

# Incidence of Musculoskeletal Injuries in Rope Mallakhamb Players and Associated Risk Factors

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## ABSTRACT

**Background:** Mallakhamb is a traditional sport originating from India and gained worldwide recognition on the sidelines of Berlin Olympics held in the year 1936. The sport of Mallakhamb was originally practiced to develop the strength, agility and flexibility of wrestlers and has now developed into a sport with championships held annually at District, State and National levels throughout India. Understanding the prevalence and nature of injuries in Rope Mallakhamb is crucial for development of effective injury prevention strategies, training protocols, and rehabilitation approaches.

**Purpose:** To evaluate incidence of musculoskeletal injuries in rope mallakhamb players and identify associated risk factors.

**Objective:** To determine Incidence of different type of musculoskeletal injuries in rope mallakhamb players. To evaluate associated risk factors.

**Setting:** Rope Mallakhamb practice centers in Pune.

**Method:** We carried out a cross sectional study in 60 athletes who were engaged in the game of Rope mallakhamb and had experience of more than one year. A pre designed questionnaire was circulated among the players via google forms and players were asked to fill the form to the best of their knowledge.

**Participants:** Age group 15-30 years were taken for the study. Players with experience of less than one year were excluded from the study.

**Outcome measure:** The primary outcome measure of this study was a pre designed sports specific questionnaire.

**Results:** In upper limb most, common injuries were wrist fractures (10%) followed by wrist sprains (8%) then forearm fractures, (6%) finger dislocation (6%), elbow dislocation (2%). In lower limb calf strain was most common injury (14%) followed by ankle sprain (12%), ankle fracture (8%), hamstring strain (8%), toe dislocation (8%) and knee joint fractures (6%). In trunk most common injury reported was back sprain (12%) of all the reported injuries.

**Conclusion:** This study concluded that the incidence of strain and sprain injuries is most common with involvement of distal joints of upper and lower extremities.

**Keywords:** Rope mallakhamb, Sports injuries.

## INTRODUCTION

The Indian Traditional sport of mallakhamb gained its international attention on the sidelines of Berlin Olympics. In the year

1936 the troupe of 35 acrobats from India demonstrated the ancient sport of mallakhamb at Olympic games<sup>[1]</sup>. Mallakhamb is an evolved sport which is

influenced by north Indian wrestling, Yoga, Martial Arts, and British Colonial Gymnastics<sup>[2]</sup>. The sport of Mallakhamb was originally practiced to develop the strength, agility and flexibility of wrestlers and has now developed into a sport with championships held annually at District, State and National levels throughout India<sup>[3]</sup>. There are various types of mallakhamb such as Pole, Rope, Hanging, Niradhar (without support) On cane, on floating platform and with weapons. But on a competitive level only Pole, Rope and Hanging are being performed by the players<sup>[1]</sup>. Pole Mallakhamb is performed on a vertical pole made up of teak wood or sheesham which is fixed to the ground and greased with the castor oil to reduce abrasive injuries to the player. The pole itself is very heavy with a metal base for stability<sup>[2]</sup>.

The another variation of mallakhamb is Rope mallakhamb in which the wooden pole is replaced with a cotton rope which is 2.5 cm thick and 5.5. meters long<sup>[2]</sup>. The rope is caught by the performer in the gap between the Big toe and the second toe along with one or both the hands and the performer is prohibited from touching the heel to the rope<sup>[2]</sup>. By using toe grip the performer climbs up the rope and ties the rope around the body through sequence of steps in 90 seconds without knotting the rope in any way and strikes various twists, turns, catches and some hanging positions<sup>[6]</sup>. Besides these, a number of Yogic posture called *asanas* and various acrobatics feats are also performed by the player<sup>[2]</sup>. The player is judged by the panel of three judges who assesses the competitor's speed, grace and difficulty of the position on the apparatus. The competitors are judged on five different categories Mounting (where performers climb up the rope), acrobatics (twists, and turns), catches (where performer catches the rope), and Balance<sup>[4]</sup>. This sport requires the agility, suppleness of the body, quickness of reflexes, neuromuscular co-ordination, and flexibility

of the performer to execute various positions and transitional activities<sup>[1,2]</sup>.

Mallakhamb is the game which is played against gravity and provides good exercise to body especially to back/spine<sup>[2]</sup>. Before starting the competition only 3 minutes are given to each team or 1 minute is given to an individual for warm up and no warming up is allowed between two sets of competitions<sup>[5]</sup>. For such warming up appropriate deduction is made by Chief Judge<sup>[5]</sup>. Asanas like *Virbhadrasana* (Warrior Pose), *Shavasana* (Corpse Pose), *Natarajasana* (Dancer Pose), *Vrischikasana* (Scorpion Pose), *Padmasana* (Lotus Pose), *Padhastasana* (Hand-to-foot Pose) and *Ekpadshirasan* (One-foot-to-head pose) are performed by the participants<sup>[5]</sup>.

## MATERIALS & METHODS

Study design – Cross sectional study.

Sampling method – Convenient Sampling.

Sample size – 60

Target Population - Rope Mallakhamb players between age group 15 to 30 years.

Study setup - Mallakhamb Training centers in Pune.

### ➤ Inclusion criteria:

Players with experience of one year and more

Recreational players

Competitive Players (district, state, national and international level)

### ➤ Exclusion criteria:

Players having experience of less than a year.

Subjects who were not willing to participate in the study.

## PROCEDURE

The study was conducted after taking ethical approval from the Institutional ethical committee of TMV's Indutai Tilak College of Physiotherapy, Pune.

The cross sectional survey was conducted with the help of a pre - designed questionnaire circulated among-st the rope mallakhamb players in Pune in the form of

google form. The convenience sampling method was used with sample size of 60 and the participants were recruited on the basis of the inclusion criteria. The informed consent was taken from the participants and procedure of the study was explained.

A demographic sheet was provided to all the participants asking about their name, age, gender, contact details and occupation. Questions regarding the years of experience of participant, their weekly practice sessions, type of injury they have had in past one one month, most commonly injured/ affected part of the body, cause of injury, recovery time from the injury sustained, use of appropriate safety equipment, provision of proper professional guidance, proper warm up and cool down time and time period between two matches were asked in the circulated google form. The result can be calculated in the form of percentage of responses for each question. Data was collected and statistically analyzed.

### STATISTICAL ANALYSIS

This study recruited 60 participants who were rope mallakhamb players of different age groups. The primary outcome measure of this study was a pre designed questionnaire. Data analysis was done using Microsoft excel software.

### RESULT

**Table 1:**

Age	Number of players
15-20 years	31.66%
21-25 years	41.66%
26-30 years	26.68%

**Interpretation:** Table 1 shows percentage of participants in various age groups, 31.66% of participants were in between age of 15 to 20 years, 41.66% were in between 21to 25 years and 26.68% were in between 26 to 30 years of age.

**Table 2:**

No. of Male Players	No. of Female Players
68%	32%

**Interpretation:** Table 2 shows the gender distribution of the participants of which 68% were male and 32% were female.

**Table 3:**

Upper Limb	
Injury	Percentage
Wrist Fractures	10%
Wrist sprain	8%
Forearm fracture	6%
Finger dislocation	6%
Elbow dislocation	2%

**Interpretation:** Table 3 shows the most common injuries in Upper limb with wrist fracture accounting for 10 % of all the injuries followed by wrist sprains which are 8% of all the injuries then forearm fracture and finger dislocations accounting for 6% each and least is elbow dislocation which accounts for 2% of all the injuries.

**Table 4:**

Lower limb	
Injury	Percentage
Calf strain	14%
Ankle sprain	12%
Ankle fracture	8%
Hamstring strain	8%
Toe dislocation	8%
Knee fracture	6%

**Interpretation:** Table 4 shows common injuries in lower limb of which calf strain is most commonly sustained injury by rope mallakhamb players accounting for 14% followed by ankle sprain which is 12% of all injuries, then ankle fracture, hamstring muscle strain and Toe dislocation having 8% of prevalence rate each and least common is knee fracture with 6 % of prevalence rate.

**Table 5:**

Trunk	
Injury	Back Sprain
Back sprain	12%

**Interpretation:** Table 5 shows most common injury in trunk which is back sprain accounting for 12% of all the injuries.

**Table 6:**

Cause of Injury	
Overexertion/fatigue	10%
Incorrect Technique	25%
Equipment Failure	8.30%
Accidental fall	40%
None	16.66%

**Interpretation:** Table 6 shows common cause of injury in rope mallakhamb players where Accidental fall is the most common cause reported by 40% of players, Use of incorrect technique accounts for 25% of all the injuries, the injuries caused due to overexertion/fatigue are about 10% of total injuries and Equipment failure accounts for 8% of total injuries and 17% of players reported no injury.

**Table :7**

Practice sessions per week	
Less than once a week	23.35%
once a week	1.69%
2 to 3 /week	40%
4 to 5/week	13.35%
everyday	21.61%

**Interpretation:** Table 7 shows weekly practice session reported by the players among which 23.3% of players practiced less than a week, 1.6% reported to be practicing once a week, 40 % reported to be practicing 2-3 times a week, 13.35% reported that they practice for 4- 5 times a week and 21.61 % reported to be practicing daily.

## DISCUSSION

The study was designed to evaluate the incidence of various musculoskeletal injuries and associated risk factors in rope mallakhamb players of age groups between 15 to 30 years in Pune. Rope mallakhamb is traditional Indian sport, now practiced Internationally. It is combination of British colonial gymnastics, Indian wrestling and Yoga.<sup>[1]</sup> Being a traditional sport, there is lack of knowledge and awareness regarding the sport injuries which affects training of the player.<sup>[1,2]</sup> A sport specific questionnaire was designed and circulated among the rope mallakhamb players through a google form. The players were recruited on the basis of inclusion and exclusion criteria and total 60 players participated in the study (n=60). Among the 60 players 16.6% players reported no injury [n=10] while 83.34% players reported to have had a sports injury related to rope mallakhamb [n=50]. The players were then divided into three age groups which were 15-20 years, 21-25 years and 26-30 years, Pie chart 1 shows the distribution of participants with respect to their age. Rope mallakhamb is commonly practiced by females and pole mallakhamb is practiced by males.<sup>[7]</sup> Pie chart 2 shows gender wise distribution of participants of which 68% were male (n=41) and 32% were female (n=19).

Further the data collected regarding the sports injury was divided into upper limb injuries, lower limb injuries and trunk injuries. The percentage of a specific injury was calculated using a formula (number of

reported injury divided by total number of participants multiplied by 100).

Table 3 shows the incidence of upper limb injuries in rope mallakhamb player of which 10% of players reported of having wrist fractures followed by wrist sprain which is 8% of all the injuries. This can be explained by the nature of the sport, a player grasps the rope with his/her hands and climbs up which exposes the wrist to the excessive tensile as well as compressive loads, which requires both flexibility and strength of wrist joint.<sup>[1,2]</sup> Lack of warm up exercise and flexibility of wrist joint may lead to injuries. Another common injury in upper limb was found out to be forearm fractures and finger dislocation with 6% of incidence rate each of all the reported injuries and can be explained by the unsteadiness of the rope which may lead to accidental falls. Inadequate grip strength, overuse or fatigue can be the reason for finger dislocation as the player has to grasp the rope while transitioning for one posture to other. Elbow dislocation was found out to be least prevalent with only 2% of all the injuries. In mallakhamb and gymnastics upper limbs are used as weight bearing limbs and hence the forces are distributed through wrist and elbow joints making them prone to injuries.<sup>[10]</sup> Duretti T. Fufa and Charles A. Goldfarb published an article in 2013 stating that the wrist injuries are common in athletes and can result from trauma like fall on outstretched arm causing injuries like fractures or overuse injuries from repetitive movements and stress on joint.<sup>[8]</sup>

Table 4 shows injuries in lower limbs. The strain and sprain injuries are more common of which 14% of players with experience of 7-9 years reported to have sustained calf muscle strain injury and 8% of players with experience of 4-6 years reported of hamstring muscle strain injury. Brady Green and Tania Pizzari in their research published in 2017 found out the association of calf muscle strain injuries with increasing age of the players engaged in various sports like football and basketball.<sup>[9]</sup> Available literature regarding muscle strain injuries

explains association of age with the muscle strain injuries as age related neuromuscular maladaptations and progressive loss of skeletal muscle tissue quality and function.<sup>[9]</sup> Advancement in the practice increases with years of experience and previous history of hamstring or calf muscle strain remains a risk factor for future strain injuries.<sup>[9]</sup> The next most common injury reported was ankle sprain and accounts for 12% of all injuries followed by ankle fracture (8%) and toe dislocation (8%) of all the reported injuries. In rope mallakhamb players must grasp the rope with a unique grip which is between the great toe and the second toe of the foot and is prohibited from touching the heel to the rope which predisposes toes for the injury.<sup>[5]</sup> The least common injury in lower limb was reported to be knee joint fractures but is of significant concern as the knee joint is important for weight bearing activities and functional independence of an individual. Arundhati V. Nimbalkar in her study on Prevalence of knee dysfunction in mallakhamb players found that there was significant amount of knee dysfunction present in pre operative athletes using KOOS scale.<sup>[1]</sup>

Table 5 shows the most common injury in trunk as reported by the players was back sprain accounting of 12% of total injuries reported. Romain Meeusen and Jan Borms published an article on gymnastics injuries in 2012 stated that the back sprain injuries sustained by the gymnasts can be due to the macro-trauma and also repeated micro-trauma caused by specific impact loads during vaults and hyper-extension of spine.<sup>[10]</sup> David Kruse and Brooke Lemmen in their research on spine injuries in the sport of gymnastics explained various spinal pathologies and concluded that there is high rate of back pain and significant spinal pathology in gymnastic population.<sup>[11]</sup> The senior groups of players has to perform certain advanced postures or *asanas* like *Vrischikasana* (Scorpion Pose) which requires extremes of spinal range of motion (extension) and *Padhastasana* (Hand-to-foot

pose) which requires full range of spinal flexion which increases the compressive and tensile loads on the spine predisposing it to various spinal pathology. Lack of warm up and cool down exercise regime can be a risk factor for back sprain injuries.

Table 6 shows the common cause of the injury reported by the mallakhamb players. The most common cause of injury was reported to be Accidental fall (40%) from the rope, which can cause a severe injury like fracture and dislocations due while landing. 25% reported that they sustained injury due to use of incorrect technique, 8% reported of equipment failure as the cause of injury and 10% were injured due to over exertion/fatigue. Not using appropriate protective gear like mats as mentioned in the rule of mallakhamb can be a risk factors for injuries sustained by accidental falls and may lead to severe injuries and loss of time from sport. Franciele Marques vanderlei in her study published in 2013 reported that the Incidence of injury was greater in training category than in initiation category.<sup>[12]</sup> Appropriate guidance and close monitoring of the practice sessions can prevent injuries sustained during practice events.

Table 7 shows the weekly practice sessions of the players among which 23.3% of players practiced less than a week, 1.6% reported to be practicing once a week, 40 % reported to be practicing 2-3 times a week, 13.35% reported that they practice for 4- 5 times a week and 21.61 % reported to be practicing daily. There was no significant correlation between the specific type of injury and weekly practice sessions of the player. At a competitive level a player has to qualify several rounds to win a tournament lack of endurance training can may leave a player at risk of overexertion leading to injury. Awareness regarding the sports injury and its risk factors should be increased among the coaches, healthcare professionals and athletes alike, fostering a safer and more sustainable practice of An Indian Traditional Sport Mallakhamb.

## CONCLUSION

This study concludes that the distal joints are more commonly injured, in upper limb wrist fractures and sprains followed by forearm fracture, finger dislocation and elbow dislocations. In lower limb calf muscle strain is more prevalent followed by ankle joint sprain, hamstring muscle strain, toe dislocation and knee joint fracture. The most common cause of injury is accidental fall followed by use of incorrect technique then overuse/fatigue and equipment failure. Hence use of protective gear such as soft mats, knee caps, should be encouraged. Provision of proper instructions and guidance from the coach, adequate warm-up and cool-down exercises must be performed by the player. Adequate rest time and training time plays a crucial role in injury prevention during a sport event. The Rope Mallakhamb is a traditional sport awareness regarding the sports injuries plays a crucial role in achieving more sustainable practice and quick recovery after sustaining any sport injury. Close monitoring of practice sessions of players, endurance training and grip strength training can be the preventive measure of overuse and recurring injuries.

### Declaration by Authors

**Ethical Approval:** Approved

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**Conflict of Interest:** The authors declare no conflict of interest.

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