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Effect of Awareness and Education Along with Conventional Physiotherapy on Pain, Disability and Posture Among Physiotherapy Students with Text Neck Syndrome: A Randomized Controlled Trial

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ABSTRACT

BACKGROUND: Text neck defined as an overuse injury of the cervical spine resulting from the repetitive stress of prolonged forward head flexion while looking down on a mobile screen. Text neck leads to harmful symptoms such as neck pain, upper back pain, shoulder pain, chronic headaches and increased curvature of the spine. The objective of study was to see the Effect of awareness and education along with conventional physiotherapy on pain, disability and posture among physiotherapy students with text neck syndrome.
METHODOLOGY: In the present study, 56 students with Text neck syndrome were included i.e. 28 in each group. group A received awareness and education along with conventional exercises and group B received conventional exercises only. Students were evaluated pre-intervention (0 week) and post intervention (6 weeks) for pain assessed by Numerical Pain Rating Scale (NPRS), functional disability assessed by Neck Disability Index (NDI) and Posture was assessed by CV-Angle. Statistical analysis was done by using jamovi version 2.3.28.0 version. Significance level was set at $p \leq 0.05$.
RESULT: Wilcoxon Signed-Rank test was applied for intra-group comparison and results showed that there was statistically significant difference in mean of NPRS, NDI and CVA in the groups during 6 weeks intervention period($p \leq 0.001$). Mann-Whitney U test was applied between group comparison and result showed that there was statistically significant difference in mean of NPRS, NDI and CVA between group A & group B ($p \leq 0.001$).
CONCLUSION: The results of present study conclude that both Awareness and Education along with conventional exercises and only Conventional exercises are effective for reduces pain, functional disability and to improve posture in students with Text neck syndrome post 6 weeks intervention compare to pre intervention. When compared between group Awareness and Education along with conventional exercises is more effective than only Conventional exercises for reducing pain, functional disability and improves posture after 6 weeks of intervention in this population.

KEY WORDS: Text neck syndrome, Forward head posture, Pain, Functional disability, Physiotherapy students.

INTRODUCTION

Mobile technology has advanced significantly in recent years, and as a result, smartphones now play a significant role in our daily lives[1]. The average screen time for smart electronic devices usages such as Mobile phones and laptops has increased exponentially in recent times[2]. The excessive use of these devices is now a major cause of different clinical conditions like vision problems, anxiety, depression, personality disorders, difficulty concentrating, mobile phone addiction, and Text Neck Syndrome.[3]

Text neck defined as an overuse injury of the cervical spine resulting from the repetitive stress of prolonged forward head flexion while looking down on a mobile screen.[4] Text neck is the term used to describe the neck pain and damage sustained from looking down at the cell phone, tablets or other wireless device too frequently and for too long.[2] The term 'text neck syndrome' was first coined by Dr. Dean L. Fishman as an overuse injury. A study done in 2021 among 283 college students in India showed 76.6% prevalence of text neck syndrome[5].

Text neck syndrome manifested not only physically, but also psychologically. Commonly experienced by young participants (82%), parents usually noticed changes in behavior and social interactions. Complains like easily irritated, alienated, hostile, and aggressive behavior, decrements in attention and focus, low school grade, communication skills and sleep disturbance are frequently reported[6].

Text neck leads to harmful symptoms such as neck pain, upper back pain, shoulder pain, chronic headaches and increased curvature of the spine.[7,8] It is estimated that 75% of the world's population is hunched over their handheld devices hours daily with their heads flexed forward[9]. The weight of the head on the spine is dramatically increased when it is flexed forward, and the effects and amount of weight are strongly and progressively enhanced by varying the degrees[10]. In fact, a full-grown head weights almost 5 kg in the neutral position. The more the head is flexed, more the forces on the neck surge to more than the double at 15◦ (roughly 12 kg)[11]. In addition, the burden of the weight of the head increases to 18.14 kg at 30◦ and to 22.23 kg at 45◦, reaching a more than fivefold effect at 60◦, arriving to a 27.22 kg. Not only the degree of the neck flexion is relevant but also the frequency of head banding induces additive effects on the neck physiology[5]. In fact, the frequent forward flexion can change the cervical spine, curvature, supporting ligaments, tendons, musculature, the bony segments, commonly causing postural change and pain on the neck and associated area.[12,13] (Figure 1)

One of the most commonly seen anatomical changes in the cervical spine is forward head posture, and this condition is often coupled with neck pain[4]. Commonly, forward head posture has been linked to occupational or lifestyle habits which cause an anterior deviation of the neck from neutral, most frequently involving looking forward or down[14]. In patient with Text neck syndrome certain variables such as pain, functional disability and head posture are commonly affected.[15] In past very few studies targeted intervention program for text neck syndrome. Author Jill Shah and Krupa Soni studied "Effectiveness of pilates along with conventional exercise program and conventional exercise program alone in subjects with text neck syndrome" and concluded that use of pilates along with conventional program evidenced a significantly greater improvement in text neck syndrome.[16] Author Pankti P. Samnani, Neeraj A. Athavale, Ashok Shyam and Parag K. Sancheti studied "Awareness of text neck syndrome in young-adult population" and concluded that a low level of awareness of text neck syndrome and also mentioned about lack of knowledge of preventive measures.[17]

In past some other studies targeted intervention program for text neck syndrome. Author Faeze Sarrafe et.al studied "Self-management exercises intervention on

Text Neck Syndrome among university students using smartphones" and concluded that that After performing the corrective exercises, 36.6% of the SNP and 13.3% of the NDI were reduced in the experimental group[18]. Head and neck angles during using smartphones in a sitting position on a chair without a backrest were the most awkward posture compared with other postures.[19] Author Arianne P Verhangen et.al studied "Physiotherapy management of neck pain" and concluded that manual therapy, exercise and education (physiotherapy management)–usually in combination seem to be the preferred evidence-based physiotherapy treatment for most patients with neck pain[20]. Author Latha P et.al studied "Effectiveness of structured teaching program on knowledge regarding text neck syndrome among college students in villupuram district" and concluded that structured teaching program on text neck syndrome was effective in improving the knowledge level among college students[21].

AIM AND OBJECTIVES OF THE STUDY:

- **AIMS:** To see the Effect of awareness and education along with conventional physiotherapy on pain, disability and posture among physiotherapy students with text neck syndrome.
- **OBJECTIVE:** To assess the effect of awareness and education over conventional physiotherapy on pain, disability and posture in patients with Text neck syndrome.

HYPOTHESIS:

NULL HYPOTHESIS (H0):

H0: There is no significant effect of awareness and education along with conventional physiotherapy on pain, disability and posture in patient with Text neck syndrome.

ALTERNATIVE HYPOTHESIS (H1):

H1: There is significant effect of awareness and education along with conventional physiotherapy on pain, disability and posture in patient with Text neck syndrome.

METHODOLOGY:

- **STUDY DESIGN**- A Randomized Controlled Trial.
- **STUDY POPULATION**- Students of different Physiotherapy Colleges with Text neck syndrome.
- **SAMPLING TECHNIQUE**- Simple random sampling
- **STUDY DURATION**- 1 Year
- **SAMPLE SIZE**- For the study the sample size was calculated in G Power 3.1.9.2 with effect size 0.8 and $\alpha = 0.05$ at 80% power. Sample size calculated was 34, with 20% drop out chances minimum sample size required for this study was 41. Total 56 students were enrolled in the study.
- **STUDY SETTING**- Different Physiotherapy Colleges of south Gujarat.

- **INCLUSION CRITERIA[22]:**

- Students of different physiotherapy colleges with text neck syndrome willing to participate in the study was included if they meet the following criteria.
- Either gender between 18-25 years of age group
- Smartphones must be used for at least >3 hours each day
- Having any of the signs and symptoms of text neck; i.e. neck pain, upper back pain, headache, tingling, numbness in hands, forward head posture.
- Those who are having NPRS <5/10

- **EXCLUSION CRITERIA[23]:**

- No history of an accident or severe injury around neck, upper back or shoulder.
- No history of recognized disease that may cause pain in the neck, upper back or shoulder.
- No history of any neurological or cardiovascular problem.
- No history of congenital deformities around neck, upper back and shoulder.

- No history of surgery around neck, upper back or shoulder area.
- Students who are using other gadgets like laptop, computer etc.

OUTCOME MEASURES:

1. Pain assessment through the numerical pain rating scale (NPRS)[24]
2. Disability was assessed through the neck disability index (NDI)[25]
3. Posture was assessed through measurement of CV-angle by MB-Ruler software.[26]

PROCEDURE:

- Ethical clearance was taken from institutional ethical committee.
- The patients were screened on the basis of inclusion and exclusion criteria. (Annexure 3)
- Demographic details were obtained from all the subjects. (Annexure 6) The purpose of the study was explained and all the participants were asked to give written informed consent (annexure 2). Pre-interventional outcome measures were taken prior of intervention.
- Procedure of how participants were included in the study is shown in flow chart. (Figure 4)
- They were randomly allocated into two groups by Random table method.
- After pre-interventional outcome measurement participants were randomly allocated into two groups by sealed envelope method.

Procedure of Randomization and Blinding:

The assigned list of numbers of those included in experimental and control groups, were written on the paper and wrapped in an aluminum foil. These aluminum foils, were again inserted in an opaque envelope. This opaque envelope had a code written on it and were placed sequentially. The participants then were instructed to pick up any envelope of his or her choice and with respect to the number wrapped in the aluminum foil. they were allotted to the respective group.

Subjects were blinded on types of interventions and to which group they were belonged. Throughout the treatment sessions, subjects from all the groups were not be allowed to have any interaction to each other and the subjects were not be aware of what kind of treatment they received and its effects.

Assessment of Cranio-Vertebral Angle (CVA)[26]:

1) 2 Markers were applied on the subjects, one marking over the C7 spinous process and one over the tragus of the ear. (Figure 5)
2) A digital camera was placed on a tripod stand, with the height adjusted according to the level of subject's shoulder. (Figure 6)
3) The subjects were seated on a chair and asked to remain in their relaxed habitual posture. The photograph was clicked against a white background.
4) The photograph was then transferred to a computer, where the CV Angle was measured using the MB Ruler Pro Software. (Figure 7)

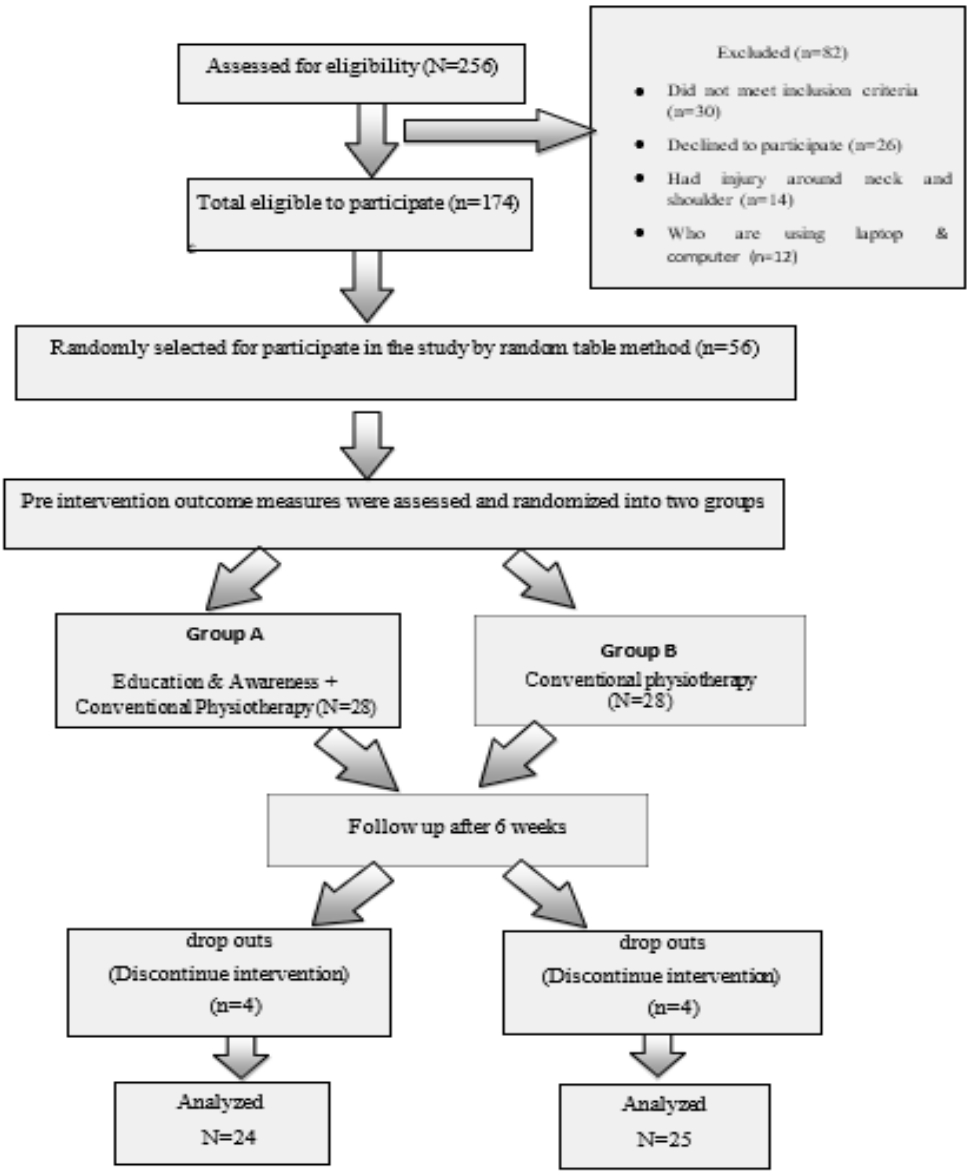
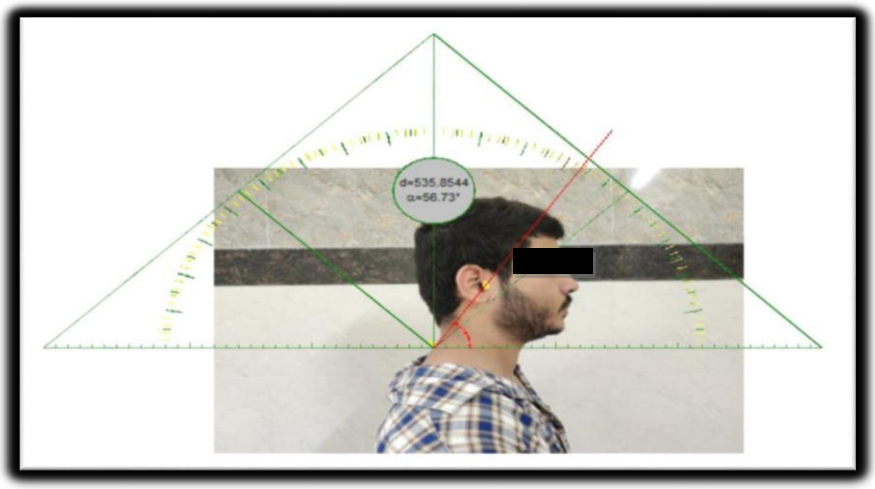


FIGURE 1: PROVIDES A FLOW DIAGRAM OF PARTICIPANT RECRUITMENT AND RETENTION THROUGH THE STUDY

FIGURE 2 CALCULATION OF CVA USING MB RULER



Intervention

Procedure of intervention for Group A (Experimental group): Awareness and education along with conventional exercises. The participants in this group were undergo awareness and education program along with conventional physiotherapy. Awareness and education program were delivered by power point presentation. Participants were encouraged for follow the ergonomic advices throughout the treatment session and reminder for the same were given daily by therapist. Conventional physiotherapy exercises were given under therapist's supervision. The exercise program was performed 5 times per week for 6 weeks to achieve the best result.

Conventional physiotherapy protocol includes[23]: Stretching of upper trapezius, levator scapulae and SCM, Active ROM of neck i.e. Flexion, Extension, Side flexion and Rotation of neck, Cervical isometrics will include isometrics for flexors, extensors and rotators, Chin tuck in, Lateral bending with chin tuck in, Neck curl with chin tuck in.

Procedure for intervention of Group B (Control group): For this group only, conventional exercises were given (The exercise protocol was same as group A) 5 times per week for 6 weeks.

Post-interventional outcome measures were taken immediately after the last session at 6 weeks.

STATISTICAL ANALYSIS

Statistical analysis was done using JAMOVI version 2.3.28.0 Software. Shapiro-Wilk test was applied to check the normality of data. All quantitative data of this study are not following the normality ($p<0.05$). Baseline characteristics were compared to check homogeneity between intervention groups. WILCOXON SIGNED-RANK test was used to analyze the pre and post intervention differences within each group and MANN-WHITNEY U test was used for between groups comparison. Confidence interval was kept 95% and the level of significance for all statistical data was set $\alpha = 0.05$.

RESULT

Total 74 patients were assessed for eligibility. Eighteen patients were excluded because they did not meet inclusion Criteria. Fifty-six patients were enrolled in the study and randomized to one of the treatment groups (28 in experimental group and 28 in control group). Four patients from experimental group and three from control group discontinued intervention in between. Outcome measurements were completed on 49 participants (24 in the experimental group and 25 in the control group) after 6 weeks of intervention.

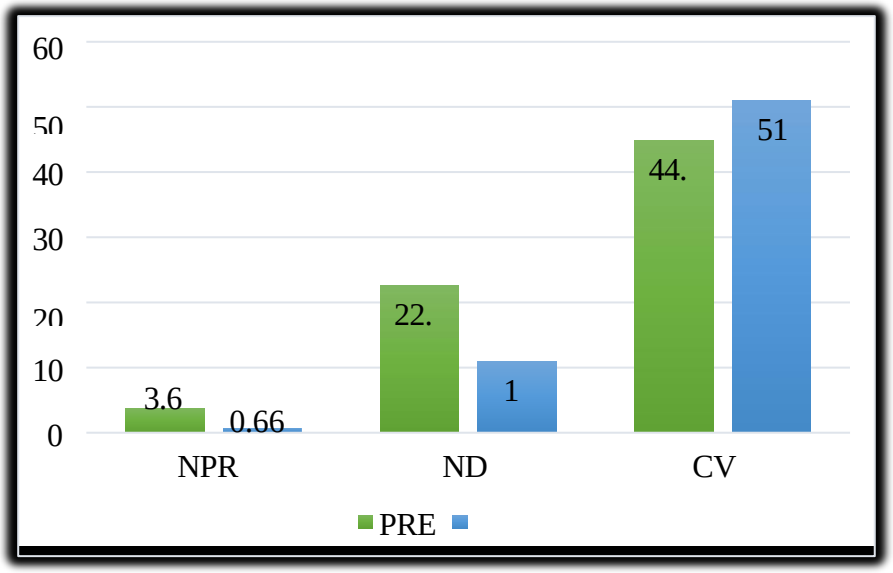
Normality was checked to assess the data were normally distributed or not for this study by using SHAPIRO-WILK Test. After checking P values, all the data were not normally distributed so, non-parametric test were used for statistical analysis of this study. i.e., WILCOXON SIGNED-RANK TEST for intragroup comparison and MANN-WHITNEY U TEST for intergroup comparison were applied. (Table -1)

TABLE-1: PATIENT'S BASELINE CHARACTERISTICS

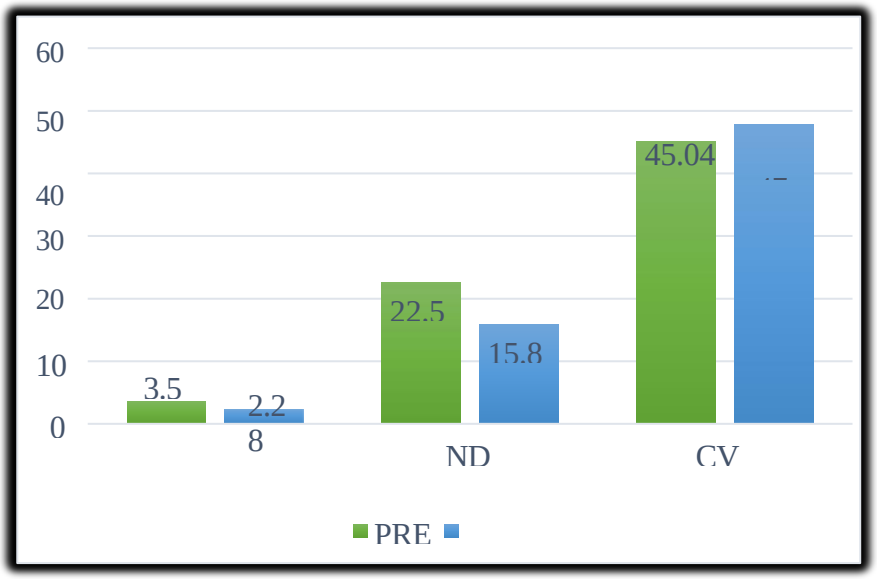
VARIABLE	GROUP A	GROUP B	
	Mean ± SD	Mean ± SD	P VALUE
AGE (YEARS)	21.3 ± 1.58	21.2 ± 1.93	0.528
BMI(WEIGHT/KG^2)	22.1 ± 3.37	23.7 ± 3.57	0.087
PRE NPRS	3.667 ± 0.702	3.52 ± 0.823	0.569
PRE NDI	22.565 ± 4.505	22.56 ± 4.925	0.994
PRE CV-ANGLE	44.875 ± 1.296	45.04 ± 1.428	0.593

TABLE- 2 : INTRAGROUP COMPARISION OF NPRS, NDI AND CV- ANGLE BY USING WILCOXON SIGNED-RANK TEST FOR GROUP A

VARIABLE	GROUP A			GROUP B		
	Pre intervention (Mean ± SD)	Post intervention (Mean ± SD)	P value	Pre intervention (Mean ± SD)	Post intervention (Mean ± SD)	P value
NPRS	3.67 ± 0.702	0.667 ± 0.702	<.001	3.52 ± 0.823	2.28 ± 1.021	<.001
NDI	22.6 ± 4.50	11.0 ± 3.72	<.001	22.56 ± 4.925	15.82 ± 5.571	<.001
CV-ANGLE	44.9 ± 1.30	51.0 ± 1.20	<.001	45.04 ± 1.428	47.76 ± 1.091	<.001



GRAPH -1: INTRAGROUP COMPARISION FOR GROUP A



GRAPH -2: INTRAGROUP COMPARISION FOR GROUP B

TABLE- 3 : INTERGROUP COMPARISION OF OUTCOME MEASURES USING MANN-WHITNEY U TEST

VARIABLE	GROUP A	GROUP B	P value
	Pre-post diff	Pre-post diff	
	Mean ± SD	Mean ± SD	
NPRS	3.00 ± 0.780	1.24 ± 0.879	<.001
NDI	11.61 ± 3.171	6.74 ± 3.171	<.001
CV-ANGLE	-6.17 ± 1.007	-2.72 ± 1.100	<.001

Mean difference of NPRS for GROUP A (3.00 ± 0.780), and GROUP B (1.24 ± 0.879), which shows significance difference (p<.001) between GROUP A and B. Mean difference of NDI for GROUP A (11.61 ± 3.171), and GROUP B (6.74 ± 3.171), which shows significance difference (p<.001) between GROUP A and B. Mean difference of CV-ANGLE for GROUP A (-6.17 ± 1.007) and GROUP B (-2.72 ± 1.100), which shows significance difference (p<.001) between GROUP A and B. (Table 7.2.7, Graph 7.2.5;7.2.6;7.2.7)

DISCUSSION

The primary objective of this study was to determine the effect of awareness and education along with conventional exercises on Pain, functional disability and Posture (CV-Angle) in students with Text neck syndrome and to assess the effect of conventional exercises alone on Pain, functional disability and Posture (CV-Angle) in students with Text neck syndrome.

The Wilcoxon signed-rank test for outcome measures of intragroup were applied, which showed statistical significance (p<0.001) for all outcome measures. Hence all the outcome measures gave statistically significant results. The Mann-Whitney U test for outcome measures of intergroup were applied, which showed statistical significance (p<0.001) for all outcome measures. Hence all the outcome measures gave statistically significant results. When compared between group Experimental group showed more effectiveness in reducing pain, disability and posture than Conventional group.

Swati C Kurane et.al study clearly highlights the lack of knowledge about text neck syndrome among students[27]. This clearly shows the need for extensive awareness program among general population. Most of the students were using mobile phones for extended periods of 6-8 hours[6]. This endangers them for development of text neck syndrome. A 5 years cohort study on texting on mobile phones and musculoskeletal disorders in young population suggested that neck pain is the most prevalent short term as well as the long-term effect of excess usage of mobile phones[1]. The awareness regarding text neck syndrome in community is not adequate and knowledge regarding this syndrome is important as it is a cumulative stress injury and can be prevented[28,29].

Pain was reduced after intervention, the possible mechanism includes neurological and tissue factors, such as stimulation of low threshold mechanoreceptors on centrally mediated pain inhibitory mechanism and on neuronal populations in the dorsal horn with possible gating effect. Low threshold mechanoreceptors from the joints and muscles project to the peri-aqueductal grey in the midbrain region. During isometric contraction, activation of muscle and joint mechanoreceptors occur. This leads to sympatho-exitation evoked by somatic efferent's and localized activation of PAG that plays a role in descending modulation of pain. Nociceptive inhibition then occurs at the dorsal horn of the spinal cord, as simultaneous gating takes place of nociceptive impulses in dorsal horn, due to mechanoreceptor stimulation[30].

Disability was also reduced after intervention; the possible mechanism includes isometric resistance exercise at the cervical vertebra can improve activation of semispinalis cervicis muscles relative to splenius capitis[31]. Thavatchai Suvarnnato et.al studied that semispinalis cervicis training with resistance applied at the second vertebral arch level can reduce functional disability and demonstrate a significant increase in neck-extensor-muscle strength[32].

Good posture is associated with increase in the levels of testosterone, serotonin and decreases levels of cortisol which increases muscle power and tolerance of risk taking. Continuous static postures lead to adaptations of relaxed but biomechanically compromised postures further leading to shortening of the muscles of the neck and compression of cervical vertebrae[33].

Thoracic kyphosis is a complication of the combination of slouched-forward shoulders and rounded upper back. According to a study done by Hansraj et.al, weight supported by the spine increases when the head is flexed at different angles i.e. 10-12 pounds in neutral, 27 pounds at 15°, 40 pounds at 30°, 49 pounds at 45°, 60 pounds at 60° and at 90° it is not reliable. The increased weight of the head forces the cervical extensors to bear weight and contract isometrically, in conjunction with the normally supporting structures like the ligaments and internal disk pressure to keep the out of balance head from falling into more flexion. The habitual postures thus cause the cervical extensors to weaken causing them to atrophy from tightness and spasm squeezing out oxygen and blood starving the muscles. Spasm and tightness lead to pain in the extensor area[34]. There is also a physiologic loss of range of motion. Continuous maintenance of a poor posture alters the length-tension relationship in a muscle resulting in repetitive microtrauma to the musculoskeletal structures giving rise to pain. In individuals performing repetitive tasks, the low forces pain leads to overload of threshold motor units.[35]

The physiological mechanism behind ergonomics is based on postural control it improves interactions between muscle-skeletal system with afferent and efferent pathways of the central nervous system and whose main role is to keep your body in a state of muscle-skeletal balance.[36]

The physiological mechanism behind isometric exercise is that a baroreceptor-related mechanism may contribute to this exercise-induced hypoalgesia phenomenon. Accordingly, this study examined whether increases in arterial blood pressure during graded isometric exercise, which activate baroreceptors in the aortic arch and carotid sinus, could account for any effects of exercise on pain.[37]

The physiological mechanism behind stretching is muscle fibers begins with the sarcomere, the basic unit of contraction in the muscle fibers. As the sarcomere contracts, the area of overlap between the thick and thin myofilaments increases. As it stretches, this area of overlap decreases, allowing the muscle fibers to elongate. Once the muscle fibers are at its maximum resting length (all the sarcomeres are fully stretched), additional stretching places force on the surrounding connective tissues as the tension increases, the collagen fibers in the connective tissue align themselves along the same line of force as the tension. Therefore, when you stretch, the muscle fibers are pulled out to its full-length sarcomere by sarcomere, and then the connective tissue takes up the remaining slack. When this occurs, it helps to realign any disorganized fibers in the direction of the tension. Proprioceptors: The proprioceptors related to stretching are located in the tendons and in the muscle fibers Muscle Spindles (intrafusal fibers) lie parallel to the extrafusal fibers. Muscle spindles are the primary proprioceptors in the muscle. Another proprioceptor that comes into play during stretching is located in the tendon near the end of the muscle fiber and is called the Golgi tendon organ. A third type of proprioceptor, called a pacinian corpuscle, is located close to the golgi tendon organ and is responsible for detecting changes in movement and pressure within the body[38].

Mean pre-post difference of NPRS of group A is 3.00 which is more than MCID of NPRS i.e. 2, so it indicates group A is clinically significant for reducing NPRS while Mean pre-post difference of NPRS of group B is 1.24 which is not clinically significant for reducing NPRS[39]. Mean pre-post difference of NDI of group A is 11.61 and of group B is 6.74 which is more than MCID of NDI i.e. 5, so it indicates both groups are clinically significant for reducing NDI, but group A is more effective as its mean is more[40]. Mean pre-post difference of CV-ANGLE of group A is reduced 6.17° and of group B is reduced 2.72° which is more than MCID of CV-ANGLE i.e. 1.40°, so it indicates both groups are clinically significant for increasing CV-ANGLE[41].

The purpose of this study was to study the effect of awareness and education along with conventional exercises and conventional exercises alone to reduce pain, functional disability and to improve posture in students with Text neck syndrome. Result of present study confirms alternative hypothesis that there is significant effect of awareness and education along with conventional exercises to reduce pain, functional disability and to improve posture in students with Text neck syndrome. Present study reported that the experimental group (awareness and education along with conventional exercises) is more useful than control group (conventional exercises only) for reducing pain, functional disability and to improve posture in students with Text neck syndrome. However no previous studies done on the effect of awareness and education along with conventional physiotherapy in students with Text neck syndrome.

Limitation of this study is study was done only on physiotherapy students. So, this study can be done on other students and general population to see the effect of this intervention in patients with Text neck Syndrome. In this study there is gender bias as number of males were limited as compared to number of females. There was no follow up once the treatment was completed, hence long-term effect was not evaluated.

CONCLUSION

The results of present study conclude that both Awareness and Education along with conventional exercises and only Conventional exercises are statistically and clinically effective for reducing pain, functional disability and to improve posture in students with Text neck syndrome post 6 weeks intervention compare to pre intervention. When compared between group Awareness and Education along with conventional exercises is more effective than only Conventional exercises for reducing pain, functional disability and improves posture after 6 weeks of intervention in this population.

Declaration by Authors

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