

[ORIGINAL ARTICLE]**Effect of Kinesiotaping Along with Conventional Physiotherapy on Forward Head Posture, Deep Neck Flexors Endurance & Functional Disability Among Young Adults (18-25 Years) - An Experimental Study**Gabhane Yash¹, Mahajan Pradnya², Shinde Mukesh³

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ABSTRACT :

Background: Forward head posture is one of the commonest postural malalignment. Very few studies have been done in Indian population to check the effect of forward head posture on static and dynamic balance. So, current study evaluate the forward head posture in young adults or to find out the effect of Kinesio taping and conventional physiotherapy on forward head posture, deep neck flexors endurance, and functional disability among young adults.

Methodology: Experimental study was done on 34 young adults in between 18-25 yrs; with convenient sampling method. Subjects were included according to inclusion criteria. Craniovertebral angle was calculated, deep neck flexor endurance was measured, and a neck disability index questionnaire was taken. Then, the intervention of Kinesio taping 3 days per week for 4 weeks and conventional physiotherapy, including stretching, strengthening, and postural stabilization exercise, was given to the subjects for 5 days per week for 4 weeks.

Result: On intra-group Comparison using paired t-test, the pre-intervention mean of CVA was 46.29+2.384. The Obtained p-value after the intervention was <0.0001 with a mean of 50.23 +3.060, and the pre-intervention mean Deep neck cervical flexor endurance was 21.294+8.27. The obtained p-value after the intervention is <0.0001 with post mean mean26.117+ 9.67, which implies a significant difference between pre-post comparisons. The pre-intervention mean of NDI was 24.720+4.351. The obtained p-value after the intervention is <0.0001 with post mean 21.067 + 3.410, implying a significant difference between pre-post comparison.

Conclusion: Kinesiotaping along with conventional physiotherapy is effective in treating forward head posture, to improve deep neck flexors endurance and reducing functional disability among young adults (18-25).

Keywords- Conventional physiotherapy, Forward head posture, Kinesiotaping

Introduction

Forward head posture (FHP) is the abnormal posture where the head protrudes forward from the sagittal plane and appears positioned in front of the body^[1]. In Forward head posture, centre of gravity of head shifts in antero-superior direction.1 FHP has been identified as the displacement of the head anteriorly with a cranio-vertebral angle less than 49 degrees^[2]. The weight on the spine dramatically increases when flexing the head forward at different degrees. An adult head weighs 4 to 5 kg pounds in the neutral position. As the head tilts forward the forces seen by

the neck surges to 12.25 kg at 15 degrees, 4018.14 kg at 30 degrees, 22.23 kg at 45 degrees, and 27.22 kg at 60 degrees.^[2]

FHP is considered to coexist with hyperextension of upper cervical spine, flattening of lower cervical spine, this puts abnormal stress on the cervical musculature causing muscle imbalance^[3].

At least 66% of healthy adults aged between 20 and 50 years were reported to have FHP3. In FHP the muscles that get shortened (tight) are the upper trapezius, sternocleidomastoid, pectoralis major and

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levator scapulae, and the muscles which becomes lengthened (weak) are deep neck flexors, middle, and lower trapezius.^[4] Deep cervical flexor (DCF) muscles exert their action anterior to the axis of motion of the atlanto-occipital and intervertebral joints that stabilize the cervical spine during movement⁴. Impairment of these muscles may cause insufficiency in their activation, coordination, overload, and poor support of cervical structures, which can lead to neck pain and altered neck posture.³ The risk factors and causes of neck pain include previous injury, lack of physical activity, repetitive activities, use of computers, cell-phones, heavy backpacks, lying on improper pillow, and posture⁵. In a study conducted on patients with neck pain, greater levels of disability were seen in patients with a more severe FHP³. The treatment for FHP has typically involved exercises that focus on stretching tight or overactive muscles and strengthening weak or inactive muscles. The most common intervention for improving musculoskeletal disorders is exercise therapy, which includes a large variety of methods such as stretching, mobilizing, postural stabilizing exercise, dynamic or isometric/static strengthening, endurance training, direction movement control, and proprioceptive exercise^[4].

Kinesio taping is effective in improving the joint position by stimulating proprioception feedback^[9]. Muscle and collagen tissue are very adaptable, and research has indicated that prolonged and low load stretch are more effective than short-term stretch. According to Wontae Gong et al., the posture of the cervical spine affects the Endurance rather than the strength of the deep neck flexors^[11]. To correct FHP, Stretching of the Shortened (tight) upper trapezius, pectorals, sternocleidomastoid and levator scapulae and Strengthening of Lengthened (weak) deep neck cervical flexor muscles, lower trapezius, and serratus anterior is effective.^[1] Thus, the present study aimed to find out the effect of Kinesio taping along with conventional physiotherapy on FHP, deep neck flexor endurance, and functional disability in young adults. FHP is accompanied by a flexion of the lower cervical spine (C4 to C7) characterized by an extension of the head and the upper cervical spine (C1 to C2). Neck muscles have a larger distribution of muscle spindles than other muscles, which require a high proprioceptive function.

Conventional isometric training (CIT) aims at improving isometric function of the neck muscle,

which counteracts the forces of gravity in order to maintain the head and neck in an upright position retraining the DCF muscles, may improve the ability to maintain the correct posture of the cervical spine. Kinesiotaping application as an intervention is most commonly used in sports or any degenerative condition related to pain. As we know kinesiotaping has shown to be effective in improving joint position by stimulating proprioceptive feedback. For correcting the malalignment and obtaining the ideal posture, it is a must to use a combination of various exercises such as stretching, strengthening exercises, and biofeedback training. This study will reflect the need for adjuvant therapy along with traditional approach to improve the quality of life & functional ability of patients with forward head posture. But In a recent study, conducted by Silva et al., induced forward head posture had no effect on postural control in healthy subjects in their study.^[10] The goal of our rehabilitation is to accelerate the treatment process using kinesiotape, which was suggested as a complementary treatment. So, the present study was conducted.

Methodology-

A six month Pre-Post Experimental study was conducted at Dr. Ulhas Patil College of Physiotherapy, Jalgaon, on 34 young adults in between 18 to 25 yrs; which were calculated by sample size calculation formula. Convenient sampling was done. Subjects included in the study those who were willing to participate in the study with FHP (CVA less than 490), both Genders. Subjects excluded were - who were not willing to participate, Subject who were unable to perform exercise or follow complete, Congenital cervical deformities (e.g., torticollis), History of trauma of cervical spine & Upper limb, Skin allergy, Open wounds in the neck region, They were excluded if they had undergone any spinal surgery, Any surgical h/o of cervical spine & Upper limb, Any positive neurological sign & h/o of Benign paroxysmal positional vertigo, Any cervical postural deformity other than FHP, Chronic smokers. CTRI Registration no. Is - CTRI/2023/08/057077.

Outcome Measures- MB Ruler Software- (ICC)>0.972. Deep Cervical Flexor Endurance Test using Pressure Biofeedback (ICC -0.93) for Endurance. 3. Neck Disability Index (ICC)-0.93.

Procedure

Ethical clearance was obtained from the Institutional Ethical Committee & Principal of Dr. Ulhas Patil College of Physiotherapy. A written Informed Consent form was obtained from subjects willing to participate. The subject was screened according to inclusion and exclusion criteria. The aim of the study and its objective was explained to willing participants. Selected participant's demographics details outcome measures were recorded. Then, the subjects received kinesiotaping along with conventional physiotherapy as follow:

Assessment

1) Assessment of Forward Head Posture (Measurement of Craniovertebral Angle) using MB Ruler Software:

Mobile camera was placed on a stable tripod stand 100 cm from the subject's lateral foot standing in sagittal plane, height of camera was adjusted at level of tragus of ear. Subject was asked to flex and extend neck for few times C7 spinous process then Ask subject to assume relax standing posture looking forward at the target arm rested beside the body. Adhesive fluorescent marker was placed on spinous process of C7 and on tragus of ear then 3 photos in sagittal plane were clicked. Then photographs were analysed using MB ruler software and angle was measured was measured.

Methodology

Systematic search was undertaken in commonly used search engines (PubMed, Google Scholar for the period from January 2012 to January 2022. The search strategy comprised of the following terms: Balance assessment , Spinal Cord Injury, Sitting Balance.

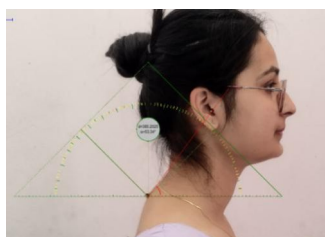
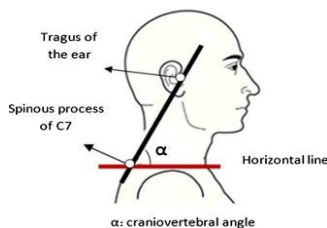


Fig no. 1: Measurement of CVA using Mb Ruler Software

Assessment of Endurance Capacity of Deep Neck Flexor Muscles –

Subject was in supine position with both crook lying place towel layers below the head. Place pressure biofeedback under suboccipital region and inflate the pressure up to 20 mmHg (stable baseline pressure). Ask patient to perform gentle head nodding action (Indicating yes)- and increase pressure on the cuff to 22mmHg and hold the pressure steady with minimal superficial muscle activity for 10 sec. If successful, relax 10 secs and repeat by increasing target position to 24mmHg up to 30 mmHg (from baseline 20 mmHg). Measure Final pressure at which the subject can hold steady without any trick movement

For Endurance = Final Pressure X No. of reps with 10 sec hold at that final pressure

A performance index is used to document an objective measure.

Performance Index = Final Pressure from

20mmHg baseline (activation score) X No. of times subject repeat the 10 sec hold (performance score)

For Example: If a patient could achieve the second level of the test (24mmHg) and perform six 10-sec holds with correct action of cranio-cervical flexion, then their performance index was $4 \times 6 = 24$. Highest Activation Score was 10mmHg & Highest Performance Index was 100mmHg. Test was considered poor

if subject could not hold the position at 26 mmHg.

Preliminary research on an asymptomatic population aged 18 to 60 years revealed no age or sex effects on test performance and determined a mean activation score of 7.6 ± 2.1 and performance index of 65.8 ± 27.5 , which show 20day repeatability determined by the (ICC 0.81 and 0.93 for the activation score and performance index respectively). Study of neck pain groups and single case studies using the original clinical test were showing that performance in patient with neck disorder was inferior with mean activation scores in the vicinity of 4 and performance indices of 10.



Fig. 2 : Assessment of Endurance Capacity of Deep Neck Flexor Muscles using pressure biofeedback

Neck pain Disability Index- Neck disability indices were used to measure neck pain and functional disability.

INTERPRETATION-

NDI = TOTAL SCORE X100

50

A score of 22% or more is considered a significant activity of daily living disability.

GRADINGS-

0-4= No Disability

5-14= Mild Disability

15-24= Moderate Disability

25-34= Severe Disability

>35 = COMPLETE DISABILITY

Intervention:

Kinesiology taping and Conventional Physiotherapy (Stretching & Strengthening) interventions was conducted for 4 weeks.

KINESIOTAPING:

Dosage of Kinesiotaping - 3 days per week for 4 weeks

1) For Upper Trapezius: Inhibitory / Neck Retraction Taping

Patient position: Sitting on Chair or Table

Therapist position: Behind patient

Procedure- Inhibitory kinesio taping was done. 5 cm wide kinesiology tape was used. The length was measured 80% from acromion process to the hairline nape of the neck. Rounding of edges done. Base of tape was applied distal to the acromion process in resting position with no tension/stretch. Subject's Head & Neck were lateral flexed to contralateral side and rotate to Ipsilateral side to elongate muscle. Other base of tape was anchored to the nape of neck just below hairline. Middle part of tape affixed with 15-25% stretch parallel to the muscle fibre over belly from insertion to origin of muscle then tape was rubbed along to the elongated muscle to activate adhesiveness. Repeat the same procedure for opposite side upper trapezius. Small I tape placed horizontally over both proximal edges by rounding edges to maintain tape for prolong duration.



Fig. 3 : Inhibitory Kinesiotaping for Bilateral Upper Trapezius

2) For Middle Trapezius- Facilitatory Taping

Patient position: Sitting on Chair or Table

Therapist position: Behind patient

Procedure- Facilitatory taping was done. 5 cm wide kinesiology tape was used. Tape was measured from C7 – T3 vertebra to the 80% Length acromion process of Both sides. Rounding edges was done. Apply base of tape with no tension at Spinous process of C7-T3 vertebra. Subject was asked to flex the neck. Apply another end to the acromion process on both sides. Middle part of the tape affixed with 15-35% stretch parallel to the muscle fibre over the belly bilaterally towards acromion process. Entire tape was rubbed onto elongated muscle fibre to activate adhesiveness of tape.



Fig. 4: Facilitatory Kinesiotaping for Bilateral Middle Trapezius



Fig. 5: Conventional Physiotherapy: Strengthening exercises:

1.Y-T-I Exercise

Patient Position: Subject Prone Lying, head in neutral with arms hanging over the edge.

Procedure:

Y Position – With the thumbs pointing up squeeze the shoulder blades together and raise the arm into Y position (elevate shoulder in full flexion). Return to starting position.

T position – with the thumbs pointing up squeeze the shoulder blades together and raise the arm in T position (arms abducted to 90 degree & externally rotated, elbow extended, horizontal abduction of scapula & scapular adduction). Return to starting position

I position – With the thumbs pointing up, squeeze the shoulder blades together & raise the arm into I position (arms at side: externally rotated shoulders and adducted scapula). Return to starting position.

2.Chin tuck

2.1Chin tuck (1st& 2nd week)

Patient Position: Sitting

Procedure:

This exercise was to activate deep neck flexor muscles. Place 2 finger at the bottom of chin. Ask the patient to lift the head up and away by gently tuck chin in and retract the head backward. Have the patient move to the extreme of the correct posture & Return to midline.

2.2Resisted Chin tuck- (3RD& 4TH Week)

Patient Position: Sitting with Loop Red colour elastic resistance band around the back of head.

Procedure:

Place an elastic band around the back of the head ends were hold in both hand in front of face. Pull the band forward with both arms and tuck chin in without tilting head forward and hold for 10 sec. Release the band and repeat the same procedure.

Dosage: 10reps with 10 sec hold 3 sets with rest of 10 sec, 5 times a week for 4 weeks.

Static Self Stretching Exercises:

Dosage- 30 sec hold/3reps with Rest Interval of 15 sec. 1 session per Day, 5 times a Week for 4 Weeks.

1.Upper Trapezius–

Patient Position:

Subject Sitting on table with the ipsilateral hand

behind the back by bringing the shoulder slight posteriorly to stabilize the scapula.

Procedure:

Ask the patient to side bend the neck opposite from tight side and then rotate neck toward tight side. Use the opposite arm to apply the stretch. Repeat same procedure for other side.

2.Sternocleidomastoid

Patient Position: Sitting on table **Procedure:**

Ask the patient to depress chest and rotate head opposite side diagonally 45% (towards ceiling). Bring head posteriorly in that position until a stretch felt. Repeat same procedure for other side.

3. Leavator scapulae-

Patient Position - Subject sitting with head side bent and rotated away from the tight side. To stabilize the scapula another hand was hold onto the seat of table/chair.

Procedure - Ask the patient to place other hand on the head to gently pull it forward and to the side in an oblique direction opposite the line of pull of the tight muscles.

4.Pectoralis Major Muscles

Patient Position – Standing, facing a corner or open door with the arms in a reverse T or V against the wall.

Procedure – Have the patient lean entire body forward from the ankle and knees slightly flexed. The degree of stretch can be adjusted by the amount of forward movement.

Statistical Analysis-

A total 34 participants are included in this study from which 5 were men and 29 women. The data obtained from the participants was statistically analysed. Mean was calculated for all the needed variables. Statistical analysis was performed with Instant Version3.05. The paired t test was used for calculating intra group values.

Result-

Total 34 subjects are included in this study from 35% subjects are between the age of 18-21 years, 65%between the age of 22-25 years from which 85% subjects are female while 15% subjects are male. From 34 subjects 9% subjects were underweight, 85% subjects were normal, 3% subjects were pre obese and 3% subjects were obese class 1.

Table 1- Age-wise distribution of study subjects

AGE GROUP=	NO. OF SUBJECTS=	MEAN=
18-21	12	22.11
22-25	22	

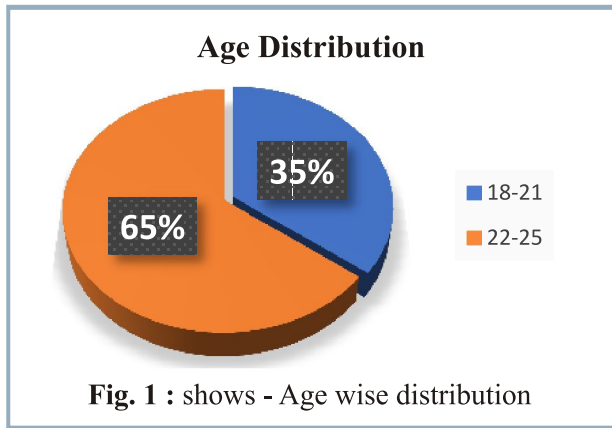


Table 2- Gender wise distribution of study subjects

GENDER	NO. OF SUBJECTS	PERCENTAGE
MALE	5	15%
FEMALE	29	85%

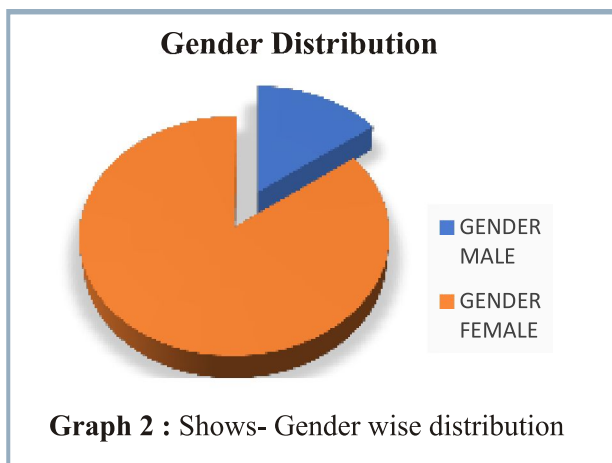
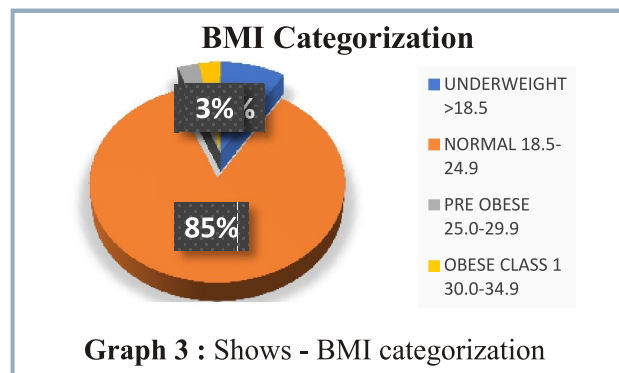


Table 3- BMI Categorization (WHO) of study subject

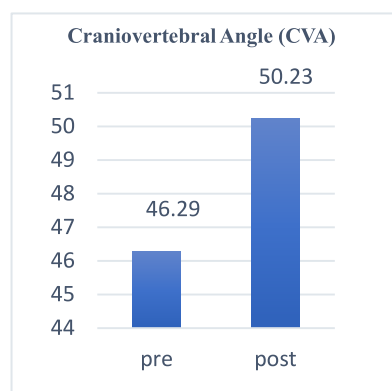
BMI	Kg/m2	NO. OF SUBJECTS	MEAN
Under weight	>18.5	3	21.5
Normal	18.6-24.9	29	
Over weight	25-29.9	1	
Obese Class 1	30-34.9	1	



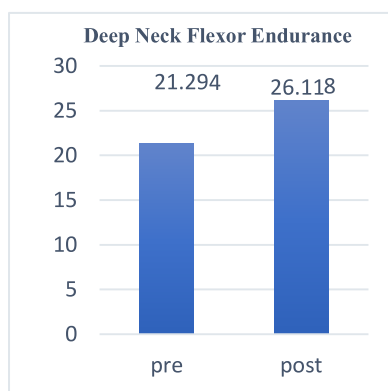
On intra group comparison using paired t test the pre intervention mean of CVA was 46.29+2.384 Obtained p value after the intervention is <0.0001 with post mean 50.23 +3.060 which implies that there is significant difference between pre post comparison for Deep neck cervical flexor endurance for Deep neck cervical flexor endurance was 21.294+8.27. Obtained p value after the intervention is <0.0001 with post mean 26.117+ 9.67 which implies that there is significant difference between pre post comparison for NDI was 24.720+4.351. Obtained p value after the intervention is <0.0001 with post mean 21.067 + 3.410 which implies that there is significant difference between pre post comparison Kinesio taping and conventional physiotherapy were effective in increasing CVA angle, improve Endurance and reducing the Neck pain and disability.

Table 4: Shows Pre post value of Outcome Measures

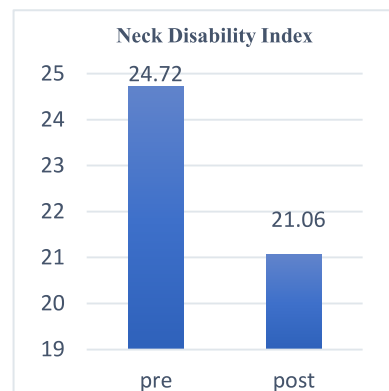
Outcome Measures=	PRE (MEAN+SD)=	POST (MEAN+SD)=	t value=	P value=	significance=
CranioJ Vertebral Angle=	46.29 ± 2.384=	50.23 ± 3.060=	10.465=	<0.0001=	Extremely significance=
Deep Neck Flexor Endurance=	21.294 ± 8.27=	26.117 ± 9.67=	7.134=	<0.0001=	Extremely significance=
Neck Disability Index=	24.720 ± 4.351=	21.067 ± 3.140=	8.668=	<0.0001=	Extremely significance=



Graph 4: Craniovertebral angle



Graph 5: Deep neck flexors



Graph 6 : NDI

Discussion-

This study shows that kinesiotaping along with conventional physiotherapy is effective to treat forward head posture, to improve cervical flexor muscle endurance or to reduce neck disability.

Kinesiology taping shows effective improvement in joint position it stimulates proprioceptive feedback. Conventional isometric training (CIT) works for improving isometric function of neck muscle, which counteracts the force of gravity to maintain neck and head in upright position retraining the DCF muscles, which has been shown to decrease neck symptoms and increase the activation of the deep cervical flexor muscles during performance of the clinical test of CCF, may improve the ability to maintain an upright posture of the cervical spine.

Variable 1- Craniovertebral Angle

Obtained p value after the intervention is <0.0001 which implies that there is significant difference between pre post comparison. Kinesio taping and conventional physiotherapy were effective in increase in craniovertebral angle. Conventional physiotherapy was effective in increasing CVA. This could be due autogenic inhibition- Golgi tendon organ has inhibitory effect on muscle tension. GTO activation passes signal to spinal cord to inhibit alpha motor neuron. It causes reflexive muscle relaxation during stretching

Kinesiotaping causes low intensity prolonged stretch force to muscle, stretch reflex activate at GTO Fires and inhibit tension in the muscle allowing the sarcomere to remain relaxed and lengthened.

This study is in accordance with swethagauns et.al (2016) in which taping has already proved its effectiveness in improving forward head posture where it improves posture with applied prolong stretch on muscles. Muscle and collagen tissues are

very adaptable and researches are indicated that prolonged and low load stretch are more effective than short term stretch. Kinesiotape maintains the proper alignment and in this way it applies prolonged stretch on tight structures surrounding shoulder and neck.

Variable 2- Deep Neck Flexor Endurance

Obtained p value after the intervention is <0.0001 which implies that there is significant difference between pre post comparison.

Kinesio taping and conventional physiotherapy were effective in improving deep neck cervical flexor endurance.

This could be due to decrease in the lordotic posture of cervical spine. As increase lordotic posture of cervical spine causing weakness of deep neck flexors (longus capitis and colis) as the curve decreases due to postural stabilizing exercise the muscle efficiency gets improved which leads to improvement of deep neck flexor endurance. While on other hand kinesiotape work as feedback to the patient to maintain posture for prolong period which improves deep neck flexors efficacy to work. This study is in accordance with filiz tuna et.al in which 62 students were present in the study pre and post difference of kinesiotaping on deep cervical flexors are noted they show that cervical kinesiotaping increase endurance for the short term.

Variable 3- Neck Pain Disability Index

Obtained p value after the intervention is <0.0001 which implies that there is significant difference between pre post comparison. Kinesiotaping and conventional physiotherapy were effective in reducing the Neck pain and disability. This may be due to reduce in neck pain and improve Endurance which will ultimately reduce disability.

This result in accordance with Ylinen et. Al. (2003)

found that neck strengthening exercises reduced NDI scores of severe neck pain patients by 9 points over 12 months when compared to a non-significant 4point change over 12 months in the control group comprising instruction on aerobic and stretching exercises.

Conclusion

Kinesiotaping along with conventional physiotherapy is effective to treat forward head posture, to improve deep neck flexors endurance and to reduce functional disability among young adult (18-25 years).

Limitations

Less number of follow ups are taken. Short duration of rehabilitation. As study is done in summer due to high sweating there is more chance of removal of adhesiveness of kinesiotape. Heavy bags of student on shoulder causes friction to kinesiotape.

Future Scope

EMG could be use concurrently, to provide additional information on muscle activation. Future study can be done by Randomized control trial design. Future study can be done using more dynamic outcome measure instead of static photographic measure for FHP. High quality or waterproof kinesiotape can be used.

Clinical Implication

Kinesiotaping along with conventional physiotherapy is effective and can be use clinically to treat forward head posture among young adult. It provides continuous feedback to patient to maintain the correct posture for prolong period. This treatment can help to accelerate the treatment process using kinesiotape was suggested as a complementary treatment.

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