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Screening for Neck and Upper Limb Injuries among Intercollegeate Volleyball Players in Selected Colleges of Bengaluru

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Abstract

Background & purpose: Volleyball is one of the most popular games in the world. The International Volleyball Federation represents about 150 million players in approximately 170 countries. Volleyball is a dynamic sport involving rapid and forceful movements of the body and of the arm and hand when spiking the ball. Injuries in volleyball are quite frequent. It is believed that an increase in the frequency, intensity and duration of training might lead to an increased rate of injury.

Methods: A prevalence study was conducted in intercollegiate 50 volleyball players between age group 18-25 were selected from the list of players fulfilling the inclusion and exclusion criteria. Players were screened for prevalence of neck and upper limb injuries using Nordic Musculoskeletal Questionnaire (NMQ) and assessed for activity limitation using Disability of Arm, Shoulder and Hand (DASH), Neck Disability Index (NDI) and Shoulder Pain Disability Index (SPADI).

Conclusion: The study was concluded that there is a more risk of upper limb injuries mainly wrist, fingers, shoulder is the more prone to Musculoskeletal disorder among volleyball players.

Results: The result of the study was observed that due to wrist injury 10% players were prevented from carrying out their normal activities during last 12 months, followed by shoulder (4%), Elbow (4%) and Neck (2%) were prevented from doing normal activities during the last 12 months.

Keywords: volleyball players; Neck and Upper limb Injuries; Nordic Musculoskeletal Questionnaire; Disability of Arm, Shoulder and Hand; Neck Disability Index; Shoulder Pain Disability Index.

Introduction

Volleyball is one of the most popular games in the world. The International Volleyball Federation represents about 150 million players in approximately 170 countries. Volleyball is a dynamic sport involving rapid and forceful movements of the body and of

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the arm and hand when spiking the ball.[1] Volleyball is an increasingly popular team sport. As with a competitive sport, there is always an inherent risk of injury. Volleyball is practiced by approximately 800 million people with diverse characteristics, including different age groups. Volleyball game was invented in the United State by William G. Morgan in 1895. Indoor (i) 6 players on floor (3 front row, 3 back row), (ii) players must rotate clockwise once serve is gained, (iii) must return within 3 hits ; initial block not counted, (iv) Players – Setters, Libero, Middle Hitter, Outside Hitters, Opposite Hitters.[2]

Volleyball is recognized as one of the most popular sports in the world amongst men and women [3] in large part due to its accessibility to a wide age group, minimal equipment requirements and the ability to play both indoors and outdoors.[4] Volleyball is practiced by approximately 800 million people with diverse characteristics, including different age groups. Sports injuries have become one of the most common injuries in contemporary Western societies and volleyball, together with soccer and basket, is at the first places in the ball-related sports causing injuries. Injuries in volleyball are quite frequent.[3] It is believed that an increase in the frequency, intensity and duration of training might lead to an increased rate of injury.[5,6] The sport involves repeated, whole-body maximal ballistic actions in addition to rapid lateral movement in response to external stimuli. As such, there is an inherent risk of injury that must be recognized. In order to manage this risk, specific injury prevention strategies are needed and should serve as an essential component to the training plan for volleyball players.

Volleyball, like any other sport, associates with injury during the tournament and pre-season trainings. Because the volleyball Playground is separated by a net; there is almost no possibility of contact between players of two teams. Therefore, it is believed that the likelihood of injury in this sport is lower than other sports, and in particular contact sports such as football and basketball.[7] However, collisions occur during attack and defence of net between players of two teams. Other risk factors for injury in this sport include landings and high jumps during spikes and attack block and diving when receiving in back court.[8] According to research results, the prevalence of injury in this sport is between 1.7 and 4.2 injuries per 1000 hours of play. Although all injuries cannot be prevented, athletic performance can be improved by preventing even one injury. Recently, physiotherapists use functional movement tests and especially Functional Movement Screening (FMS) as a screening tool in order to predict injuries, followed by the development of preventive strategies. Gary Cook et al. developed FMS for the first time so as to identify those with compensatory movement patterns in their kinetic chains. This screening tool consisted of seven movement tests that require balancing between mobility and stability. These tests include movement patterns of deep squat, hurdle step, inline lunge, shoulder mobility, active straight leg raise, trunk stability push up, and rotary stability.[9]

Body Biomechanics In Volleyball Players

An earlier study conducted by Wendy J. Hurd at all concluded in their study stated body mechanics with respect to each phase of throwing biomechanics and what kind of musculoskeletal disorders.

Phases of volleyball divided into

1. Wind up/approach
2. Cocking
3. Acceleration
4. Deceleration/follow through

Wind up: Serve- Relatively low activity during serve Attack - Synergistic action of anterior deltoid and supraspinatus to position Humerus overhead. Infraspinatus and teres minor act to position humeral head within glenoid fossa.

Cocking: Serve- Humerus remains elevated with horizontal extension and maximum external rotation of the shoulder. Increase in activity for inner (subscapularis and teres major) and outer (latissimus dorsi and pectoralis major) anterior wall muscles may be secondary to their protective role against anterior subluxation. Attack- Supraspinatus and anterior deltoid continue to work to maintain humeral elevation. Ifraspinatus and teres minor function to achieve shoulder external rotation.

Acceleration: Serve- Float serve acceleration is comparatively slower placement is objective. Peak

teres minor activity as it functioned to restrain anterior humeral translation. Anterior wall muscles acting to internally rotate and adduct humerus.

i. Attack- Maximum force generation is objective. Less anterior deltoid and supraspinatus activity as arm is moving into extension. Teres minor limiting anterior humeral translation. Peak anterior wall muscles activity.

Deceleration/follow through:

i. Serve- More limited follow through with float serve. Anterior deltoid and supraspinatus control humerus extension. Infraspinatus and teres minor act to compress humeral head in glenoid fossa. Minimal anterior wall muscle activity.

ii. Attack- Kinetic energy dissipation distributed across deceleration and follow through. Humerus did not remain elevated, resulting in relatively low anterior deltoid and supraspinatus activity. Infraspinatus and teres minor playing stabilizing role. Lower anterior wall muscle activity.[10]

This study focus to rule out for the Neck and Upper Limb musculoskeletal discomfort and associated injuries affect the performance of intercollegiate volleyball players in selective colleges of Bengaluru.

Methodology: Method of Data Collection

Source of Data:

The data for the study will be collected based on the following categories:

- **Study setting:** Selected colleges in Bengaluru
- **Study subjects:** Intercollegiate volleyball players
- **Study design:** Descriptive study
- **Sampling technique:** Purposive sampling
- **Study recruitment:** selected colleges in Bengaluru
- **Sample size calculation:** n=50

Inclusion Criteria:

- Volleyball players between the age of 18 to 25 years
- People who are in volleyball practice
- Subjects willing to participate and sign the informed consent

Exclusion Criteria:

- Candidates with musculoskeletal injuries (neck pain, shoulder pain etc)
- History with upper limb surgery and back surgery
- Subjects who have already participated in similar kind of study

Method of Collection of Data:

Materials Required:

- Stationeries
- Consent form printouts
- Screening form: Standardized Nordic Questionnaire
- Questionnaires print outs
  1. Neck Disability index (NDI)
  2. Disabilities of the arm, Shoulder and Hand (DASH)
  3. Shoulder pain Disability Index (SPADI)
  4. Numeric pain rating scale

Procedure:

The investigator personally contact corresponded college authorities and obtain permission from the concerned authorities and with the subjects. Subsequently after obtaining the permission, the investigator will be screening the subjects for meeting the requirements of inclusion criteria and the study will be continued.

Study subjects will be screened using Standardized Nordic Questionnaire, and after finding their suitability according to the inclusion and exclusion criteria, the subjects with discomfort of neck and upper limb will be further documented with Neck Disability index(NDI), Disabilities of the arm, Shoulder and Hand(DASH) and Shoulder pain

Disability Index (SPADI) to record the discomfort of neck and upper limb. The demographic data including name, age, gender and duration of practice in day o r week will be obtained. The subjects will be briefed about the nature of study.

Neck Disability Index: The neck disability index will be to know how neck discomfort adversely affects their daily activities like dressing, personal care, driving, recreational activity, etc. The NDI consisted of 10 components and each component were scored from 0 to 5. In the neck disability index, the subjects will be asked to tick the options available. The score out of 50 will be documented.

Numeric Pain Rating Scale: This scale will be used to know the intensity of neck pain. The scale numbered from 0 to 10 was distributed to the subjects. The subjects will be asked to score their pain out of 10. The result will be then collected and documented.

Shoulder Pain Disability Index (SPADI):

The patient is instructed to choose the number that best describes their level of pain and extent of difficulty using the involved shoulder. The pain scale is summed up to a total of 50 while the disability scale sums up to 80. The total SPADI score is expressed as a percentage. A score of *0* indicates best 100 indicates worst. A higher score shows more disability. In scoring SPADI, any question missed should be taken out of the total score of each subscale. i.e if 1 question is omitted in the pain section, the total score is divided by 40.[12]

Disabilities of the ARM, Shoulder and Hand (DASH):

The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire is a 30-item questionnaire that looks at the ability of a patient to perform certain upper extremity activities. This questionnaire is a self-report questionnaire that patients can rate difficulty and interference with daily life on a 5 point Likert scale.[13]

Stastistical Analysis: The data collected for this study was analyzed statistically in the following categories:

Descriptive statistics: All the categorical variables were presented in the form of frequency tables and graphs whereas necessary. The quantitative variables were summarised using Mean ± SD with 95% confidence interval of Means.

Statistical Software: The data collected study was entered in Microsoft version 2010.

Discussion

Volleyball is one of the most popular games in the world. Volleyball is a dynamic sport involving rapid and forceful movements of the body and of the arm and hand when spiking the ball.[1] Volleyball is an increasingly popular team sport. As with any competitive sport, there is always an inherent risk of injury.[2]

The current study aimed to screen the neck and upper limb injuries in volleyball players. A similar study was conducted at Annamallai University in Andhra Pradesh. Aim of the study was to quantify the injuries of varsity volleyball players and to determine the temperament, position, incidences and parent of injuries involved in varsity men volleyball players at Annamalai University. Players age ranged from 18-26 years participated in the study. Self-administered sports injuries questionnaire was used to screen the injuries. The results showed that were most commonly injured anatomical location. Shoulder (28.57%), ankle (26.20%), finger (14.26%), thumb (11.90%) & knee and wrist (7.14%). The study concluded the rate of injuries and their injuries affecting shoulder, ankle and finger represent a significant source of disability and impaired performance for professional volleyball players.[3] A similar study was conducted in the two Danish elite division. A total of 70 female players were participated in that study. A means of a questionnaire survey had used for the screen the injury. The results showed that Finger (21%) and (18%) overuse injuries to shoulder (15%) and knees (16%).[7]

In this study using musculoskeletal disorders were noted using Nordic musculoskeletal questionnaire. Overuse of shoulder in spiking and serving will cause the injuries in shoulder and wrist. Musculoskeletal Disorders in volleyball players has impact on affecting their activities of daily living (ADL). The present study showed that the prevalence of neck trouble in last 12 months was 2.0%. Prevalence of shoulder trouble in last 12 months was 28%, Trouble

during the last 7 days was 14% and ADL affected in last 12 months was 4%. Prevalence of Elbow trouble in last 12 months was 4%. In wrist trouble during last 12 months was 32%, Trouble during the last 7 days was 18% and ADL affected in last 12 months was 10%. DASH analysis shows Mean-12.10, SD-7.32, Minimum-3.30 (N=25/50) and Maximum-27.50 (N=25/50).NDI showed that out of 50 subjects only 1 respondent complained of neck discomfort and which is 14% neck disability. SPADI analysis showed that pain score mean value 19.08, Total disability score mean value 0.64 and Total SPADI score mean value 20.64 out of (N=13/50).

Limitations:

- Unavailability of scales in local language
- Larger population of Intercollegiate volleyball players could have been included
- Current study was only determined to find out the prevalence of Musculoskeletal Disorder but did not focus to prescribe the exercise.

Conclusion

The results of the study showed that the prevalence of upper limb injuries among intercollegiate volleyball players age ranged between 18-25 years. In the present study out of 50 players the most prevalent Musculoskeletal Disorder was wrist with prevalence of 32% in last 12 months, 18% in the last 7 days and 10% in last 12 months where ADLs were affected.

Hence, the study concluded that there is a more risk of upper limb injuries mainly wrist, fingers, shoulder is the more prone to Musculoskeletal disorder among volleyball players.

Conflict of Interest: There was no personal or institutional conflict of interest for this study.

Source of Funding: Self.

Ethical Clearance: Ethical clearance taken from R.V. College of Physiotherapy, Bengaluru

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