Level Male and Female Swimmers, (North Maharashtra University, Jalgaon Maharashtra, Department of Physical Education Sports and Culture, 2009), p:12

⁷ Tori Caudill, Swimming World College Intern, 3 Common Swimming Injuries with Prevention Tips, 2015, (accessed on: September 11, 2016), Retrieved from:

<https://www.swimmingworldmagazine.com/news/common-swimming-injuries-treatment-prevention/>, p:14

It is clear that, every sport comes with a set of specific injuries. Injuries owing to Swimming may be Acute or Repetitive injuries; “Acute Injuries” is as a sudden or one time injury which are not so common and may be due to carelessness such as slips on wet surfaces or shallow water diving and overuse or repetitive strain are chronic injuries due to repetition of strokes involving repeated movement of same joints in same direction. To understand the swimming injuries prevention mechanism, it’s essential to know about the different types of swimming injuries of swimmers. Different types of injuries will be explained comprehensively in the following paragraphs.

2.1. Shoulder Injury

Shoulder pain is the most common orthopedic problem particularly in competitive swimming due to high repetition rate, the extreme range of motion and the force required for propulsion.⁸ The term “swimmer’s shoulder” refers to the

⁸ Verma, Hemant, A Study of Swimming Related to Injuries in Inter University Level Male and Female Swimmers, 2009, (accessed on: September 11, 2016), Retrieved from:

http://shodhganga.inflibnet.ac.in/bitstream/10603/87008/12/12_chapter%201.pdf, p: 28-32



tendonitis of the biceps tendons. A recent study showed that 91% of elite swimmers age 13 to 25 reported at least one episode of shoulder pain.⁹ The recent study by John Bradley et al¹⁰, on “Review of Shoulder Injuries and Shoulder Problems in Competitive Swimmers” on 2016, found six main factors that associated with shoulder problems: biomechanical factors, general swimmer characteristics, injury history, shoulder laxity and range of movement, shoulder strength and general strength. All the risk factor groups will, of course, be interrelated to some degree. For example, fatigue and reduced muscular endurance can reduce the ability of the shoulder muscles to support the shoulder, and fatigue can also change the body position in the water, potentially changing the biomechanics of the swimming stroke. Injury history also can be related to underlying shoulder strength or muscle endurance, and an imbalance in

shoulder strength may predispose one shoulder to injury. Under this injury, there are different types of injury, such as;

2.1.1. Labrum Tears

A more severe form of swimmers shoulder, if left untreated, can result in a tear of the labrum. This injury is very serious and always requires surgery. Along with the surgery, swimmers suffering from labrum tears are expected to complete a physiotherapy regiment in order to aid in recovery and prevent muscle atrophy. According to Drier, different kinds of tears require different exercise regiments.¹¹ The pains brought on by swimmer’s shoulder are often caused by a muscle imbalance that develops over time by using the same techniques without variety or additional training.

2.1.2. Rotator Cuff Injuries

This kind of injuries can occur from a sudden violent, movement of the shoulder, chronic repetitive motions, aging and

⁹ David Geier, Surprising statistics about swimming injuries, 2012, (accessed on: September 10, 2016), Retrieved from:

<http://www.drdaavidgeier.com/surprising-statistics-swimming-injuries/>

¹⁰ John Bradley et al, Review of Shoulder Injuries and Shoulder Problems in Competitive Swimmers, (American Journal of Sports Science and Medicine, 2016, Vol. 4, No. 3, 57-73), (accessed on: September 10, 2016), Retrieved from:

<http://pubs.sciepub.com/ajssm/4/3/1>

¹¹Tori Caudill, Swimming World College Intern, 3 Common Swimming Injuries with Prevention Tips, 2015, (accessed on: September 11, 2016), Retrieved from:

<https://www.swimmingworldmagazine.com/news/common-swimming-injuries-treatment-prevention/>



overuse or even tearing in the tendons of the rotator cuff. This can be categorized into four stages based on the severity of the injury: first, swelling and mild pain, secondly; inflammation and scarring, thirdly; partial or complete tears of the rotator cuff and finally; cuff tears arthropathy. Front crawl and backstroke are the main causes of swimmer's shoulder, while the breaststroke is the least likely to cause it.

2.1.3. Shoulder Impingement

Impingement in the competitive swimmer is typically caused by altered kinematics due to muscle fatigue or laxity rather than subacromial pathological changes. A characteristic position for subacromial impingement is forward flexion and internal rotation of the glenohumeral joint during the recovery phase of the stroke. At the point when the hand enters the water, the hydrodynamic force applied on the hand generates a large moment in the shoulder joint, causing elevation of the humeral head and subsequent impingement. The hyperextension of the upper extremity at the late pull-through phase of the stroke pushes the humeral head anteriorly and rotates

internally, possibly aggravating an impingement when muscle fatigue is present. A hand entry that crosses the midline of the long axis of the body causes impingement of the supraspinatus and the long head of the biceps.¹²

2.2. Overuse Injuries

Most injuries in swimming are due to overuse. The repeated movement of the shoulder can cause micro-injury to different structures under risk during swimming. The elite swimmers may log up to 8000 to 20000 meters per day average using the freestyle arm stroke for most of the distance. At average of 8 to 10 arm cycles per 25 meters, a swimmer completes over one million shoulder rotations each week. This type of training predisposes swimmers to overuse injuries of the shoulder.¹³ Generally, impact with the other object, twisting, friction,

¹²Bansal et al., Shoulder Impingement Syndrome Among Competitive Swimmers In India—Prevalence, Evolution And Risk Factors. (Journal of exercise science and fitness • Vol 5 • No 2 • 2007), (accessed on: September 10, 2016), Retrieved from; https://www.researchgate.net/publication/252049667_Shoulder_impingement_syndrome_among_competitive_swimmers_in_India_-_Prevalence_evaluation_and_risk_factors

¹³ Julio José Contreras Fernández et al, Shoulder Pain in Swimmers, Pain in Perspective, INTECH, open science/ open minds, 2012,p,124



shearing and over stretching forces may inflict the damage.¹⁴

Walter B. Franz wrote about overuse syndromes in runners that the over-use syndromes are not unique to runners. Any sport involving chronic muscle skeletal activity can result in overuse syndromes.¹⁵

2.3. Knee Injuries

Knee injuries are the one of most common source of pain in elite swimmers. Swimmer's knee is a type of knee pain that is mostly attributed to the breaststroke¹⁶, it is also known as breaststroke knee. For a good breaststroker's kick the swimmer must have the ability to rotate the lower leg out at the knee. Strain to the common extensor tendon in the elbow is relatively common in swimmers.¹⁷ It is noteworthy to say that the

knee pain is more often easily controlled that shoulder pain experienced by swimmer. According to one of recent study, 86 percent of competitive breaststroke swimmers had at least one episode of knee pain related to swimming breaststroke.¹⁸ Practicing with improper technique can be the main cause behind the development of swimmer's knee. Kicking our legs while they are positioned at what is essentially a 90 degree angle places a lot of stress on the knee, and this can cause gradual damage if the breaststroke is done improperly over a long period of time. The results can be weak knees, dull pain, sudden and sharp pangs, and swelling/inflammation.¹⁹ There are some factors affecting knee injuries such as ;

2.3.1. Biomechanical Factors

Like most swimming pathology, overuse is the primary factor in causing knee pain and

¹⁴ Sri Krishna Devaraya University, Anantapur, Analytical Study Of Sports Injuries In The Fourth And Fifth National Games, Department Of Physical Education And Sports, ,March, 2002, P:52

¹⁵ Walter B. Franz, Sports injuries and athletic problem chapter-22, Overuse syndromes in runners, (Surjeet publication LTD, New Delhi, 1989) , p 289-300.

¹⁶ Tori Caudill, Swimming World College Intern, 3 Common Swimming Injuries with Prevention Tips, 2015, (accessed on: September 11, 2016), Retrieved from:

<https://www.swimmingworldmagazine.com/news/common-swimming-injuries-treatment-prevention/>

¹⁷ Hemant Jivendrakumar Verma, A Study of Swimming; Related to Injuries in Inter University Level Male and Female Swimmers, (North

Maharashtra University, Jalgaon Maharashtra, Department of Physical Education Sports and Culture, , MAY-2009), p:3

¹⁸ David Geier, Surprising statistics about swimming injuries, 2012, (accessed on: September 10, 2016), Retrieved from: <http://www.drdaavidgeier.com/surprising-statistics-swimming-injuries/>

¹⁹ Common Swimming Injuries, 2016, (accessed on: September 12, 2016), Retrieved from: <http://www.thephysiocompany.com/blog/common-swimming-injuries>

injuries. Repetitive hydrodynamic forces result in cumulative stresses that increase the risk of soft tissue injuries. Further, freestyle has a reduced relative risk for knee pain. The biomechanics of the breaststroke generates high valgus loads due to the adducted hip position. Extreme hip abduction angles at kick initiation can be detrimental. Increased valgus loads also occur in the knee in addition to rapid knee extension. Due to the kick style in the breaststroke technique, increased tension across the medial compartment and increased compression of the lateral compartment occur. The flutter kick in freestyle swimming requires repetitive quadriceps contraction, which may result in patellofemoral overload. Increased patellofemoral contact stresses resulting in anterior knee pain also occur during wall push-off, due to forceful quadriceps contraction with the knee in a high degree of flexion, or during starts and turns when the knee is in a partial squat position. Moreover, abnormal kicking mechanics are often present in swimmers with knee pain.

2.3.2. Extrinsic Factors

Overuse in breaststroke swimmers contributes to knee pain and injuries. Knee pain in breaststroke swimmers correlates with the number of years of training, the volume of training, the caliber of the athlete, and increasing age. Means, freshmen swimmers suffer the most injuries compared with more experienced swimmers.

2.3.3. Intrinsic Factors

Intrinsic factors can contribute to the biomechanical stresses on the knee and subsequent development of patellofemoral pain. Quadriceps muscle abnormalities may predispose to patellar maltracking due to impaired strength, endurance, and flexibility. Swimmers may experience patellofemoral pain as a consequence of patellar instability, subluxation, or maltracking.

2.4. Low Back Pain

Low back pain is a not uncommon injury in elite swimmers and it has been reported in breaststrokes in swimmers with tight hamstrings. The stroke tends to increase the



lumbar lordosis, which increases stress on the lumbar nerve roots. One of the recent study shows incidence rates of low back pain as high as 50 percent for butterfly which mainly used by competitive swimmers and 47percent for those swimming breaststroke.²⁰ The reason the lower back is affected is that, unlike most other strokes, people do not turn to the side to come up for air when doing the butterfly. Instead, they remain positioned with their torsos parallel to the bottom of the pool and lift their heads directly up. This motion places a huge amount of stress on the lower back and gradually leads to pain.

2.5. Neck Injuries

As usually swimmers are more concerned about getting air than they are about how to get it, the neck injury is another example of the repetitive motions that gradually lead to pain. The most common cause of neck pain in swimming is extending the neck too far when coming up for air.²¹

²⁰ Retrieved from: Surprising statistics about swimming injuries August 2, 2012 • Swimming, retrieved from: <http://www.drdauidgeier.com/surprising-statistics-swimming-injuries/>

²¹ March 23, 2016, Common Swimming Injuries, Retrieved from:

2.6. Foot and Ankle Injuries

Competitive swimmer aim for maximal ankle planter flexion, gain the extra range of movement by stretching the anterior compartment of the muscle of leg during the stoke action. Repetitive stock action may lead to inflaming the extensor tendons. There are pain and crepitus over the tendons during flexion and extension.

2.7. Elbow Injuries

Elbow injuries stem from the arm pull in the butterfly in freestyle. Most of the competitive swimmers use a form of “elbow- up” pull, which involves benching the elbow and holding its higher than the hand throughout the first part of the pull. This creates the most efficient angles for the swimmers to pull the water backward, giving the maximum thrust of the hand.

2.8. Psychological Injury

The last swimming injury is the psychological injury. Besides to physical limitations, injury also results in significant psychological reactions such as anxiety,

<http://www.thephysiocompany.com/blog/com-mon-swimming-injuries>



depression, anger, and lowered self-esteem.²² Early studies investigating the effect of psychosocial factors on athletic injury focused on personality variables which reveal that certain athletes would have a predisposition to injury based on their personality traits. Considering the contradictory results of a variety of studies on the relationship between personality traits and injury, towards study which conducted by Junge at 2000, he was suggested that no one characteristic profile could be drawn that would reveal an athlete who was predisposed to injury. Life event stress is one psychosocial factor which has a history of findings supporting a positive relationship with the injury.

In the theoretical model proposed by Williams and Anderson (1998), they identified various psychosocial predictor variables of injury, potential mechanisms for the stress-injury relationship, and possible interventions for preventing injury. At the

²² Julie Hardt, Prevention and Management of Injury in Competitive Swimming, School of Sport Science Exercise and Health, The University of Western Australia, 2012, (accessed on : September 8, 2016), Retrieved from: [http://research-repository.uwa.edu.au/en/publications/prevention-and-management-of-injury-in-competitive-swimming\(fef80e9b-bde0-4c27-afba-2cf58b223dc4\).html](http://research-repository.uwa.edu.au/en/publications/prevention-and-management-of-injury-in-competitive-swimming(fef80e9b-bde0-4c27-afba-2cf58b223dc4).html), p:1

core of their model is the stress response, which is presented as a bidirectional relationship between the cognitive appraisals like; evaluation of demands, resources, and consequences of a potentially stressful athletic situation and the physiological reactions like; increased muscle tension and attention responses like; narrowing of the visual field to the situation. These variables interact with one another, and they may increase injury vulnerability by affecting an athlete's ability to appropriately detect and react to environmental cues.²³

Further critics from Davis through studying on the relationship between linking stress and injury in competitive swimmers on 1991 presented that a reduction of stress may lead to a reduction in injury rate. In his study of a Division II collegiate swimming program, he implemented a sports psychology program emphasizing relaxation techniques and he suggested that the reduction of stress due to relaxation contributed to a subsequent reduction in injury occurrence.²⁴ By examining this suggestion on next session, Davis found that, a 52 percent reduction in

²³ Ibid, p:11

²⁴ Ibid, p:10



injury rate as compared to injury reports from the previous season.²⁵

2.9. Previous Injury History

Studies unequivocally denote that the previous injury is a significant risk factor for future injuries as it increases risk by up to two and a half times. Previous injuries can cause fibrosis resulting in adhesions and reduced range of movement at a joint. These factors predispose the area to further injuries at the same site due to ligament laxity, reduced muscle strength, and poor proprioception.²⁶

2.10. Other Injuries²⁷

- **strain:** Strains are injury involving the musculotendinous unit and may involve the muscle tendon and the junction between two as well as their attachment

to bone pulling the tissues which connect muscle to bone, can cause a strain and it can happen suddenly or develop over time.

- **Groin strain:** This is often a bruise stretching of a teaching of muscle fibers which run from the front of the hip bone to the inside of the thigh. The strain of the inside groin muscle occurs most commonly in the athlete who slips slid ways separating his feet widely. Treatment is with ice and early and regular stretching.
- **Sprain:** This is an injury involving a ligament which is basically inelastic and designed to prevent abnormal motion of a joint whenever. The joint is forced to move in abnormal directions ligaments are stressed, swelling, bruising and joint immobility is such symptoms.
- **Back strain:** This is occurring commonly in swimmers. This particularly in which requires a marked increase in amount at lumber lordosis at the time at around the shots. The signs and symptoms of acute back strain are no different in aquatic than in other sports. A major problem is that with a

²⁵ Ibid, p:15

²⁶ Inneke Scorgie, The Epidemiology Of Injuries In Competitive Adolescent Swimmers Attending a Johannesburg Swim Squad, 2016, Department of Health and Rehabilitation Sciences Groote Schuur Hospital, Observatory Cape Town, South Africa,(accessed on: September 10, 2016), Retrieved from:

https://open.uct.ac.za/bitstream/item/24071/thesis_hsf_2016_scorgie_inneke.pdf?sequence=1, P;32

²⁷ Verma, Hemant, A study of swimming related to injuries in inter university level male and female swimmers, 2009, (accessed on: September 11, 2016), Retrieved from:

http://shodhganga.inflibnet.ac.in/bitstream/10603/87008/12/12_chapter%201.pdf,, p: 28-32



painful back, it is virtually impossible to swim.

- **Ear infection:** An infection in the canal between the eardrum and the outer ear, ear feels blocked and hurts to chew. It is being continually wet or chlorine in swimming pools. Seek medical advice, antibiotics ear drops are usually very effective but infection can sometimes persist. The ear should keep properly dried after swimming that avoids this problem.
- **Swimming's itch:** It also called Cercarial dermatitis appears as a skin rash caused by an allergic reaction to certain parasites found in certain birds and mammals. Therefore, the parasites instead burrow into the nearby swimmer's skin, causing an allergic reaction and rash.
- **Muscle cramps:** Acute condition is more devastating to the swimmer than muscle cramps. There is no exact cause and reason at acute cramping and it most frequently occurs under competitive playing conditions. A swimmer having a previous history of cramping is more likely to cramp again losses of sale,

potassium; manganese and even Zinc have been postulated etiologic factors.

- **Muscle pull:** It is an acute tear of skeletal muscle fiber and it characterized by sudden localized and persistent pain in a muscle. It resulting from lack of proper warm up before any physical activity, poor flexibility, over training, lack of coordinative activity, poor training and imbalance in muscular strength between agonistic muscles. It also occurs most frequently under competitive and training condition.

3. Injury Prevention

It is always easier to prevent an injury with proper techniques than it is to rehabilitate after an injury has occurred. There are Common Measures for Prevention of Swimming Injuries including, first; Warm-up and Cool-down which it means to keep exercising till your heart rate, breath rate, and blood pressure turns normal for about 13 to 20 minutes, secondly; "Pool Temperature" that should be in-between 77 and 81 degrees Fahrenheit. Cool Pools lead to decreased blood flow causing strain in muscles and warmer pools lead to fatigue due to increasing in temperature of the



swimmer and thirdly “Training, Rest and well balanced Diet” which is necessary for maintaining muscle strength for swimming.²⁸

Attention and care of skin also is important in injury prevention. Young swimmers lose heat more rapidly and are more prone to chilling. Skin is susceptible to carcinoma from ultraviolet exposure and must be protected particularly where water, ice, snow and high altitudes enhance exposure-response intensity.²⁹

In the recent research on “Analytical Study of Sports Injuries in The Fourth and Fifth National Games”, by Sri Krishna Devaraya University, reveals that the health related problems are common among all sports persons and are not related sport or gender. The deficiency of nutrition, water, weather, food habits, sports environment, hygiene and proper awareness may reduce these problems. A participant with good health

may raise his or her performance to their optimum level and also helps to minimize their sports injuries during training and competition days. Most of health athlete’s problems according to this research were fever, under respiratory infection and Diarrhea which was the biggest drawback among the competitors that hinder to raise their performance during the fourth National Games.³⁰

Towards developed countries like the United States, it must be noted that there are around 3 million annual injuries incurred during sports participation among children and adolescents.³¹ Moreover, the recent research through semi-structured interviews were administered to 30 of the 112 members of the technical and medical staff assisting the Brazilian athletes who participated in various sports at the 2011 Pan American Games in Guadalajara, represented that main factors in the occurrence of injuries were

²⁸ Swim India, 6 Injuries Commonly Associated with Swimmers – Know How to Prevent Them. (accessed on: September 13, 2016), Retrieved from: <http://swimindia.in/6-injuries-commonly-associated-with-swimmers-know-how-to-prevent-them>

²⁹ Sri Krishna Devaraya University, Anantapur, Analytical Study Of Sports Injuries In The Fourth And Fifth National Games, Department Of Physical Education And Sports, ,March, 2002, P:70

³⁰ Krishna Devaraya University, Anantapur, Analytical Study Of Sports Injuries In The Fourth And Fifth National Games, Department Of Physical Education And Sports, ,March, 2002, P:122

³¹ Albert C. Hergenroeder, Prevention of Sports Injuries, (accessed on: September 10, 2016), Retrieved from: http://pediatrics.aappublications.org/content/101/6/1057.short?sso=1&sso_redirect_count=1&nfstatus=401&nftoken=00000000-0000-0000-0000-000000000000&nfstatusdescription=ERROR%3a+N+o+local+token



overtraining, inadequate sports technique, inadequate nutrition, and aspects related to the athletes' behavior. The main strategies for injury prevention reported by the participants were muscle strengthening exercises, nutritional counseling and the provision of an orientation session or information.³² Therefore it's necessary for all those who are involved with swimming somehow, to have the skills to diagnose, manage and triage their sport's injuries, and to prevent injuries in swimming through technique correction.

3.1. Shoulder Injury Prevention

Appropriate prevention of swimmer's shoulder is critical in all intense training programs. Routine icing and, in some cases, prophylactic NSAIDs may be needed during heavy training. Continual reinforcement of proper stroke mechanics and adequate flexibility is essential. Yardage and intensity must be increased gradually at the start of each season, and warm-up and cool-down periods should be lengthy. After long

kicking-only sets, a swimmer needs additional warm-up before using arm strokes at normal speed.³³ Furthermore, less stress placed on the shoulder which causing less pain occur through technique correction and along with it, limiting the amount of arm heavy drills and pulling with paddles can aid tremendously in preventing further injury on swimmer's shoulder . Another approach to swimmer's shoulder prevention is to incorporate orthopedic band exercises into the stretching routine daily to build shoulder strength. Treatments for swimmers shoulder are with a regiment of icing the affected area and anti-inflammatory medicine to reduce swelling, the athletic trainer at Lindsey Wilson College, Ashley Drier further recommends low weight dumbbell exercises with internal and external rotation along with ultrasound and stem machine treatments. The shoulder pads also protect exposed bony areas and high or low velocity forces.³⁴ And also related to Rotator Cuff

³² Bruno T. Saragiotto et al, Risk factors and injury prevention in elite athletes: a descriptive study of the opinions of physical therapists, doctors and trainers, 2014, Retrieved from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4183252/>, p: 137–143

³³ IES, Inland empire swimming, competitive swimming injuries, (accessed on: September 10, 2016), Retrieved from: <http://www.ieswim.org/wzielsc/UserFiles/File/Competitive%20Swimming%20Injuries%20Shoulder.pdf>, P:3

³⁴ Elise Mae Cradley-Smith, A systematic Review of the Aetiology of Shoulder Injuries and the Associated Preventive Strategies Within Competitive Swimmer, (accessed on: September 11, 2016),



injuries prevention, exercising swimmer's shoulder muscles outside the pool to ensure that you do not develop an imbalance is another important way to ensure that swimmers don't develop swimmer's shoulder. The best way to prevent the onset of this injury is to vary the strokes swimmer use while swimming.

3.2. Overuse Injury Prevention

One of the most important preventive measures for overuse injuries is warm-up, which consists of mild stretching and low intensity swimming. This would include strengthening the shoulder rotator cuff muscles and the muscles that stabilize the spine.³⁵

3.3. Knee Injury Prevention

The best treatments towards knee pain are Hamstring stretching Quadriceps strengthening exercises, muscle stimulating exercises to enhance strength around the knee, using cushion shoe, using knee caps,

Retrieved from:

[http://www.physicaltherapyinsport.com/article/S1466-853X\(12\)00002-8/fulltext](http://www.physicaltherapyinsport.com/article/S1466-853X(12)00002-8/fulltext)

³⁵ Hemant Jivendr Akumar Verma, A Study of Swimming; Related to Injuries in Inter University Level Male and Female Swimmers, (North Maharashtra University, Jalgaon Maharashtra, Department of Physical Education Sports and Culture, , MAY-2009), p:3

braces and anti inflammatory medicines. In contrast, up stir climbing, deep squats, heavy weights, sitting with knee and feet tucked under the buttocks should be eliminated. It also can be prevented through making sure to warm up correctly and allowing the muscles to become warm before attempting the sometimes painful exercises.³⁶ Athletes with inadequate hip internal rotation also benefit from flexibility exercises. Butterfly swimmers require hip external rotators to power their kick from the gluteus medius and piriformis. During periods of rest, ice should be used judiciously and short courses of non steroidal anti-inflammatory medication may be beneficial. If pain persists, a 3-day period of absolute rest is recommended, and the athlete should then be reassessed prior to returning to the water.³⁷ As it mentioned earlier, prevention always is easier than rehabilitation. Knee injuries better to prevent

³⁶ Tori Caudill, Swimming World College Intern, 3 Common Swimming Injuries with Prevention Tips, 2015, (accessed on: September 11, 2016), Retrieved from:

<https://www.swimmingworldmagazine.com/news/common-swimming-injuries-treatment-prevention/>

³⁷ Florian Wanivenhaus et al , Epidemiology of Injuries and Prevention Strategies in Competitive Swimmers,(accessed on: September 14, 2016), Retrieved from:<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3435931/>



rather than rehabilitation which can be hard to treat.

3.4. Low Back Injury Prevention

The individuals suffering from low back, require repetitive flexion - extension movements of the lumbar spine, abdominal, paravertebral muscle strengthening exercises, muscle relaxants, ice massage may be helpful. The best way to prevent this from occurring is to work out the back muscles, and stretch them before and after swimming and varying the strokes practiced rather than focusing on one is also important.

3.5. Neck Injury Prevention:

The best way in preventing neck injuries is the swimmer to come up just far enough to get the air and also neck rolls and stretches outside the pool are a great way to prevent this injury.³⁸

3.6. Elbow Injury Prevention

³⁸ Common Swimming Injuries, 2016, (accessed on: September 12, 2016), Retrieved from: <http://www.thephiocompany.com/blog/common-swimming-injuries>

The elbow is often subjected to compressive forces that lead to overuse injuries and act as a cushion during collisions in sport, several muscles that move to the shoulder also cross the elbow. Likewise, several muscles that move to the wrist and fingers also cross the elbow, therefore, flexibility and strengthening exercise must focus on muscles that move towards the shoulder, elbow and wrist and general flexibility exercises for the shoulder and hand can be used in conjunction with warm-up exercises and proper skill techniques are the factors in preventing injury in this region.

4. Conclusion

Knowledge about the incidences, nature of sports injuries and preventive measures awareness are the main outcome of injury surveillance and it could allow for some injuries to be prevented. Clearly, this area of study is an important area for the physiotherapist and physician as they work together in bringing the injured patient back to the normal condition, alongside them, study on sports injury causes and prevention is also required to Teachers, Coaches, Physical directors, sports administrators and managers to be made aware of the mild,



moderate and severe injuries sustained by participants in particular sports and education about appropriate prevention strategies.

In the Indian context, there is need more funds to be sought by the sports sponsoring organizations for the development, promotion, and dissemination of educational interventions and to conduct conferences and workshops on sports injury causes and prevention.

The center and state government and university sports authorities in the Country should establish sports injury prevention research centers to recognize the importance of sports injury prevention. In this country, these three organs must work together closely and through developing safe facilities and policies to encourage best practice related to the use of protective equipment and to improve the performance of India in national and International dimension.

Due to recent increase of swimming participation in every country particularly in India, there is a need for data on injury rates for the variety of sports particularly swimming as a popular sport among young people and also by looking at recent events

towards Indian swimmers at 2016 Rio Olympic, that two Indian swimmers were competing but disappointingly, in the women's 200m freestyle, She finished 28th out of the total 29 swimmers and in the men's 200m butterfly heats, he finished 41st amongst the 43 swimmers on the basis of his timings³⁹, it is clear that there is need more research on sports injuries and its prevention and overall issues which affect on swimmers especially during the tournament, in all the events that recently held in and outside of India, particularly about specific aspects of particular sports and swimming as well in reducing the incidence of head, neck, low back, spine injuries. Furthermore, there is need to present the different correct technique which might help in preventing injuries. Finally, conclusions can be drawn that prevention assumes a fundamental performance-influencing role and findings of this article express that prevention of swimming injuries in competitive swimming

³⁹ Rio Olympics, Swimming: Sajan Prakash, Shivani Kataria finish 41st and 28th in their events, (accessed on: September 14, 2016), Retrieved from: <http://indianexpress.com/sports/rio-2016-olympics/live-india-swimming-shivani-kataria-sajan-prakash-womens-200m-freestyle-heats-200m-mens-butterfly-2962146/>



and regular swimming as well, is most certainly better than the cure.

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