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EVALUATION OF HEAD POSTURE, NECK PAIN, HEADACHE, STRESS LEVEL AND IT'S CORRELATION WITH MYOFASCIAL TRIGGER POINTS DURING EXAM PERIOD AND ACADEMIC PERIOD IN PHYSIOTHERAPY STUDENTS: REPEATED MEASUREMENTS STUDY

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Abstract

Background: Myofascial Trigger points (MTrPs) are hyperirritable spots located in a taut band of skeletal muscle.Acute trauma/ repetitive micro-trauma may lead to the development of stress on muscle fibers and the formation of trigger points. Physiotherapy students preparing for university exams are exposed to many predisposing factors for MTrPs can lead to awkward or poor posture and MTrPs. Therefore, this study aims to evaluate the Head posture, Neck Pain, Headache, Stress Level and its Correlation with Myofascial Trigger Points during exam period and Academic Period in Physiotherapy Students.

Method: 75 students from different academic year participated in this study. The MTrPs was examined in 3 different muscles by the examiner. The study was done in two periods i.e. academic year and during exam period in the same subject. Craniovertebral angle was measured.The stress level was measured. Data was collected fromeach of the physiotherapy students. Statistical analysis was done using SPSS version 26.00

Results: The MTrPs were more prevalent during exam period as compared to academic period. ($p<0.05$). Active MTrPs were significantly higher than latent MTrPs during the exam period. There was a moderate positive correlation between the active MTrPs and theNRSof headache, NRS of Neck pain, NRS of stress levelduring the exam period.

Conclusion: This study showed significant difference of MTrPs, headache, neck pain & stress level found between exam period & academic period. There was positive correlation that exists between active Myofascial trigger points and Headache, Neck Pain & Stress level.

***Key words*: Exam period, Forward Head Posture, Headache, Myofascial Trigger points(MTrPs), Neck pain, Stress level.**

INTRODUCTION

Myofascial trigger points(MTrPs) are defined as hyperirritable tender spots in discrete taut bands of hardened muscle that produced local and referred pain. MTrPs is composed of numerous contraction knots or nodules.Contraction knot appear as a segment of muscle fibre with extremely contracted sarcomeres and an increased diameter. It prevents full lengthening of muscles, weakens the muscle and mediates a local twitch response of muscle fibre when adequately stimulated [3].

Acutetrauma or repetitive micro trauma may lead to the development of stress on muscle fibers and the formations of MTrPs [5]. Electrophysiological studies havedemonstrated abnormal electrical activity near MTrPs, which is described in literature as endplatenoise, and is associated with an increased amount of acetylcholine. This amount is not sufficient tocreate a muscle contraction, but might explain the taut band and the nodule in the muscle. It is always tender and painful on compression [16]. A "local twitch response" is often elicited when a firm pressure is applied over the trigger point. It is defined as a transient visible or palpable contraction or dimpling of the muscle and skin as the tense muscle fibers (taut band) of the trigger point contract when pressure is applied. Lack of exercise, prolonged poor posture, vitamin deficiencies, sleep disturbances, and joint problems may all predispose to the development of micro-trauma. Also Occupational or recreational activities that produce repetitive stress on a specific muscle or muscle group commonly cause chronic stress in muscle fibers, leading to trigger points [5].

MTrPs are divided into two major sub-categories: active and latent.Active MTrPs areassociated with spontaneous local and referred pain.Active MTrPs causes pain at rest. It is tender on palpation with referred pain that is similar to the patient's pain complaint. The pain is often described as spreading or radiating[5]. They may also be associated with othersymptoms such as weakness, paresthesia, or temperature changes, whereas Latent MTrPs onlyevoke local or referred pain when palpated and direct pressure is applied to them. It does not cause spontaneous pain, but may restrict movement or cause muscle weakness[5]. Latent MTrPs may become activated by a variety of stimuli, including poorposture, overuse, or muscle imbalance. Latent MTrPs may be found in many pain-free skeletal muscles and may be "activated" and converted to Active MTrPs by continuous detrimental stimuli. Active MTrPs can be inactivated by different treatment strategies; however, they never fully disappear but rather convert to the latent form[7]. Both active and latent MTrPs can cause loss of ROM and weakness which results in limited function [3, 12, and 21]MTrPs may be the cause of head and neck painalso [3].

Forward Head Posture(FHP) is a common postural disorder, in which the craniovertebral angle indicates the head on trunk positioning. A small angle often appears with shortening of the cervical extensors as well as sternocleidomastoid. Normally, the cervical spine is lordotic. Other than flexion and extension movementsof neck protraction and retraction movements also occurs. If the cervical spine is held in protracted position for prolonged duration it will lead to poor head posture known as FHP [6]. Severity of the FHP correlates with functional disabilities and neck pain. [6]

In chronic TTH group craniovertebral angle is smaller. The severity of the FHP correlates with functional disabilities and neck pain. [25]Some authors found that both muscle MTrPs in neck-shoulder muscles and cervical joint dysfunctions contribute at the same time to neck pain perception. Some study says that the pain of neck and head syndromes may be provoked referred pain from MTrPs in the posterior cervical, head, and shoulder muscles[11].It is also assumed that stress and anxiety influence pain. The stress and anxiety levels were shown to be higher in the medical students.A study showed that Pressure Pain Threshold (PPT) was less during exam period. [24]

In one of the study of Janse van Vuuren E.C observed that as lecturers in physiotherapy, they observed emotional stress among students during clinical training even though most students were academically successful [14]. Students preparing for exams are exposed to a wide variety of predisposing factors for MTrPs, mainly like prolonged sitting, prolonged use of computers, mental concentration, reading papers and psychological stress which may lead in FHP and MTrPs. [17] The MTrPs, if increased, it would lead to pain which could affect their performance in exam. Hence,there is a need to evaluate the Head posture, Neck Pain, Headache, Stress Level and its Correlation with Myofascial Trigger Points during exam period and Academic Period in Physiotherapy Students.

MATERIALS AND METHODOLOGY

1. **Type of Study**– Repeated measurements study with no intervention.
2. **Method of Sampling** – Quota Sampling.
3. **Study setting**–Dr. UlhasPatil College of Physiotherapy,Jalgaon.
4. **Study Population** – Physiotherapy students
5. **Sample Size** – 75. Formula- $n=4\delta^2/E^2$
6. **Study Duration** – 6 Months.
7. **Study place** – Dr. UlhasPatil College of Physiotherapy, Jalgaon.
8. **Materials required** – Pen, Paper, Camera and Questionnaire.
9. **Outcome Measures** – MB Ruler- To measure the Craniovertebral angle
   - Numerical Rating Scale (NRS) - To evaluate the pain and stress,
   - Perceived Stress Scale- for Stress level

10. Selection criteria

- **Inclusion criteria** :-

1. 18-26 year old Physiotherapy Students
2. Subjects with informed consent
3. Both the gender

- **Exclusion criteria:-**

1. Recent traumatic neck or head injury
2. Active neurological disorder
3. Mental disorders
4. Congenital/acquired spinal deformity
5. Myopathies
6. Fibromyalgia

- **Statistical analysis** –SPSS Windows 26.0

– Paired t test
– Wilcoxon Signed Rank Test
– Pearson Correlation

PROCEDURE

- Permission from institutional ethical committee was taken.
- Subjects were screened according to selection criteria.
- Detail procedure of the study was explained and the consent form was signed by selected students.
- Basic demographic data was collected using a self-administered questionnaire and include age, sex, self-reported weight and height from which Body Mass Index (BMI) will be calculated as weight in kg divided by height in meters squared).
- Numerical Rating Scale (NRS) for headache, neck pain and stress level was filled by the students.
- A questionnaire of Perceived Stress Scale was filled by the students.
- Each subject is examined twice: once during the mid of academic period , then again during the exams period& vice-versa
- The examination included assessment of MTrPs in the cervical musculature and tenderness of the suboccipital muscles

METHOD

The study was conducted in Dr. UlhasPatil College of Physiotherapy, Jalgaon. 75 students from different year voluntarily participated in this study. Informed consent form and data was collected by the physiotherapist of each students. The MTrPs was examined in 3 different muscles by the examiner. The study was done in two periods i.e. academic year and during exam period in the same subject. Pictures of the subjects were taken with their permission to calculate the craniovertebral angle. MB ruler was used to calculate the angle. Perceived Stress Scale (PSS) was taken both during academic year period and during exam period. It consisted of 10 questions which helped to assess the stress level.

***Statistical Analysis*:** The data was collected and was analyzed using SPSS version 26.0.The data was expressed in Mean ±SD, frequencies and percent using descriptive statistics. Comparison of the variables (FHP, NRS of headache and neck pain, PSS, NRS of stress level & sub-occipital tenderness)between the academic and exam period was calculated by using paired T- test.

Wilcoxon Signed Rank Testwas used to compare academic vs. exam period for prevalence of Active and latent MTrPs.

Pearson correlation coefficient test was used to find the relation between the variables (NRS of Stress level, NRS of headache & NRS of neck pain) and active trigger points.

Outcome measures

1. **FHP evaluation:**

FHP is defined by the angle between the line connecting the two markersand a horizontal line drawn from the cervical marker. FHP should be examined through a lateral photograph, with one marker placed on the tragus of the left ear andone on the spinous process of C7 vertebra. MB Ruler was used to measure the craniovertebral angle.

Fig. 1

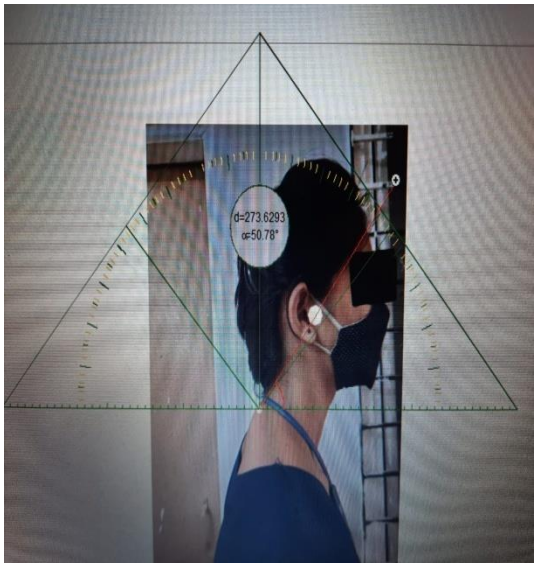


Fig. 2

Fig.1: lateral veiw, Fig.2: angle measured using mb ruler

2. MTrP evaluation:

The Upper Trapezius, Levator Scapula, and SCM muscles are examined bilaterally for MTrPs.The examiner palpated themuscles in search of a taut band in the muscle, within which they look for a nodule. If a noduleis located, the examiner presses the nodule for 10 seconds and asks the subject whether itevoked pain.If the subject responded negatively, the findings are described as a taut band. If the subject responded positively, he/she is asked to show where pain was felt and whether the painis familiar

A referred and familiar pain was considered an active MTrP, while local or referred but unfamiliar pain was considered a latent MTrP.

For Upper Trapezius and SCM muscles: the examiner used pincer palpation technique to find a hyperirritable spot ornodule and press it against the muscle fibers.

For the Levator Scapula: the examiners use a flatpalpation technique at the muscle's insertion to find a hyperirritable spot and press it toward the underlying bone.

If multiple MTrPs were found in the same muscle, the examiner asks the subject to indicate the most irritable spot.

The suboccipital muscles: is palpated by examiner and the subjects was requested to report pain if it was evoked. This criteria is measured dichotomously- pain is either present or absent

Fig.3-MTrPs Evaluation

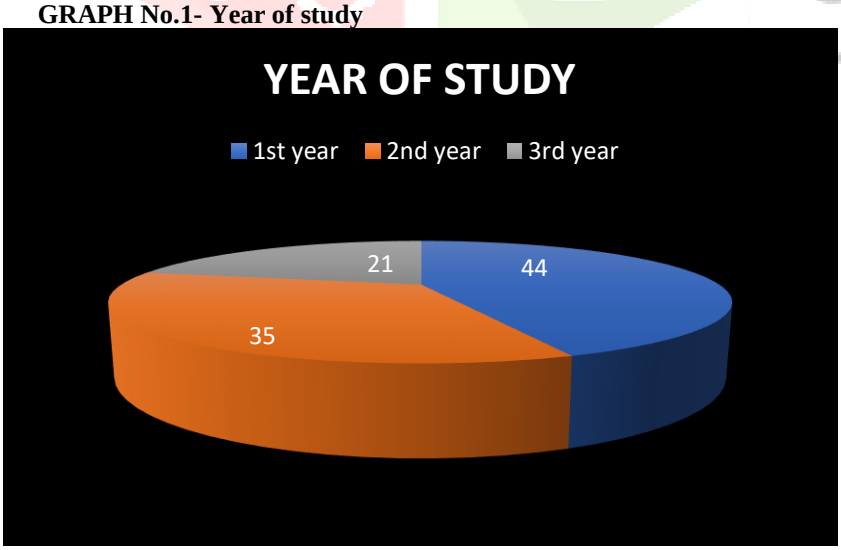
DATA ANALYSIS

Table No.1- Demographic Data

Characteristics		N (%)	Mean±SD	Min-Max
Age			21.53 ±2.16	19-25
Gender	F	63 (84.0)		
	M	12 (16.0)		
BMI			21.31 ± 3.74	13.50-31.60
Dominance	Left	2 (2.7)		
	Right	73 (97.3)		
yr.of.study	1yr	33 (44.0)		
	2yr	26 (34.7)		
	3yr	16 (21.3)		
Physical activities	No	31 (41.3)		
	Yes	44 (58.7)		

In this study 75 physiotherapy students were analyzed Table.1 Average age 21.53±2.16 out of which 63(84%) were females and 12(16%) were maleStudents participated from 3 different year of study: 33(44%) were from first year, 26(34.7%) were from second year and 16(21.3%) were from third year. 21.31±3.74. Mean BMI was calculated based on the self reported height and weight. 73 (97.3) students were right handed. Regular Physical activities were reported by 44(58.7%) students.

GRAPH No.1- Year of study



Students participated from 3 different year of study: 33(44%) were from first year, 26(34.7%) were from second year and 16(21.3%) were from third year. 21.31±3.74.

Table No.2 – Myofasical Trigger Points Evaluation

	MTrPs EVALUATION					COMPARISON	
MUSCLES	**PERIOD**	**NO FINDINGS**	**TAUT BAND**	**LATENT TRIGGER POINTS**	**ACTIVE TRIGGER POINTS**	**Z**	**Asymp. Sig. (2-tailed)**
		0	1	2	3		
Rt.Trapezius	Academic	14	0	45	16	-4.016[b]	0.000
	Exam	12	0	19	44		
Lt.Trapezius	Academic	32	0	34	9	-3.014[b]	0.003
	Exam	25	1	21	28		
Rt.SCM	Academic	59	0	16	0	-3.103	0.002
	Exam	48	0	10	17		
Lt.SCM	Academic	60	2	13	0	-1.165[b]	0.244
	Exam	59	0	10	6		
Rt.Levator Scapula	Academic	27	6	39	3	-5.896[b]	0.000
	Exam	14	1	18	42		
Lt.Levator Scapula	Academic	44	11	17	3	-6.046[b]	0.000
	Exam	21	3	11	40		

During Exam period the all the muscles showed significantly high as compared to during academic year except Lt SCM. Active trigger points were more prevalent during exam period in Rt. Trapezius and Rt. Levator scapulae(p=0.000, p=0.000).

Latent Trigger points in was also higher in left Trapezius, left Levatorscapulae and Left SCM during exam period. The total Prevalence of Active and latent trigger points during exam period was higher as compared to the academic year. (Table.2)

The Myofascial findings showed significantly higher prevalence of MTrP in the right side of muscles during exam period. (Table.2)

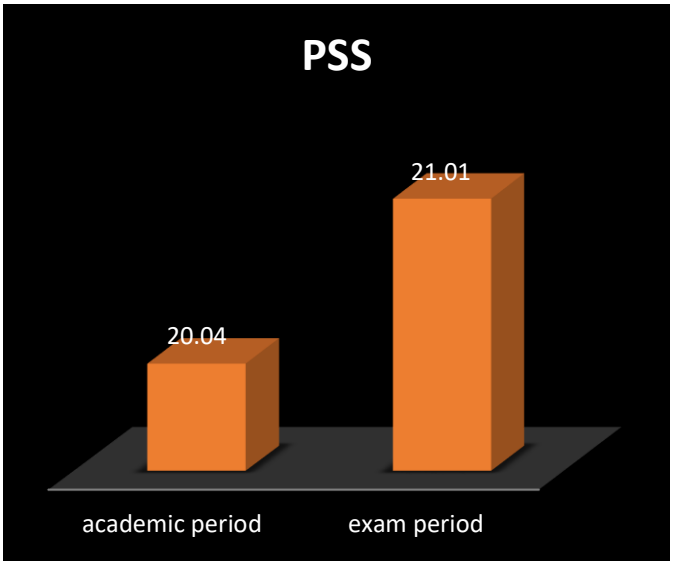
Suboccipital tenderness was more during the exam period0.64 ±0.48 compared to during academic year 0.83 ± 0.38 (p=0.001). (Table.3)

Table no.3 – the comparison between exam period and academic period

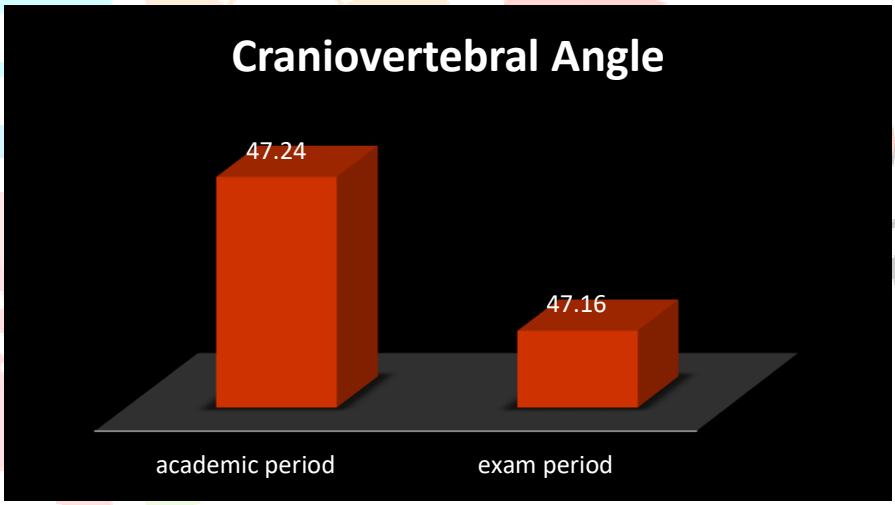
	DURING ACADEMIC	**DURING EXAMS**	**COMPARISON**	
	MEAN ±SD	MEAN ±SD	T	Sig. (2-tailed)
CVA	47.24 ±3.69	47.16 ± 6.07	0.092	0.927
NRS headache	2.25 ±2.29	3.47 ± 2.74	-2.942	0.004
NRS Neck pain	2.25 ±2.10	3.67 ± 2.83	-3.356	0.001
NRS Stress level	4.23 ± 3.01	5.79 ± 2.60	-3.671	0.000
PSS	20.04 ±5.75	21.01 ± 5.22	-1.012	0.315
Sub-Occipital Tenderness	0.64 ±0.48	0.83 ± 0.38	-3.335	0.001

Table No.3 show that there were significant difference between the academic and exam period in the variables.

GRAPH No. 2- THE COMPARISON OF CRANIOVERTEBRAL ANGLE BETWEEN EXAM PERIOD AND ACADEMIC PERIOD

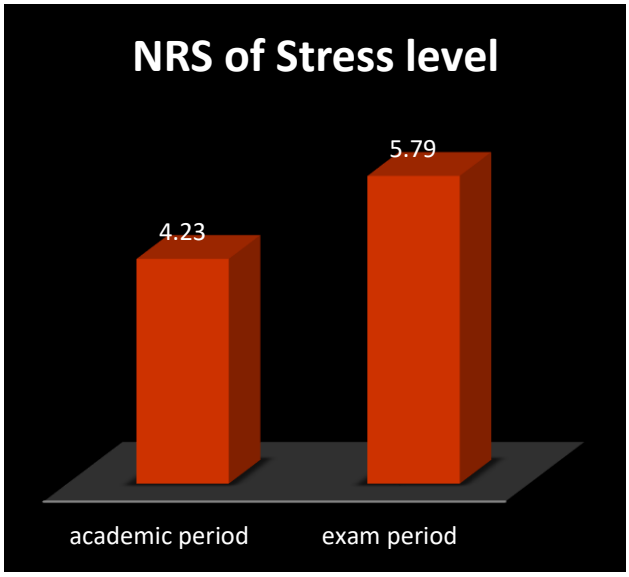


Graph No.4



Graph no.2 shows mean CV angle 47.24 ± 3.69 during academic period and 47.16 ±6.07 during exam period.

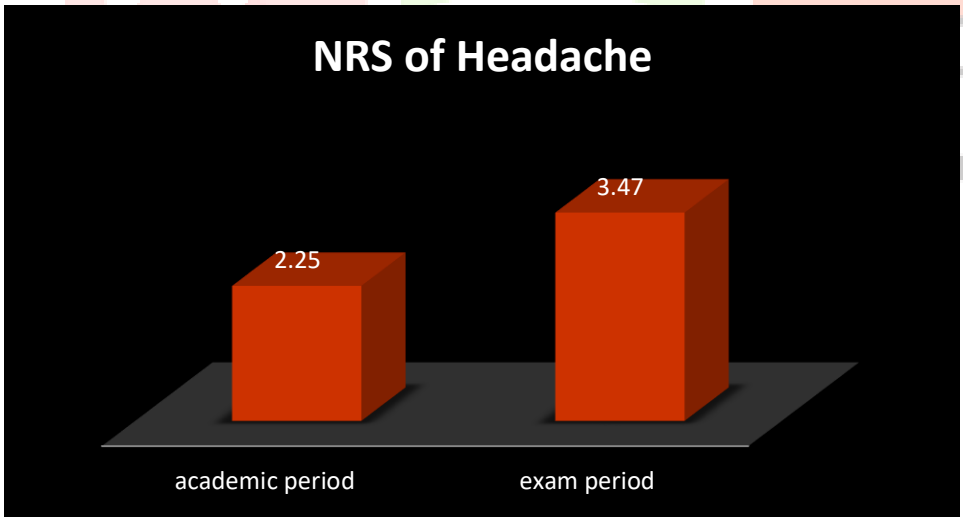
GRAPH No.3 & 4 – THE COMPARISON OF STRESS LEVEL DURGING EXAM AND ACADEMIC PERIOD



Graph No.3

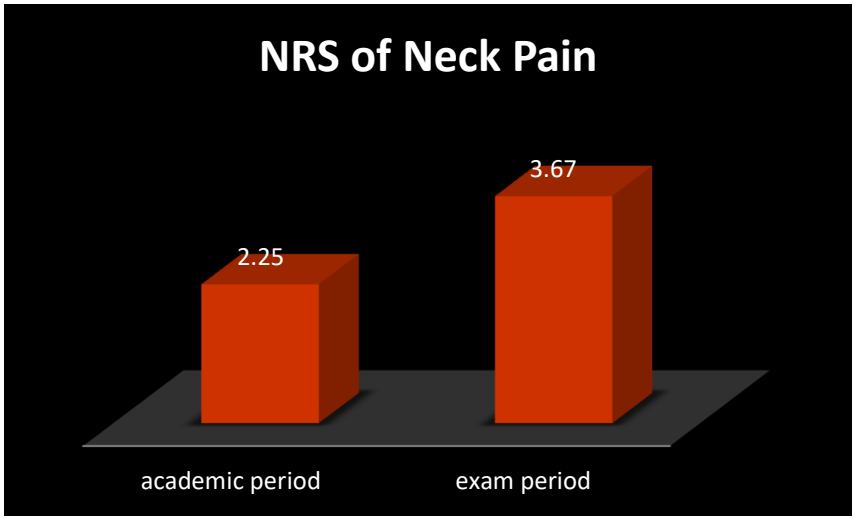
The self reported NRS stress level by the students was significantly higher during exam period 4.23 ± 3.01 as compared to 5.79± 2.60 during academic year (p=0.000), whereas PSS scale showed no significant differences between the exam period 21.01 ± 5.22 and academic year 20.04 ± 5.75

GRAPH No.5 & 6THE COMPARISON OF STRESS LEVEL DURGING EXAM AND ACADEMIC PERIOD



Graph No.5

Graph No.5 NRS of Headache during academic year2.25 ± 2.29, during exam period 3.47 ± 2.74 (t= -2.942, p= 0.004)



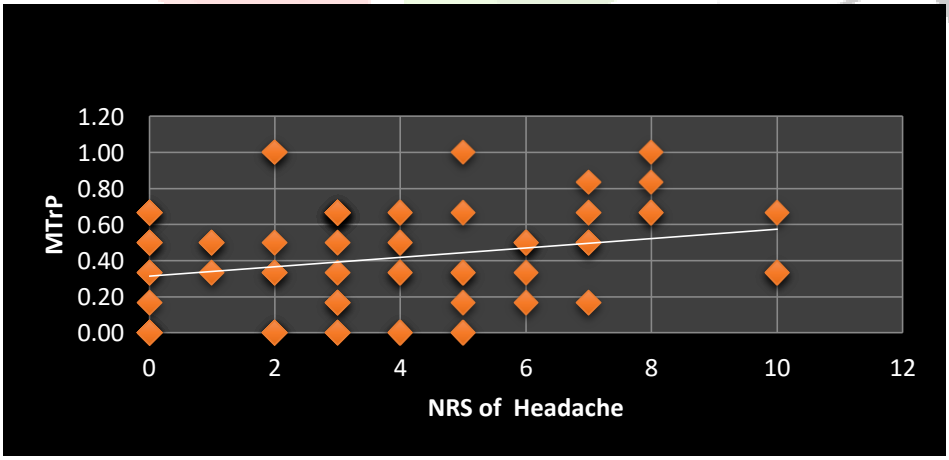
Graph No.6

Graph No. 6 shows NRS of Neck pain during academic year 2.25 ± 2.10, during exam period 3.67 ± 2.83 (t= -3.356, p=0.001). (Table.3)

TABLE No.4 –CORRELATION BETWEEN ACTIVE TRIGGER POINTS AND HEADACHE, NECK PAIN, & STRESS LEVEL

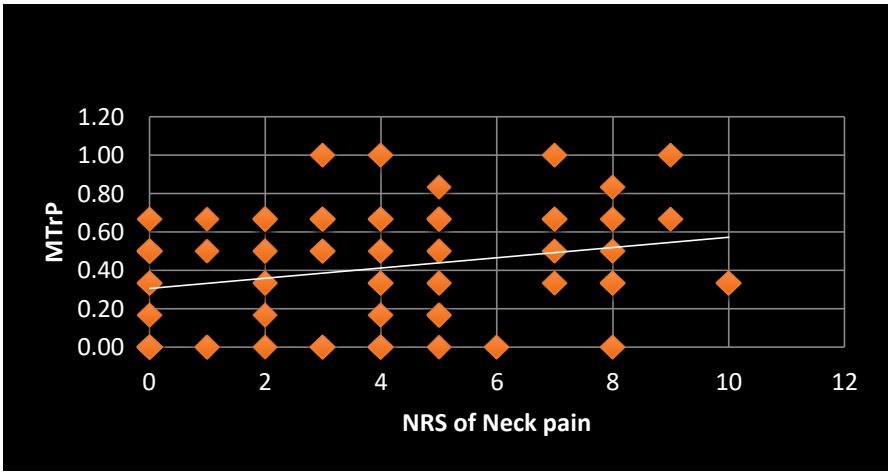
Correlations of Active TrP during Exam Period		
During Exam Period	Pearson Correlation	Sig. (2-tailed)
NRS of Headache	.243*	0.037
NRS of Neck Pain	.256*	0.028
NRS of Stress level	.329**	0.004
**. Correlation is significant at the 0.01 level (2-tailed).		
*. Correlation is significant at the 0.05 level (2-tailed).		

The correlation between the active trigger points during exam period and the NRS of headache, NRS of Neck pain & NRS of Stress Level during exam period also showed significance differences. ($p<0.005$) (Table.4)



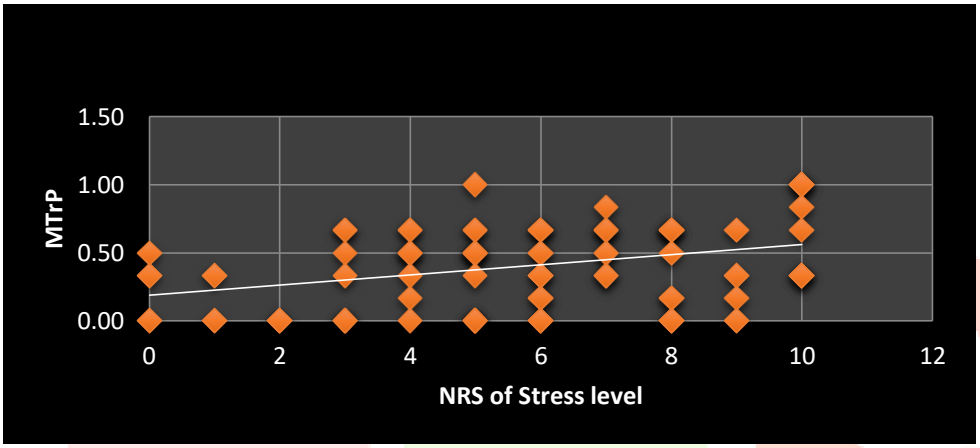
Graph No.7

Graph No. 7 showed moderate positive correlation between Headache and Active MTrPs



Graph No.8

Graph No. 8 showed moderate positive correlation between Neck pain and Active MTrPs



Graph No.9

Graph No. 9 showed moderate positive correlation between stress level and Active MTrPs

RESULT

The result showed that the students were mostly females. The students were of different year of study, out of which maximum were from 1st years. The MTrPs were more prevalent during exam period as compared to academic period. ($p<0.05$) Active MTrPs were significantly higher than latent MTrPs during the exam period as compared to academic period. The result also showed that active MTrPs was seen in the dominant side. Most of the students were Right handed and the result showed increase in active MTrPs in the Right side muscle. Latent trigger points were mostly seen in the non dominant side.(left side). Sub-occipital Tenderness were significantly higher during exam period than that of academic period. Forward Head posture did not show any significant difference during exam period and academic period. The NRS of headache and NRS of Neck pain was also significantly higher during exam period. The NRS of Stress level showed significant difference between exam period and academic period. The PSS showed no significant difference between exam period and academic period. There was a moderate positive correlation between the activeMTrPs and the NRS of headache($r=0.243$, $p=0.037$), NRS of Neck pain($r=0.256$, $p= 0.028$), NRS of stress level($r=0.329$, $p=0.004$) during the exam period. It result that during exam period the active MTrPs of the muscles was increased and the headache, neck pain and Stress level also increased.

DISCUSSION

Theaim of the study was to find the effect of exam period on prevalence of myofascial trigger points and Head posture and in physiotherapy students and the relation between the head & neck pain with active MTrPs during exam period. The result suggested that there was significant difference in the prevalence of MTrPduring exam period and also showed relation between head and neck pain with active MTrPs.

Myofascial trigger points (MTrPs) are defined as hyperirritable tender spots in discrete taut bands of hardened muscle that produced local and referred pain. It prevents full lengthening of muscles, weakens the muscle and mediates a local twitch response of muscle fibre when adequately stimulated. [2] It may lead to musculoskeletal disorder. Lack of exercise, prolonged poor posture, vitamin deficiencies, sleep disturbances, and joint problems may all predispose to the development of micro-trauma. Occupational or recreational activities that produce repetitive stress on a specific muscle or muscle group commonly cause chronic stress in muscle fibers, leading to trigger points. [4] During exam period the prolonged poor posture and repetitive stress to the specific muscles mainly Trapezius and sternocliedomastoid and levator scapulae lead to MTrPs, which may cause muscular discomfort or pain which may lead to poor performance in the examination.

In this study 75 subjects of physiotherapy students participated from different year of study group. Most of them were females. Mean of BMI (21.31 ±3.74)was taken as overweight and obese subjects had higher tendency to report myofascial pain syndrome. [3] The study showed prevalent MTrPs during exam period as compared to the academic year as compared to the results of other studies. (L.Kalichmanet.al. 2016). There was significant increase in both active and latent trigger points during the exam period than that of academic year. The muscles Rt. Trapezius and right levator scapulae showed active trigger points during exam period. The subjects were mostly right side dominant students. Therefore there was increase in active trigger points in the dominant side.

In DeryaCelik et al, (DeryaCelik et al. 2013)LTrPs may be found in many pain-free skeletal muscles and may be "activated" and converted to ATrPs by continuous detrimental stimuli. This proved that there was significant increase in ATrPs during exam period and the results showed that during academic period the latent TrPs was more (Table.3). The result showed that during exam period the latent trigger points of academic period may be converted into active trigger points due to aggrevating factors which increase the tension in the muscles.

Sub-occipital Tenderness was palpated as to examine the MTrPs of sub- occipital muscles. The result showed that it was significantly higher during exam period. (Table.2)

In the study of C.Fernández-de-las-Peñas et al. (C.Fernández-de-las-Peñas et al. 2006) suggested that the degree of FHP correlated positively with headache duration, headache frequency, and the presence of suboccipital activeTrPs. The Result of this study showed that there only slight increase in the CV angle and no significant difference was seen between CV angle during exam period and during academic year. The current study was similar to one study in which it forward head posture did not correlate with the location or the number of Myofascial pain syndrome. (An Sun et al. 2014)

In this study it showed that during exam period there was also an increased level of Stress as compared to that during academic year.($p<0.05$)The factors contributing high stress level include high expectations of parents and teachers, high self-expectations, competitiveness, inadequate accommodation, interpersonal or family problems, sleeping problems as well as health problems, clinical training. A similar study that showed high perceived Stress during the exam period in medical students.(J.Fritz 2021).One of the study also showed that the perceived stress showed no significant increase during exam period as the students needed the mental concentration during both exam period as well as academic period. (L.Kalichmanet al. 2016)

During exam period the headache and neck pain significantly increased.In Linton's (Linton 2000) review of 11 studies showed that there was a significant relation between stress, anxiety and neck or back pain.Few studies suggested that both muscle TrPs in neck-shoulder muscles and cervical joint dysfunctions contribute at the same time to neck pain perception. Active MTrPs are associated with spontaneous local and referred pain.An Active trigger point causes pain at rest.[5]Furthermore, it seems that referred pain originated in muscle TrPs could also contribute to neck symptoms perceived by subjects after a rear-end crash. The study showed that the pain profile of neck and head syndromes may be provoked referred pain from TrPs in the posterior cervical, head, and shoulder muscles. Several recent studies also reported that both TTH and migraine are associated with referred pain from TrPs in the suboccipital, upper trapezius, sternocleidomastoid, temporalis, or superior oblique muscles [11].The resultof the current study showed that there was a positive correlation between the head pain and the active Trigger points. Also between Neck pain and active trigger points.The characteristic active MTrPs is referred pain. Therefore during exam the active MTrPs was higher, the neck pain and headache was also higher during exam period.

One of the study shows that circumstances that require high mental concentration correlate with high stress levels and high trapezius muscle activity.Some study showed that there was a relation between mental load and muscle activity. As, Roman- Liu et al study suggested that there was the muscle tension increases during sustained attention. Some other studies showed that there was increase in muscle EMG activity during high stress condition (Shahidi et al 2013).This could explain the result of the correlation between stress level and active MTrPs in this study as due to increase in stress the muscle activity also increased specially in suboccipital, upper trapezius, sternocleidomastoid, and levator scapulae.

CONCLUSION

There was significant difference of myofacial trigger point, headache, neck pain & stress level found between exam period & academic period. There was positive correlation that exists between active Myofascial trigger points and Headache, Neck Pain & Stress level.

LIMITATIONS AND SUGGESTION

The examination of MTrPS was done by the examiner manually. The pressure algometer could not be used to measure the pressure applied during palpation of trigger points.
Evaluation of MTrPs was manually by palpation. EMG was not used to see the twitch responses.

FUTURE SCOPE OF STUDY

The examination of MTrPs could be done using pressure algometer.
Further studies could be done on the muscle activity using EMG for MTrPs.
This study could help to assess and treat active trigger points to prevent further musculoskeletal disorders.

FUNDING: Self funding

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