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PREVALENCE OF SCAPULAR DYSKINESIS IN STRING PLAYERS

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Abstract: Introduction: Musical performances require a maximum of concentration, both on the psychological and on a physical level. Student and professional musicians practice their instrument for thousands of hours a year, sometimes many hours a day, maintaining unfavourable postures and require a high level of neuromuscular activity, while placing a very significant load on their musculoskeletal system.The prevalence of musculoskeletal disorders in instrumentalists is relatively high, ranging from 73.4% to 87.7%.At least 75% experience upper extremity symptoms, most of which relate to overuse. Most commonly, occupational injuries in musicians affect the upper quarter region, with highest prevalence in the cervical-thoracic spine, shoulder, elbow, wrist and hand. These upper quarter injuries and consequential pain are frequently associated with neuromuscular changes often affecting the cervical spine and scapular stabilizers. String instruments are the generic term of the instruments that make sound with the vibration of strings. Included in the category of bowed string instruments are the violin, viola, cello, and double bass. Although they include guitars, harps, pianos in the broad meaning, the violin family; violin, viola, cello, and contrabass.The present study evaluates the presence of scapular dyskinesis in young musicians who play these instruments i.e – Violin , Sitar , Ukulele , Guitar. AIM: To Study the Prevalence of Scapular dyskinesis in string players.

Objective: To Study the Prevalence of Scapular dyskinesis in string players using Scapular Dyskinesis test (SDT) & Lateral Scapular Slide test (LSST).

Methods: An Observational study was conducted on 90 string players , aged 18-35 years, playing instrument for more than 5 years with frequency of playing the string instrument between 4-5 times a week with 2-2.5 hours of practice sessions.The ones who had swelling, sensory impairment (eg: Diabetes,Arthritis,Pregnancy),Players with Previous Shoulder injuries, Upper limb fracture were excluded from the study.Players with Recent upper extremity & neck injuries were also excluded.

Results: This study was done in 90 string instrument players from Pune. Among 90 string instrument players:30 were violin players from which 6 players had scapular dyskinesis, which shows 20% prevalence.20 were sitar players from which 2 players had scapular dyskinesis, which shows10% prevalence.20 were ukulele players in which there was no prevalence of scapular dyskinesis.20 were guitar players in which 2 players had scapular dyskinesis , which shows 10%prevalence.The results showed that the average age of String players was 25 years , with an average playing experience of 7years in which this study shows 11 % prevalence of scapular dyskinesis.

Conclusion:Thus the study concludes that the prevalence of scapular dyskinesis is 11% in string players in & around Pune.

INTRODUCTION:

Musical performances require a maximum of concentration, both on the psychological and on a physical level. [2]Student and professional musicians practice their instrument for thousands of hours a year, sometimes many hours a day, maintaining unfavourable postures and require a high level of neuromuscular activity, while placing a very significant load on their musculoskeletal system.[1]

The prevalence of musculoskeletal disorders in instrumentalists is relatively high, ranging from 73.4% to 87.7%.At least 75% experience upper extremity symptoms, most of which relate to overuse.[3]

Most commonly, occupational injuries in musicians affect the upper quarter region, with highest prevalence in the cervical-thoracic spine, shoulder, elbow, wrist and hand (Leaver et al., 2011, Paarup et al., 2011; Kok et al., 2013, 2016). These upper quarter injuries and consequential pain are frequently associated with neuromuscular changes often affecting the cervical spine and scapular stabilizers (Steinmetz et al., 2010; McCrary et al., 2016).[1]The scapula plays several crucial roles in facilitating proper shoulder function. These roles include providing synchronized scapular rotation during humeral motion, serving as a stable base for activating the rotator cuff, and acting as a vital link in the kinetic chain.[4]

The presence of bony and soft tissue injury as well as muscle weakness and inflexibility can alter the roles of the scapula and alter scapular resting position and/or dynamic motion. This altered scapular position/movement has been termed 'scapular dyskinesis'.[4]Scapular dyskinesis is defined as the presence of noticeable alterations in the movement patterns of the scapula in relation to the rib cage. It is not well defined and can be associated with various conditions that affect the relationship between the glenohumeral or acromioclavicular joints, as well as muscle activation and coordination.[5]Due to the close neurophysiological relationship between the cervical spine and the shoulder, scapular dyskinesis has been associated with cervical dysfunctions. Scapular dyskinesis can be caused by impairments of scapular muscle stabilizers and correlate positively with the presence of shoulder pain and pathology (Kibler and McMullen, 2003, Kibler and Sciascia, 2010, 2012).[1]

Repetitive movements associated with increased muscle activity that stabilizes the wrist, elbow and shoulder girdle load stress on the surrounding tendons; over time, this can lead to pain due to chronic tendinopathy.[3]

String instruments are the generic term of the instruments that make sound with the vibration of strings. Included in the category of bowed string instruments are the violin, viola, cello, and double bass.[5]Although they include guitars, harps, pianos in the broad meaning, the violin family; violin, viola, cello, and contrabass.[3]

The present study evaluates the presence of scapular dyskinesis in young musicians who play these instruments i.e-1.Violin 2.Sitar 3.Ukulele 4.Guitar.

MATERIALS & METHODOLOGY:

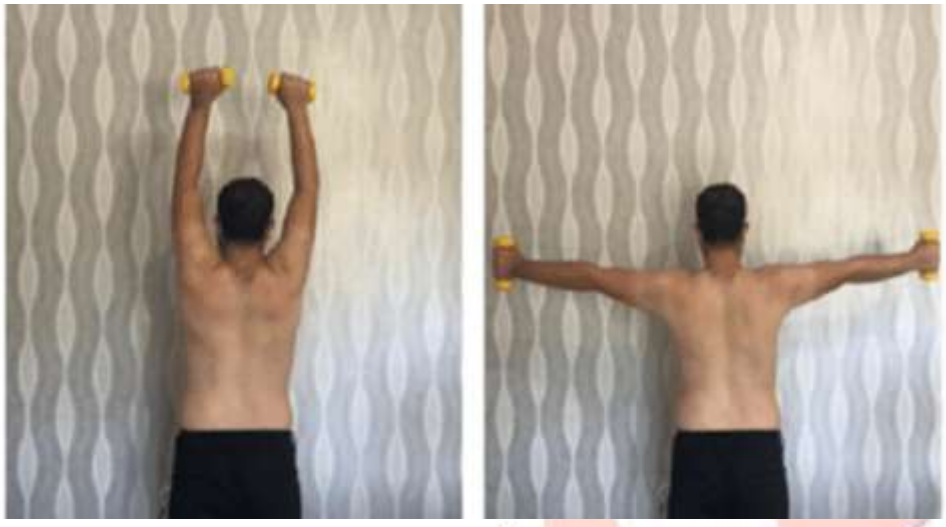
An Observational study was conducted on 90 string players , aged 18-35 years, playing instrument for more than 5 years with frequency of playing the string instrument between 4-5 times a week with 2-2.5 hours of practice sessions. The ones who had swelling, sensory impairment (eg: Diabetes, Arthritis, Pregnancy),Players with Previous Shoulder injuries, Upper limb fracture were excluded from the study. Players with Recent upper extremity & neck injuries were also excluded .Data was collected according to inclusion and exclusion critera. The study was approved by the ethical committee.Consent was taken from each participant before the study & assessment forms were circulated to the string players (participants).

The participants who met the inclusion criteria were selected and added to the study. The participants were explained about the questionnaire. Consent form was taken from the participants. A Pen, Consent Form, Data Collection Sheet, Measuring tape & Dumbells were required to collect data using the Scapular Dyskinesis test & Lateral Scapular Slide test.

•SCAPULAR SLIDE TEST (SDT) ;The Scapular Dyskinesis Test (SDT) is a dynamic, visually based test used to identify scapular dyskinesis. In this test, the patient repeatedly performs active, weighted shoulder flexion and abduction while the clinician observes the scapulohumeral rhythm while standing behind the patient.The presence of scapula dyskineses is defined as an abnormal movement patterns,

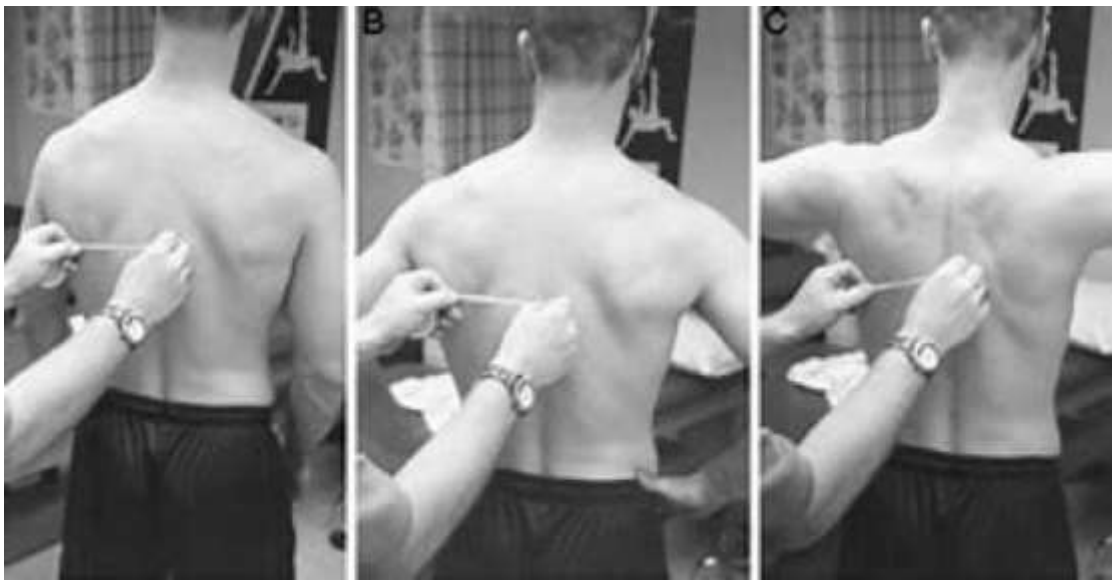
either dysrhythmia (the scapula demonstrates premature or excessive elevation or protraction, nonsmooth motion during arm elevation and/or lowering) or winging (medial border of the scapula and/or inferior angle of the scapula are posteriorly displaced away from the thorax). Based on the combined flexion and abduction test movements, the presence of scapular dyskinesis is classified as either not present (normal) or present (subtle dyskineses or obvious dyskinesis).

Execution:1.The patient is holding two dumbbells of 1.4kg/3lbs if he weighs less than 68.1kg/150lbs or 2.3kg/5lbs if he weighs ≥68.1kg/150lbs.2.The patient is asked to perform 5 repetitions of bilateral flexion followed by 5repetitions of bilateral abduction in the frontal plane with straight elbows and at a cadence of 3 seconds.3. The examiner observes for winging and/or dysrhythmia. Based on the combined flexion and abduction test movements, the presence of scapular dyskinesis is classified as either not present (normal) or present (subtle dyskineses or obvious dyskinesis).
The SDT classification system has shown moderate interrater reliability (weighted kappa 0.48-0.61, 75%-82% agreement).



(image showing scapular slide test)

•LATERAL SCAPULAR SLIDE TEST (LSST):Lateral scapular slide test is used to determine the stability of the scapula during glenohumeral movements. The patient sits or stands with the arm resting at the side. The therapist measures the distance from the base of the spine of the scapula to the spinous process of T2 or T3 (most common) . The patient is then tested holding following 3 positions : 0 degree (shoulder in neutral position with arms relaxed at the sides) , 45 degree abduction (hands on waist, thumbs posteriorly) & 90 degree abduction with medial rotation.
In each postion the distance measured should not vary more than 1-1.5 cm (0.5 inch to 0.75 inch) from the original measure.



(Image showing Lateral Scapular Slide Test)

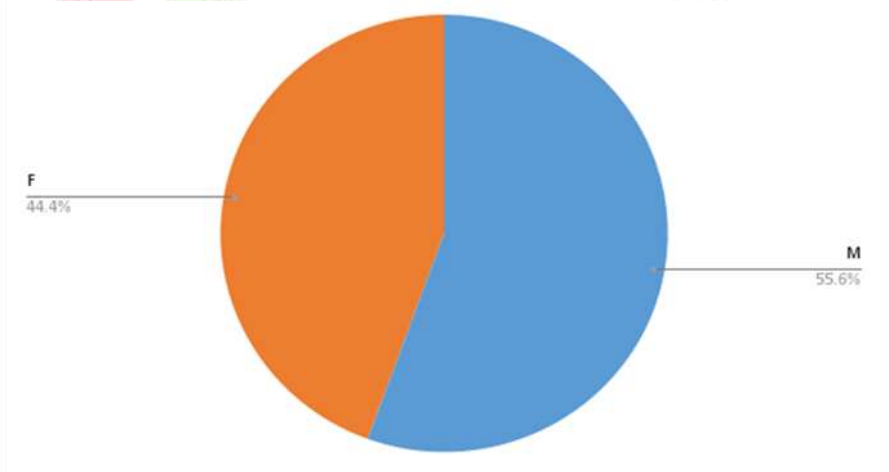
RESULTS

This study was done in 90 String instrument players from Pune.Total 90 Consent forms were recorded & among them:

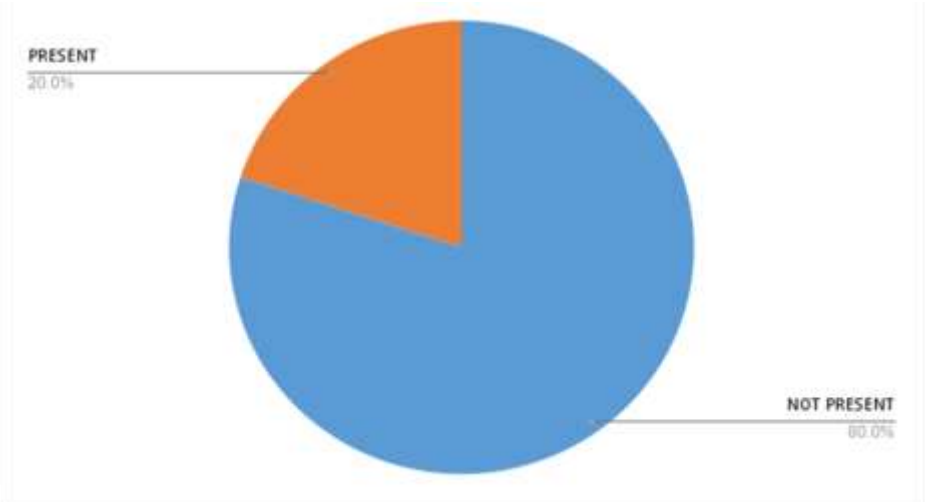
NAME OF INSTRUMENT	TOTAL NUMBER OF PARTICIPANTS	SCAPULAR DYSKINESIS PRESENT
VIOLIN	30	6
SITAR	20	2
UKULELE	20	0
GUITAR	20	2

Table 1: Showing Name of Instrument, total number of participants & total number of scapular dyskinesis present.

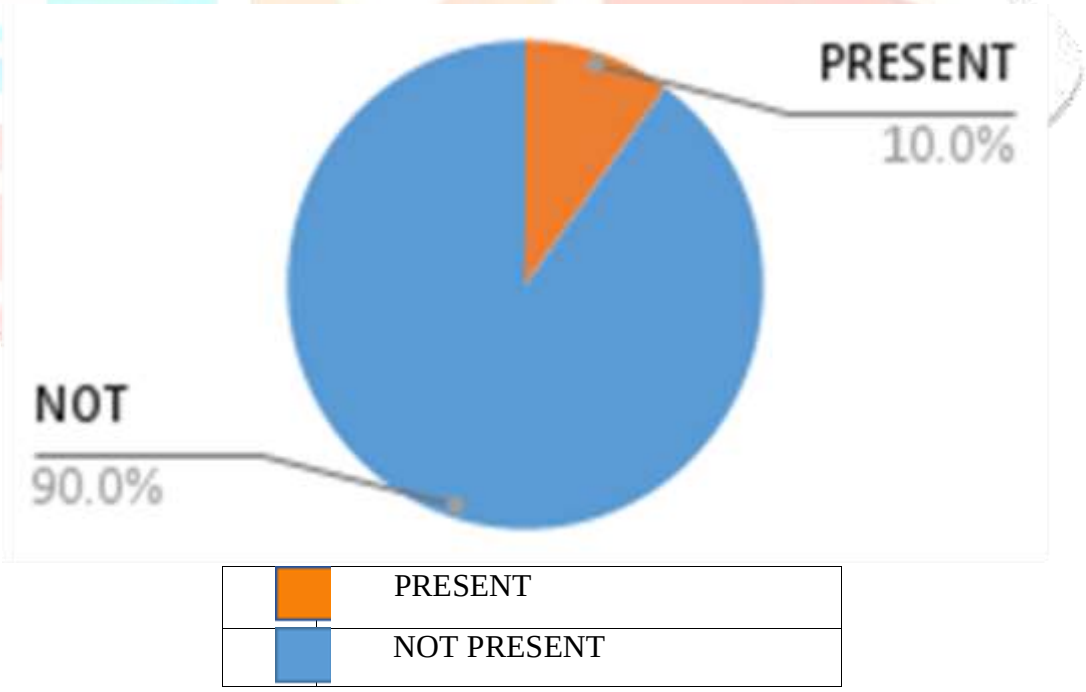
1. From 90 string instrument players, 44.4% were female and 55.67% were male.



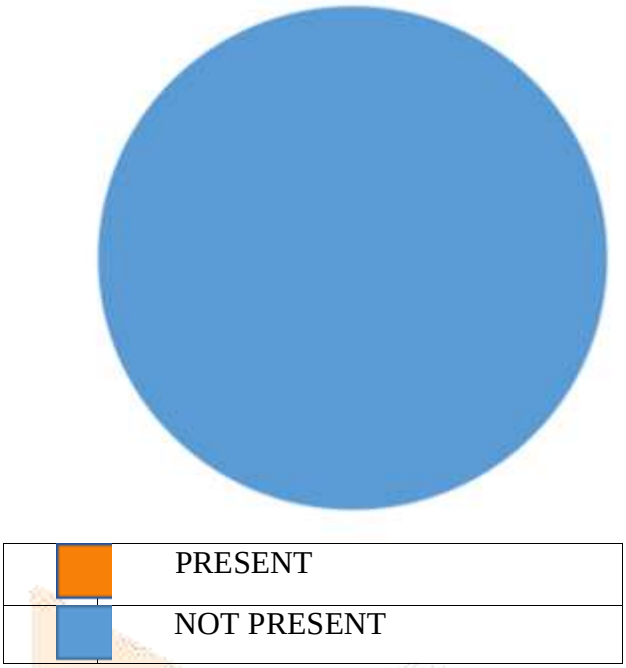
2.30 were violin players from which 6 players had scapular dyskinesis, which shows 20% prevalence.



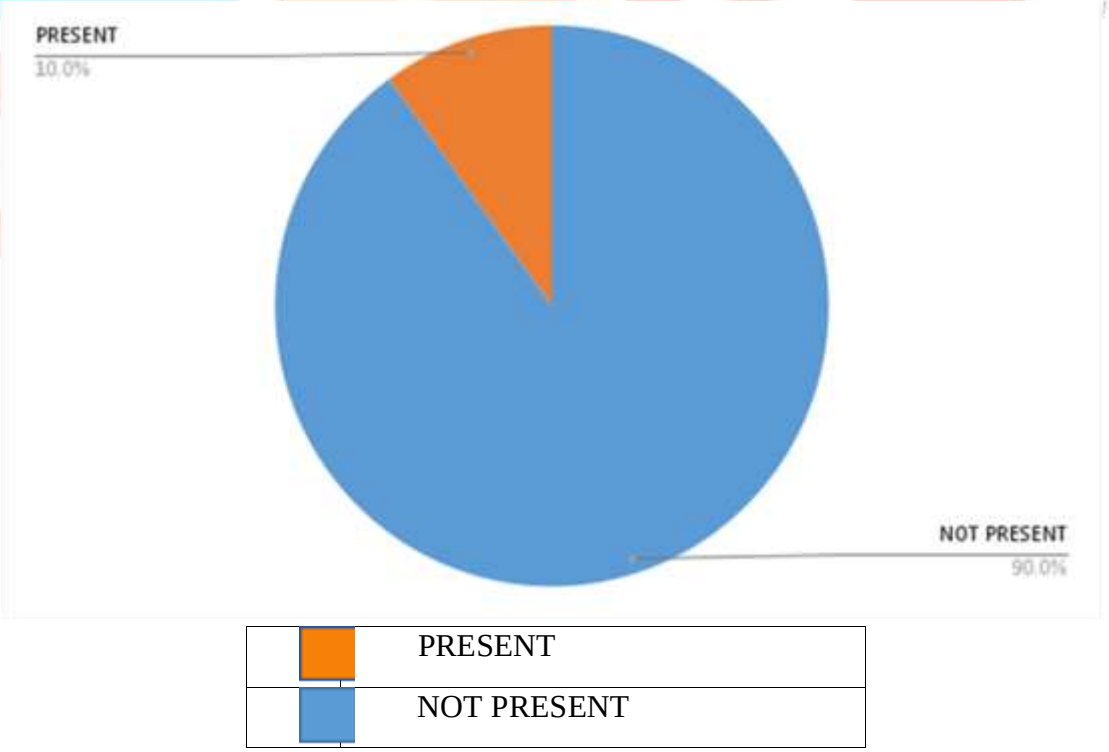
3. 20 were sitar players from which 2 players had scapular dyskinesis, which shows 10% prevalence.



4. 20 were ukulele players in which there was no prevalence of scapular dyskinesis.



5. 20 were guitar players in which 2 players had scapular dyskinesis , which shows 10% prevalence.



Thus ,The results showed that the average age of String players was 25 years , with an average playing experience of 7 years in which this study shows 11 % prevalence of scapular dyskinesis.

DISCUSSION

The aim of this study was to study the prevalence of scapular dyskinesis in string players in and around Pune (Maharashtra).

Total 90 subjects (30 violinists, 20 sitar players, 20 ukulele & 20 guitar players) were assessed to find prevalence of scapular dyskinesis. The scapular dyskinesis was assessed using Scapular dyskinesis test and lateral scapular slide test.Musculoskeletal problems are common in instrumental musicians. Most of these problems can be classified as musculotendinous overuse, nerve entrapment/thoracic outlet syndrome, or motor dysfunction. Also seen in musicians are problems related to hypermobility and degenerative arthritis. Although these problems are seen in all instrumentalists, their prevalence is highest in professional musicians, with string players most commonly affected by musculotendinous overuse.(6)

Playing a musical instrument involves a vast combination of actions, including rapid, repetitive and complicated movements of the hands and fingers, which requires considerable effort from the muscles, ligaments and bones.(7)Static muscular work in an instrument-specific body posture frequently results in overstress of muscles, tendons and joints, resulting to musculoskeletal pain. As repetitive periods of pain over the years are frequently accompanied by neuromuscular alterations and genesis of pain memory, there is generally the risk of developing a chronic pain syndrome, leading to avoidance of optimal postures caused by pain, and losses of fine motoric skills caused by muscular tenseness and hypo-mobility of the affected joints.(2)

Pain is the main symptom of overuse lesions and musicians who play string instruments are the most affected. There are intrinsic and extrinsic factors for these disorders. The relationship between musicians and their instruments is the focal point of ergonomic analysis and biomechanical training, while postural alignment is essential, leading to appropriate neck and hand positions.(7)

A combination of factors exposes string musicians to neuro-musculo-skeletal disorders associated with pain and damage. These include: overuse due to the long playing hours involving repetitive movements under stressful conditions in unnatural posture. Although the disorders are usually non-traumatic, they may often lead to prolonged or even permanent damage.(8)

The result of this study showed greater prevalence scapular dyskinesis in violinists followed by sitar & guitar players.

In violin playing, the neck and shoulder muscles of the left side are engaged in holding the instrument. The sternocleidomastoid supports the violin during rotation and depression movement of the chin.The trapezius, while taking part in supporting and securing the violin, also holds the head in place, and acts as a stabilizer muscle for the continually abducted left arm.The left shoulder muscles, particularly the anterior deltoid, are used to support the raised left arm.This asymmetrical posture can lead to uneven loading on the shoulder girdle, potentially causing muscular imbalances and altered scapular mechanics.(8)

The shoulder muscles, such as the deltoid, have been described as being active during the continual movement of the right arm when playing. The greatest muscle activity is found when the shoulder is horizontally abducted and flexed, at the beginning of a down-bow, especially at low speeds.During the down-bow, the deltoid and biceps in the right arm act eccentrically because their torques have to perform work against gravity torque.(8)

Bowing movement thus appears to be controlled by the shoulder rather than elbow as abduction in the shoulder is needed to be able to switch strings on the violin. Continuous bowing motions can lead to overuse injuries, muscle fatigue, and altered biomechanics in the shoulder girdle, predisposing violinists to scapular dyskinesis.(8)

Furthermore,The work of violinists requires a seated position throughout the entire rehearsal and performance period. They look for the best body position, seeking balance and distribution of body weight to obtain greater motor control and precision of movements in the instrumental execution.(8)

While playing the sitar, specific hand motions and postures can contribute to scapular dyskinesis, particularly due to the asymmetrical nature of the instrument and repetitive movements involved. During sitar playing, the right hand (for right-handed players) engages in repetitive motions of plucking or strumming the strings with the mizrab (metal plectrum). This action often requires elevating and protracting the shoulder, leading to increased tension and potential fatigue in the muscles surrounding the shoulder girdle, including the upper trapezius, levator scapulae, and serratus anterior.

Prolonged elevation and protraction of the shoulder can alter the normal scapular mechanics, leading to decreased stability and control of the scapula. This may result in abnormal movement patterns, such as

excessive upward rotation or anterior tilt of the scapula, which can contribute to scapular dyskinesis over time.Repetitive shoulder elevation and protraction without proper muscle conditioning and postural support can lead to muscle imbalances, with some muscles becoming overactive or fatigued while others become weakened or inhibited. Imbalances between the muscles that stabilize and move the scapula may contribute to altered scapular mechanics and the development of dyskinesis.

While playing guitar, the picking hand (usually the right hand) may undergo repetitive motions such as strumming or picking. Continuous strumming or picking can lead to overuse injuries and muscle fatigue in the shoulder girdle muscles, potentially contributing to scapular dyskinesis.

The repetitive motions of the picking hand, combined with prolonged playing sessions and poor posture, can lead to muscle imbalances in the shoulder region. Imbalances between the muscles that stabilize and move the scapula may disrupt the coordinated movement of the scapula, contributing to dyskinesis.

Additionally, asymmetrical postures during guitar playing, especially if one shoulder is elevated or protracted more than the other, can further exacerbate scapular dyskinesis. This asymmetry can lead to altered scapular mechanics and increased strain on the shoulder girdle muscles, increasing the risk of dyskinesis. Guitar players often engage in long practice sessions without adequate rest and recovery, leading to cumulative stress on the shoulder girdle muscles.

These factors may have contributed to show the results stating the prevalence of scapular dyskinesis in string players.

CONCLUSION

Thus the study concludes that the prevalence of scapular dyskinesis is 11% in string players in & around Pune.

LIMITATION

Post their music session, the students were in a hurry to reach home so they weren't cooperative for the study.The students were hesitant to expose their back as they were uncomfortable.

Findings may only apply to the specific population study (string players aged 18 to 35 years old) and may not be applicable to other demographic groups.

FUTURE SCOPE OF STUDY

Future study should expand the sample size to represent string players in Maharashtra.

Strengthening exercise along with ergonomic advice to improve the posture while playing string instrument can be intervened to the participants to reduce the prevalence of scapular dyskinesis in them.

This study can be conducted on other string players.

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