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"PREVALENCE OF UPPER CROSS SYNDROME AMONG DENTAL STUDENTS WITH THE USE OF SURGIMAP SPINE SOFTWARE IN SANGLI DISTRICT."

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Abstract: **Background:**

Upper cross syndrome (UCS) is a frequent postural dysfunctional pattern in which the musculature of the shoulder girdle/cervicothoracic region of the body has a dysfunctional tone. UCS refers to a distinct altered muscle activation pattern, as well as changed movement patterns and postural abnormalities, according to Vladimir Janda. The term "rounded shoulders" is frequently used to characterize the upper crossing syndrome's rounded forward shoulder girdle and arm position. The levator scapulae, pectoralis major, and upper trapezius have tightness, excessive facilitation, and over excitation, whereas the serratus anterior, deep neck flexors, notably the scalene, middle trapezius, lower trapezius, and rhomboids, have weakness, inhibition, and suppression. Upper cross syndrome is characterised by a forward head position, thoracic spine hunching, lifted and protracted shoulders, scapular winging, and limited thoracic spine mobility. Muscle imbalances, discomfort, and reduced range of motion result from these aberrant postural variations, which cause stress on muscles and articulating surfaces. The craniocervical, cervico-thoracic, and gleno-humeral joints, as well as the C4-C5 and T4-T5 segments, are commonly impacted joints. This ailment is given the term "cross" because a "X" (a cross) can be drawn across the upper torso. Muscle imbalance between tonic and phasic muscle is the most common cause of this condition.

Purpose of Study:

The purpose of this study was to find out the prevalence of upper cross syndrome in dental students by using Surgimap Spine Software.

Material And Methodology:

Fourty five dental students from both genders,age group between 22 to 28 with history of neck pain or soft tissue related problems were taken for the study.NPRS were used to check the quantity of pain and also neck disability index were used for the assessment.The craniovertebral angle was measured using the surgimap spine software.

Results:

Demographic profile of subjects studies was analyzed,and proportion of upper cross syndrome in dental students was assessed as per inclusion criteria that is 22 to 28 years, with history of neck pain, soft tissue related problems were included.On correlation analysis NPRS with craniovertebral angle showed non significant result at 5% value [0.471] The prevalence rate of forward head in subject with high NPRS was 86.67%.

Conclusion:
The study proves that there is presence of forward head posture as there is reduced in craniovertebral angle measured by surgimap spine software between the age group of 22 to 28 among the dental students of sangli district.

***Keywords*: Upper Cross Syndrome, Neck Disability Index Questionnaire, Numerical Pain Rating Scale, Surgimap Spine Software, Craniovertebral Angle, Forward Head Posture.**

INTRODUCTION

Upper cross syndrome (UCS) is a frequent postural dysfunctional pattern in which the musculature of the shoulder girdle/cervicothoracic region of the body has a dysfunctional tone. UCS refers to a distinct altered muscle activation pattern, as well as changed movement patterns and postural abnormalities, according to Vladimir Janda[1]. The term "rounded shoulders" is frequently used to characterize the upper crossing syndrome's rounded forward shoulder girdle and arm position. The levator scapulae, pectoralis major, and upper trapezius have tightness, excessive facilitation, and over excitation, whereas the serratus anterior, deep neck flexors, notably the scalene, middle trapezius, lower trapezius, and rhomboids, have weakness, inhibition, and suppression[2].

Upper cross syndrome is characterised by a forward head position, thoracic spine hunching, lifted and protracted shoulders, scapular winging, and limited thoracic spine mobility. Muscle imbalances, discomfort, and reduced range of motion result from these aberrant postural variations, which cause stress on muscles and articulating surfaces. The craniocervical, cervico-thoracic, and gleno-humeral joints, as well as the C4-C5 and T4-T5 segments, are commonly impacted joints [2] This ailment is given the term "cross" because a "X" (a cross) can be drawn across the upper torso. Muscle imbalance between tonic and phasic muscle is the most common cause of this condition.[3]

Tonic muscles are those that are frequently tense, i.e. excessively facilitated, whereas phasic muscles are those with lower activation, i.e. those that are more prone to developing inhibition. Muscles that are normally tight/overly facilitated are represented by one arm of the cross, while the muscles that are typically weak/overly inhibited are represented by the other arm of the cross. [3]

Proper posture is linked to a variety of biomechanical, motor control, and performance characteristics for optimal functional performance. A deviation from a healthy posture indicates the presence of a neuromuscular imbalance and musculoskeletal pain. Upper cross syndrome is characterised by a forward head position, thoracic spine hunching, lifted and protracted shoulders, scapular winging, and limited thoracic spine mobility. Muscle imbalances, discomfort, and reduced range of motion result from these aberrant postural variations, which cause stress on muscles and articulating surfaces.The cranio-cervical, cervico-thoracic, and gleno-humeral joints, as well as the C4-C5 and T4-T5 segments, are commonly impacted joints [2]

he cervical angle is a reliable angle to measure the FHP . The angle between the horizontal line passing through the spinal process of C7 and the line that attach the central point of the tragus of the ear to the spinal process of C7 considered as the cervical angle. A skin marker was placed on the spinal process of C7. If the cervical angle was less than 50°, the subject would be considered to have FHP.15

This ailment is given the term "cross" because a "X" (a cross) can be drawn across the upper torso. Muscle imbalance between tonic and phasic muscle is the most common cause of this condition.[3]

There is no standard method for determining posture in photographs taken visually or by other means. Simple tools like a tape measure, a pencil landmark, or a plumb line are used to assess posture subjectively, whereas angular measurements between anatomical landmarks are used to analyse posture quantitatively. the lack of a suitable clinical quantitative assessment tool to track postural changes.

Although sophisticated three-dimensional posture analysis tools such as Optotrak, Vicon, Motion Analysis, and Surface topography are available, most clinics cannot afford them.

Surgimap Spine is a Software package created for medical professionals. It is a free computer programme that may be used to examine, store, and transport photographs. Researchers investigated the accuracy of Surgimap in determining the cobb angle and analysing the sagittal plane. The Surgimap Spine Software had previously been used by orthopaedics for radiological purposes, but it had never been used for photographic analysis, so the goal of this study was to determine the intra-rater and inter-rater reliability of Surgimap in measuring spinal postural angles from images of normal adolescent students in schools.

Proper posture is important for optimal functional performance, and is associated with many biomechanical, motor control, and performance variables. Deviation from healthy posture suggests the presence of neuro-muscular imbalance and may be associated with certain musculoskeletal disorders.13

Upper crossed syndrome(UCS) is an abnormal posture that according to Vladimir Janda (1923-2002) refers to a specifically altered muscle activation pattern (especially in the neck, trunk and scapular muscles) and altered movement patterns(scapular dyskinesis) along with postural deviations.These changes can lead to various musculoskeletal symptoms in the head, neck, shoulder, and upperback, and it is, therefore, essential to quantify US behavior because of its consequences.14

NEED OF STUDY

- Previous studies has shown that there is presence of upper cross syndrome in physiotherapy students.
- Also studies shows that there is presence of upper cross syndrome in bank employees.
- But there is lack of study in prevalence of upper cross syndrome in dental students of Sangli district.
- Hence the need of my study is to find out the prevalence of upper cross syndrome in dental students of Sangli district.

AIMS AND OBJECTIVES

AIM

- To find out occurence of upper cross syndrome in dental students in Sangli district by use of Surgimap Spine Software.

OBJECTIVE OF THE STUDY

- To find out prevalance of upper cross syndrome in dental students
- To evaluate prevalance of upper cross syndrome in dental students by using Neck Disability Index Questionnaire.
- To evaluate prevalence of upper cross syndrome in dental students by using Numerical Pain Rating Scale.

REVIEW OF LITERATURE

- **1.Sanjana S. Zad , Pragati Patil [2021]** – The purpose of the study was to find the effectiveness of Janda's approach in upper cross syndrome in medical students. Outcome measures like neck disability index questionaire, cranio-vertebral angle, numerical rating scale was used. It was concluded that warm up exercise before treatment and cool down exercise after treatment with stretching and strenghtning exercise and ergonomic advice was effective in upper cross syndrome in medical students.

- **2. Khokhar HL , Khan A , Zia A [2021]** The objective of the study was to assess the prevalence of upper cross syndrome among the students of Doctor of Physical Therapy and Bachelors of Eastern Medicine and Surgery at unversity of Balochistan Quetta , Pakistan. A self constructed questionnaire comprised of 18 questions was used as outcome measure. It was concluded that upper cross syndrome has high prevalence in the students of DPT and BEMS in faculty of pharmacy and health science, at unviversity of Balochistan Quetta, Pakistan

- **3. Andrew Ng, Melanie J. Hayes [2016]** – The purpose of the study was to see the musculoskeletal disorders and working posture among dental and oral health students. A self-reporting questionnaire measuring MSD prevalence and Branson's Dental Operator Posture Assessment Instrument is used as outcome measure. The result of the study concluded that there is high prevalence of poor posture in older dental students.

- **4. Mohammed K. Yousef, Afnan O. AL-Zain [2009]** – The purpose of the study is to see posture evaluation of dental students. Posture assessment is taken as outcome measure. The study concluded that there are postural changes among the dental student.

MATERIALS AND METHODOLOGY

MATERIALS

- Writing material
- Surgimap Spine Software
- Neck Disability Index Questionnaire.

METHODOLOGY

- Type of study – cross-sectional study
- Study duration – 6 months
- Sampling techniques – purposive sampling
- Study population – dental students with history of neck pain
- Sample size – 35 subjects
- Study setting – dental colleges and hospitals in Sangli

INCLUSION AND EXLUSION CRITERIA

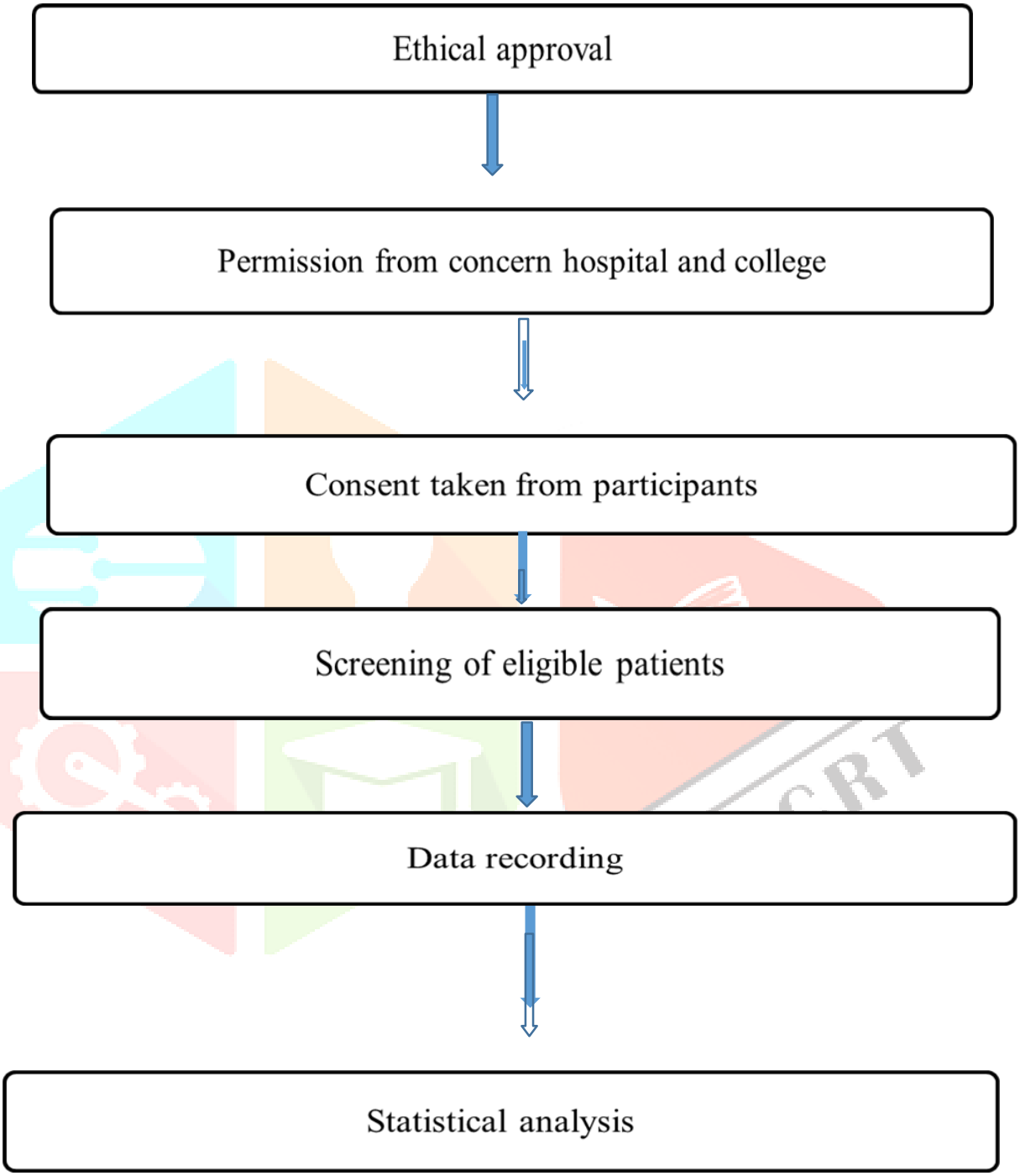
Inclusion criteria

- Both male and females
- Age group between 22 to 28
- History of neck pain
- Soft tissue related problems

Exclusion criteria

- History of upper body trauma
- History of postural structural deformity
- Patients with cervical radiculopathy
- Malignancy

PROCEDURE


Ethical approval
Permission from concern hospital and college
Consent taken from participants
Screening of eligible patients
Data recording
Statistical analysis

1) **CRANIOVERTEBRAL ANGLE:**

Procedure:- A digital imagining technique will be used to evaluate the head and neck posture in standing position.
A mobile phone (64 megapixel) will be placed at a distance of 150 cm on a tripod stand and height will be adjusted according to the level of the subject's shoulder.
Adhesive tapes will be used to locate the C7 spinous process and tragus of the ear.
The subjects will be then asked to stand laterally so that their left shoulder is facing the camera.
The subjects will be instructed to stand comfortably with their weight evenly distributed on both feet and the eyes looking straight forward.
Then the subjects will be instructed to flex and extend the head three times and then rest it in a comfortable position.
An image will be taken with the mobile camera and then the angle will be measured using the Surgimap software.

Surgimap Software Reliablity- 0.99

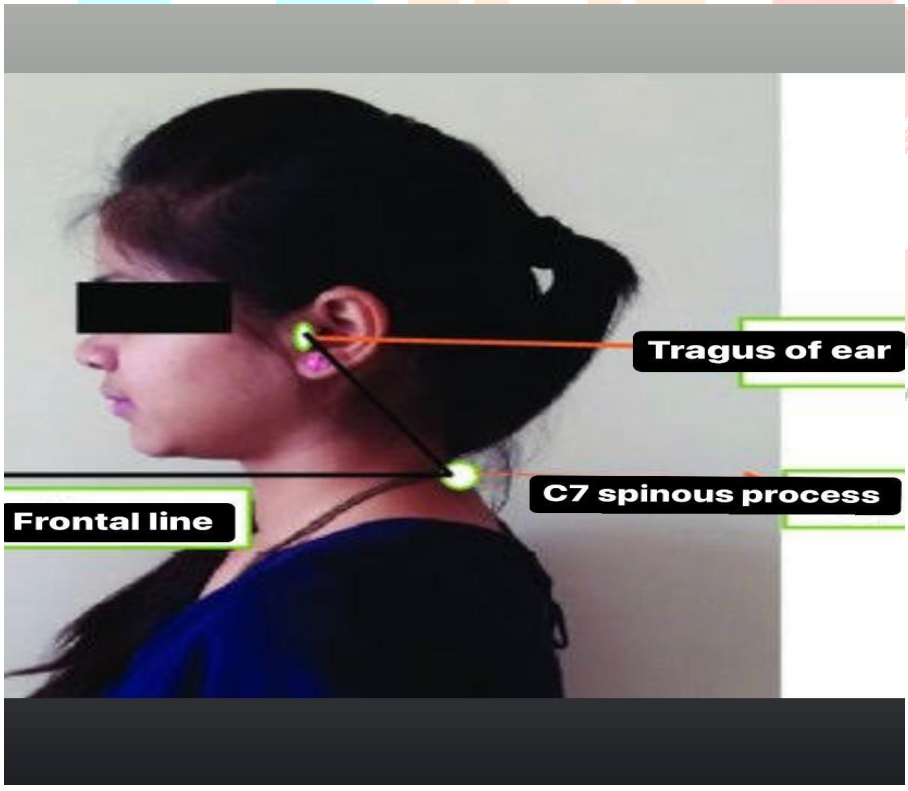
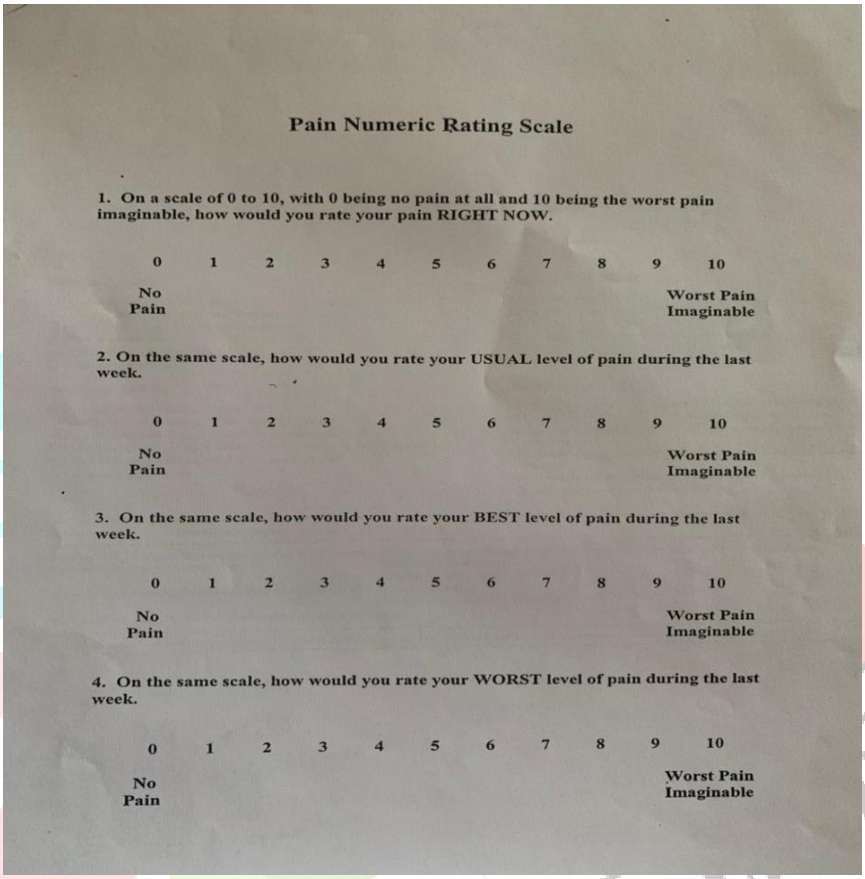


Fig No. 1 CRANIOVERTEBRAL ANGLE

Numerical Pain Rating Scale

Procedure: In a Numerical Rating Scale (NRS), patients are asked to circle the number between 0 and 10, 0 and 20 or 0 and 100 that fits best to their pain intensity. Zero usually represents 'no pain at all' whereas the upper limit represents 'the worst pain ever possible.

Scale reliability:ICC= 0.64 to 0.86



Pain Numeric Rating Scale

1. On a scale of 0 to 10, with 0 being no pain at all and 10 being the worst pain imaginable, how would you rate your pain RIGHT NOW.

0 1 2 3 4 5 6 7 8 9 10

No Pain — Worst Pain Imaginable

2. On the same scale, how would you rate your USUAL level of pain during the last week.

0 1 2 3 4 5 6 7 8 9 10

No Pain — Worst Pain Imaginable

3. On the same scale, how would you rate your BEST level of pain during the last week.

0 1 2 3 4 5 6 7 8 9 10

No Pain — Worst Pain Imaginable

4. On the same scale, how would you rate your WORST level of pain during the last week.

0 1 2 3 4 5 6 7 8 9 10

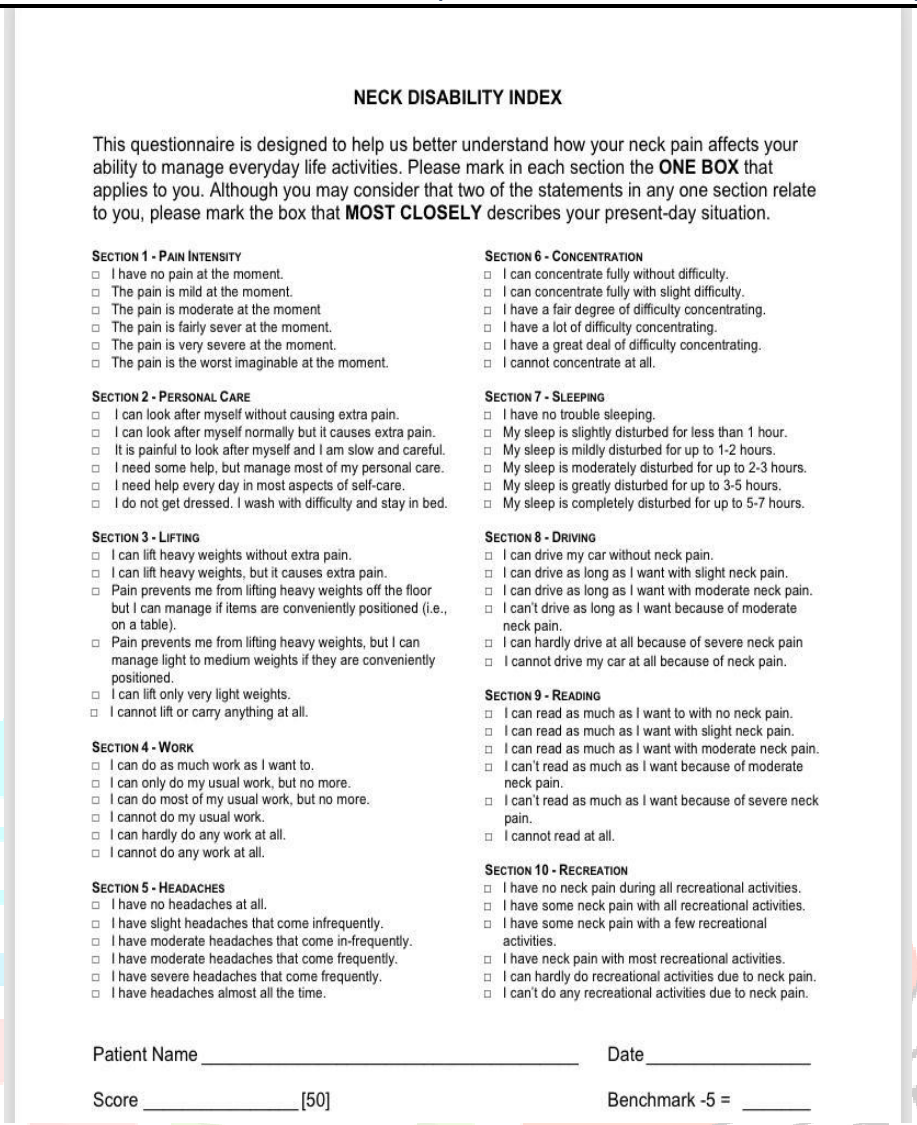
No Pain — Worst Pain Imaginable

Fig no.2 Numerical Pain Rating Scale

Neck Disability Index Questionnaire

Procedure: It consists of ten questions each with six answers (scoring 0–5 points). The sum of the scores obtained is doubled to give a percentage score out of 100 (0–20 normal, 21–40 mild disability, 41–60 moderate, 61–80 severe and 80+ complete/exaggerated). It is simple and takes around 5 min to complete and score.

Scale reliability: ICC0.50 to 0.98



NECK DISABILITY INDEX

This questionnaire is designed to help us better understand how your neck pain affects your ability to manage everyday life activities. Please mark in each section the **ONE BOX** that applies to you. Although you may consider that two of the statements in any one section relate to you, please mark the box that **MOST CLOSELY** describes your present-day situation.

SECTION 1 - PAIN INTENSITY
- □ I have no pain at the moment.
- □ The pain is mild at the moment.
- □ The pain is moderate at the moment
- □ The pain is fairly sever at the moment.
- □ The pain is very severe at the moment.
- □ The pain is the worst imaginable at the moment.

SECTION 2 - PERSONAL CARE
- □ I can look after myself without causing extra pain.
- □ I can look after myself normally but it causes extra pain.
- □ It is painful to look after myself and I am slow and careful.
- □ I need some help, but manage most of my personal care.
- □ I need help every day in most aspects of self-care.
- □ I do not get dressed. I wash with difficulty and stay in bed.

SECTION 3 - LIFTING
- □ I can lift heavy weights without extra pain.
- □ I can lift heavy weights, but it causes extra pain.
- □ Pain prevents me from lifting heavy weights off the floor but I can manage if items are conveniently positioned (i.e., on a table).
- □ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.
- □ I can lift only very light weights.
- □ I cannot lift or carry anything at all.

SECTION 4 - WORK
- □ I can do as much work as I want to.
- □ I can only do my usual work, but no more.
- □ I can do most of my usual work, but no more.
- □ I cannot do my usual work.
- □ I can hardly do any work at all.
- □ I cannot do any work at all.

SECTION 5 - HEADACHES
- □ I have no headaches at all.
- □ I have slight headaches that come infrequently.
- □ I have moderate headaches that come in-frequently.
- □ I have moderate headaches that come frequently.
- □ I have severe headaches that come frequently.
- □ I have headaches almost all the time.

SECTION 6 - CONCENTRATION
- □ I can concentrate fully without difficulty.
- □ I can concentrate fully with slight difficulty.
- □ I have a fair degree of difficulty concentrating.
- □ I have a lot of difficulty concentrating.
- □ I have a great deal of difficulty concentrating.
- □ I cannot concentrate at all.

SECTION 7 - SLEEPING
- □ I have no trouble sleeping.
- □ My sleep is slightly disturbed for less than 1 hour.
- □ My sleep is mildly disturbed for up to 1-2 hours.
- □ My sleep is moderately disturbed for up to 2-3 hours.
- □ My sleep is greatly disturbed for up to 3-5 hours.
- □ My sleep is completely disturbed for up to 5-7 hours.

SECTION 8 - DRIVING
- □ I can drive my car without neck pain.
- □ I can drive as long as I want with slight neck pain.
- □ I can drive as long as I want with moderate neck pain.
- □ I can't drive as long as I want because of moderate neck pain.
- □ I can hardly drive at all because of severe neck pain
- □ I cannot drive my car at all because of neck pain.

SECTION 9 - READING
- □ I can read as much as I want to with no neck pain.
- □ I can read as much as I want with slight neck pain.
- □ I can read as much as I want with moderate neck pain.
- □ I can't read as much as I want because of moderate neck pain.
- □ I can't read as much as I want because of severe neck pain.
- □ I cannot read at all.

SECTION 10 - RECREATION
- □ I have no neck pain during all recreational activities.
- □ I have some neck pain with all recreational activities.
- □ I have some neck pain with a few recreational activities.
- □ I have neck pain with most recreational activities.
- □ I can hardly do recreational activities due to neck pain.
- □ I can't do any recreational activities due to neck pain.

Patient Name _____ Date _____

Score _____[50] Benchmark -5 = _____

Fig no.3 Neck Disability Index Questionnarie

STATISTICAL ANALYSIS

Statistical analysis was calculated using :-

- Karl Pearson Correlation Analysis

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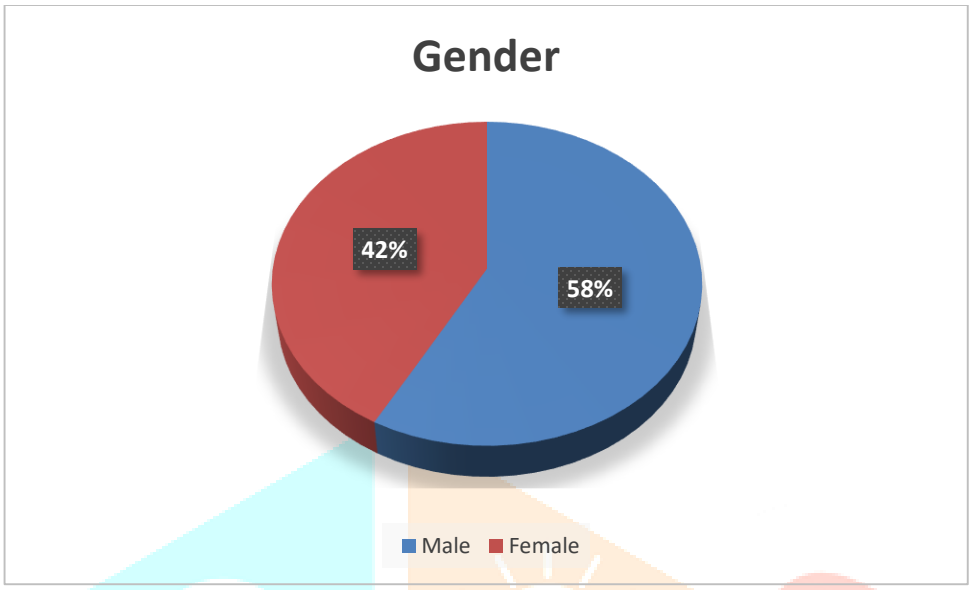
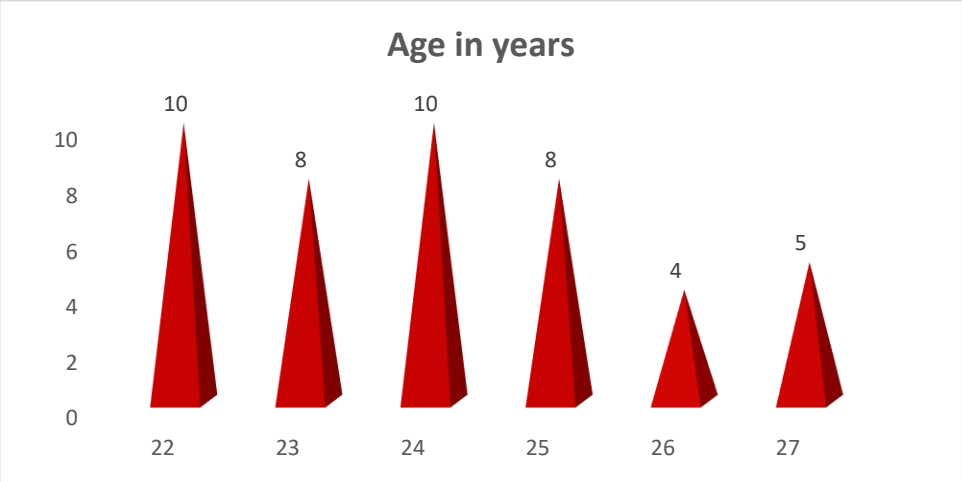
Gender	Frequency	Percent
Male	26	58
Female	19	42
Total	45	100

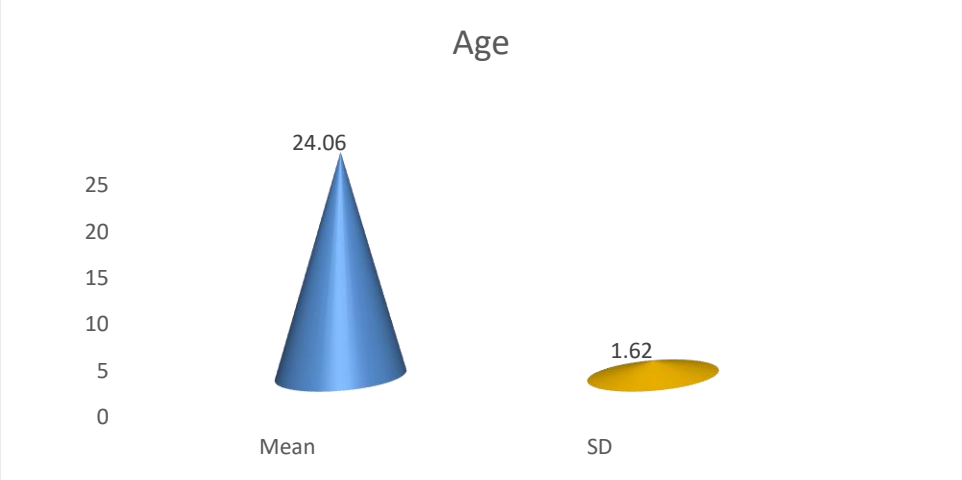


Age in years	Frequency	Percent
22.00	10	22.2
23.00	8	17.8
24.00	10	22.2
25.00	8	17.8
26.00	4	8.9
27.00	5	11.1
Total	45	100



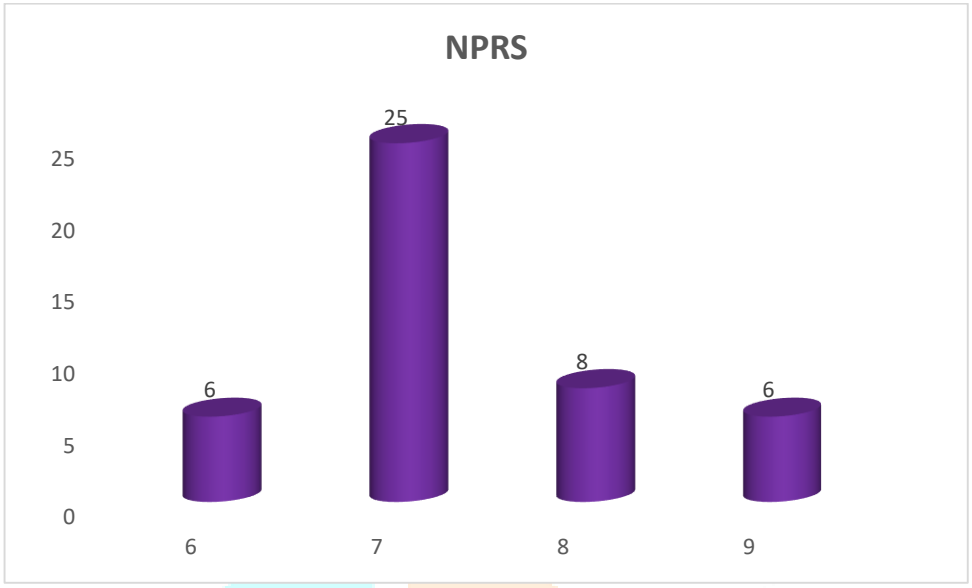
Descriptive Statistics

Particular	Minimum	Maximum	Mean	SD
Age	22.00	27.00	24.06	1.62

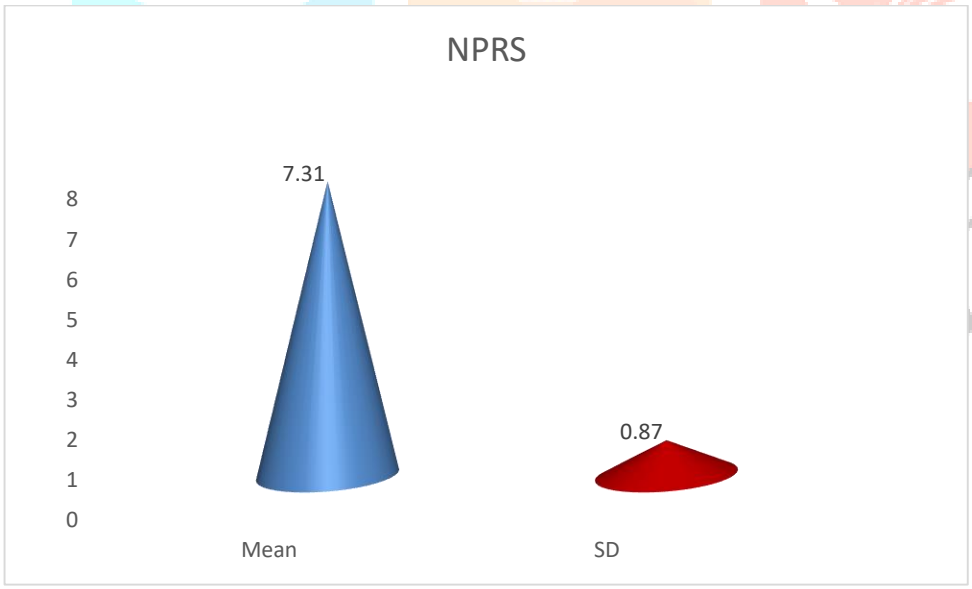


NPRS	Frequency	Percent
6.00	6	13.3
7.00	25	55.6
8.00	8	17.8
9.00	6	13.3

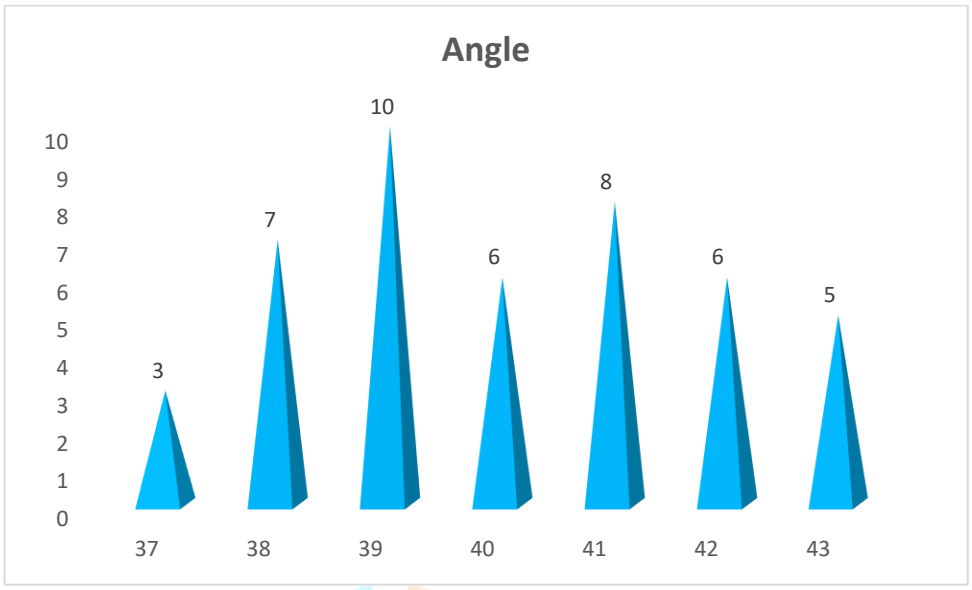
Total	45	100



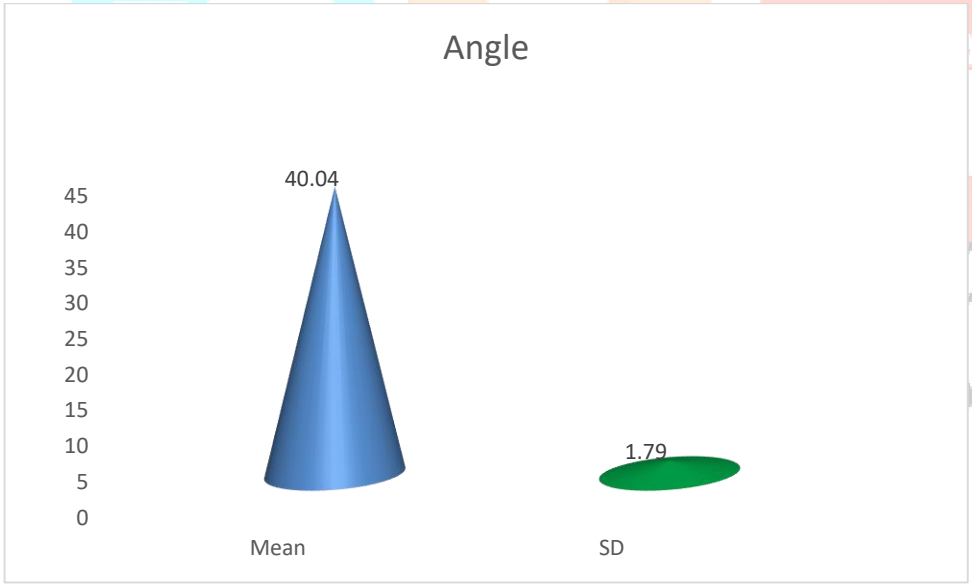
Particular	Minimum	Maximum	Mean	SD
NPRS	6.00	9.00	7.31	0.87



Angle	Frequency	Percent
37.00	3	6.7
38.00	7	15.6
39.00	10	22.2
40.00	6	13.3
41.00	8	17.8
42.00	6	13.3
43.00	5	11.1
Total	45	100



Particular	Minimum	Maximum	Mean	SD
Angle	37.00	43.00	40.04	1.79



Karl Pearson Correlation Analysis

Variable X	Variable Y	r-value	p-value	Result
Age	NPRS	-0.063	0.682	Non-Significant at 5% Non-Linear association
	Angle	0.147	0.337	Non-Significant at 5% Linear association

Correlation coefficient r-value for Age and NPRS has been recorded as -0.063 which is statistically non-significant at 5% level with non-linear association. It means both the variables are moving in the opposite direction at the time association with each other. It is also called as indirect relationship between the variables

Correlation coefficient r-value for Age and Angle has been recorded as 0.147 which is statistically non-significant at 5% level with linear association. It means both the variables are moving in the same direction at the time association with each other. It is also called as direct relationship between the variables

Karl Pearson Correlation Analysis

Variable X	Variable Y	r-value	p-value	Result
NPRS	Angle	-0.110	0.471	Non-Significant at 5% Non-Linear association

Correlation coefficient r-value for NPRS and NPRS has been recorded as -0.110 which is statistically non-significant at 5% level with non-linear association. It means both the variables are moving in the opposite direction at the time association with each other. It is also called as indirect relationshipbetween the variables

DISSCUSSION

The findings of this study revealed the prevalence of Upper Cross syndrome (UCS) in dental students of Sangli district. It was revealed that female gender was more vulnerable to develop the disorder while prolonged working hours showed significant association to disability the reason behind this might be the poor posture and weak musculature. Similarly, a study conducted by ***Trinkoff et al17*** determined the relationship between prolonged working duration and musculoskeletal problems among registered nurses showed that 13+ hours per day, off shifts, weekend work, overtime or continuous working are the factors to develop musculoskeletal disorders along this low salaries and psychological stress increase the burden of Work-Related Musculoskeletal Disorders. Therefore, reduced hours and relax shifts are required to minimize the risk of Musculoskeletal Disorders and recovery time. Likewise, our study reported that most of the individuals worked for 40-60 hours/week have moderate disability therefore certain measures has be to taken for the lifelong consequences.

Another study conducted by ***Tolu and Basaran18*** declared that 98.4% healthcare professionals who worked for longer duration in operation theater or emergencies reported to have complaints of muscular deficiency developed within 1 year, in particular with low back disorders (70.7%). Furthermore, it was revealed that women were more likely to develop Work Related Musculoskeletal Disorders in the upper back this might be due to weak upper limb posture than in men, similar to this study as women were found to be prone to Upper Cross Syndrome (UCS). Therefore, inappropriate postural position may be serving as predominant risk factor in Musculoskeletal Disorders development.

A study conducted by Daneshmandi19 determined the association between Upper Cross syndrome (UCS). The analysis revealed the measurements of forward head inclination, rounded shoulder and upper back

kyphosis was found to be increased. The concept was in contrast with the general assumption, that body building is a sport for growth and development of a symmetrical muscle form rather it may cause imbalance between tonic and phasic muscles of the body. Moreover, lack of proper stretching before and after training can also results in reduced shoulder mobility, increasing muscle bulk can also reduce the mobility of limbs. Thus, Upper Cross syndrome (UCS) may also be seen prevalent among such professions yet it is unexplored till date. Besides, ***Shahid et al20*** also determined the association forward head posture on neck disability and associated level of stress among undergraduate students in which 70 (56%) students presented with forward chin posture, 3(4.2%) students had moderate disability, 37(52.8%) students with severe disability were reported. Whereas, 23 (32.8% had low, 30 (42.8%) moderate and 17 (24.2%) high stress. There was a significant co relation with forward head posture and level of stress but no effect on functional disability.

Furthermore, number of studies reported that dental students have frequent workrelated injuries that are often unreported due to busy schedule or to avoid job incompetence. Moreover, the most affected body regions are lower back, upper back, shoulders and neck respectively. However, analysis has been done in our study to report that which sector of dental students had the highest percentage with poor posture 68%. are more prone to develop Musculoskeletal Disorders with respect to age, gender, working hour, posture, psychological issues and work performance respectively.

Prevalence of Upper Cross syndrome (UCS) has been studied among students as well, a study that concluded that medical students who did not give attention to their postures, prolong duration of classes and long term time spending on laptops/ personal computer led them to develop Upper Cross syndrome (UCS) in their future, was found to be 37.1%22. This condition is not only prevalent among professional health care workers but also related in abundance with the labors in various sectors of the industry.

A study by ***Mujawar, and Sagar23*** have figured out a prevalence of Upper Cross syndrome (UCS) being 28% in laundry workers owing to their abnormal posture for long working hours. The chief complaints were noted as neck pain presenting with forward head and neck posture. There is need for more researchers in work related musculoskeletal disorders to be studied with respect to profession, age, gender and the chief complains, psychological issues, work performance and the limitations this condition makes for an individual in his/her life24,25.

Although the prevalence and incidence of Upper Cross Syndrome (UCS) have been studied in different populations, including laundry workers to office workers, from students to various health care professionals, among the best of author's knowledge, this is the first study addressing the prevalence of UCS among dental students community working in sangli district, besides this study has established the strong correlation of Upper Cross Syndrome with Work Related Musculoskeletal Disorders.

In recent COVID crises, the data was collected electronically through emails or social media platforms as well as screening was based upon the participant's perception that might lead towards the biasness. Furthermore, sample size was not completely fulfilled due to ongoing pandemic.

CONCLUSION

Present study was done in Sangli district community among the dental students to assess the upper cross syndrome with the help of **Surgimap Spine Software, Numerical Pain Rating Scale, Neck Disability Index Questionnaire.** The study concluded that there is presence of forward head posture as there is reduced in craniovertebral angle measured by Surgimap spine software between the age group of 22 to 28 among the dental students of Sangli district.

LIMITATIONS AND SUGGESTIONS

LIMITATIONS

This study was limited to a small geographic area and study duration was short and limited.

SUGGESTIONS

A future study with large sample size and among upper cross syndrome in dental students.

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