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Research Protocol

Physiotherapy Section

Effect of Deep Cervical Flexor versus Core Stability Exercises on Range of Motion and Function in Individuals with Forward Head Posture- A Research Protocol

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ABSTRACT

Introduction: The human spine forms cervical and lumbar lordosis and thoracic kyphosis when it is aligned in the sagittal plane against a vertical reference. When the head protrudes forward from the sagittal plane and appears to be in front of the body, it is called Forward Head Posture (FHP). The atlantooccipital joint and upper cervical vertebrae extend, whereas the lower cervical and upper thoracic vertebrae flex. FHP puts more strain on the neck causing problems with the musculoskeletal, neurological, and respiratory systems. The Deep Cervical Flexor (DCF) muscles have been revealed to have an important role in the cervical spine's support and strengthening. FHP is one of the most typical incorrect postures that has increased in popularity recently.

Need of the study: The present study would help to assess the effect of both the techniques, CSE and DCF on pain, range and function in individuals with FHP to help the patient and the therapist in a better approach to rehabilitation.

Aim: To compare the impact of Core Stability Exercises (CSE) to DCF exercises on people who have a FHP.

Materials and Methods: In this interventional comparative study, a total of 70 patients with FHP and neck pain will be included with Craniovertebral Angle (CVA) less than 50°. They will be divided into two equal groups. After a warm-up, Group A will receive DCF exercises while Group B will receive CSE for four weeks, and pain, range, and function will be assessed at the beginning, after two weeks, and after four weeks of intervention. Pain will be assessed by the Visual Analogue Scale (VAS), range will be evaluated with a goniometer, and function will be assessed by Neck Disability Index (NDI). The statistical tests used will be Chi-square test and the Student t-test.

Keywords: Core strength, Craniovertebral angle, Deep cervical muscles, Rehabilitation

INTRODUCTION

When the human spine is aligned against a vertical reference in the sagittal plane, it creates three curves, the cervical and lumbar lordosis being the posteriorly concave portions and thoracic kyphosis being the anteriorly concave portion. These spinal curves are a compensating arrangement of spinal segments that sustain the body with the least amount of stress and energy consumption possible. The cervical spine's function is to counterbalance the head against gravity's force [1,2]. The most frequent postural deformity is FHP, which occurs when the head protrudes forward from the sagittal plane and appears to be in front of the body. The atlanto-occipital joint and upper cervical vertebrae extend, whereas the lower cervical and upper thoracic vertebrae flex [3].

A key component in developing incorrect head and neck posture is a lack of awareness while functioning. Poor head posture is thought to be inefficient because it increases the antigravity strain on cervical tissues, causing aberrant and compensatory activity which results in pain [3]. FHP puts more strain on the neck, causing problems with the musculoskeletal, neurological, and respiratory systems. These modifications lead to prolonged and excessive strain on the muscles, fascia, and nerves of the neck and shoulders. Muscle shortening and elongation as a result of muscular imbalance causes many bodily components to malfunction. Prolonged FHP has been linked to a reduction in the number of sarcomeres as well as muscle fibre shortening, both of which can impact muscular contraction [4]. Occupation and habits are two factors that contribute to this posture in modern individuals, and in most cases, except for the occupational element, are mostly impacted by the habit of using electronic devices. Even carrying a backpack causes poor posture in the body. With a reported incidence of 73%, this postural abnormality is common in people of all ages [5].

Given the relationship between FHP in standing and a lack of abdominal muscle control, which exacerbates thoracic kyphosis, it seems sensible to think that implementing a training program to enhance spinal realignment might help FHP. Inactive individuals can benefit from core muscle training programs to address FHP [6]. Core stability regimens, on the other hand, are likely to reduce the percentage of muscle activity necessary for optimal posture maintenance and to reduce muscular fatigue in those muscles [6].

Adults with increased FHP have been reported to have poor neck flexor and extensor muscle function. Lower cervical flexion and extension, as well as posterior muscular stiffness and anterior cervical muscle weakening and lengthening, are all possible symptoms of FHP [7]. It has been determined that the DCF muscles play a crucial role in the cervical spine's stability [7].

In recent years, people have been adopting a sedentary lifestyle leading to bad posture. This can give some major complications in chronic stages. A lack of abdominal muscle control has been linked to attaining FHP. To reduce and prevent this posture, CSE plays a major role [6].

As no study comparing the impact of Deep Cervical Flexor Exercises (DCFE) and CSE and CSE on function and Range of Motion (ROM) in individuals has been found; there is a strong need to perform a study to evaluate the same. This study aims to investigate the impact of DCFs on core stability in individuals with a FHP.

REVIEW OF LITERATURE

In general, FHP shortens the extensors of the neck, such as the splenii, upper trapezius, and SCM muscles, while lengthening and weakening the cervical flexors [3]. According to research, when performance is compromised, the balance between the neck's

posterior stabilisers and the DCF is thrown off, which makes it difficult to maintain normal alignment and posture. This loss of alignment can then induce cervical impairment [8]. The goal of the study is to analyse the efficacy of DCFE and CSE on ROM and function in people with FHP.

In previous studies, reduced CVA and cervical flexion range were predictors of cervical discomfort [4,6]. The exercises used are proven to be effective individually and in other age groups. Therefore, the comparison between these exercise programs in healthy individuals will be seen in this study. A warm-up session will activate the muscles and enhance the performance of both groups equally without altering the results.

A study conducted in 2021 by Esmaeili Z et al., compared the effect of CSE and functional corrective exercises on 14-16-year-old females resulting in a substantial effect on postural correction and a combination of exercises (Functional corrective exercises+CSE) considerably improved FHP when compared to each other [6]. A systematic review done by Mahmoud NF et al., stated that age played an important role in the relation between neck pain and FHP. Also, FHP was increased in individuals with neck pain [9]. The rationale behind DCF training as a treatment for FHP is that DCF has a significant postural role in sustaining and straightening cervical lordosis. Retraining these muscles has been shown to reduce neck symptoms and improve the ability to maintain an upright posture of the cervical spine. Improved ability in holding an upright posture of the cervical spine during the functional task of sitting was due to the high endurance of DCF muscles [10]. Our findings could help healthcare professionals determine a patient's functional condition. To avoid any disparities in recovery time between the two groups, both would have the same treatment duration.

MATERIALS AND METHODS

The present research protocol is presented for an interventional comparative study which will be conducted in the Outpatient Department of Ravi Nair Physiotherapy College and AVBRH Sawangi, Wardha, Maharashtra, India from May 2022-May 2023 on individuals with FHP. The Ethical approval from the Institutional Ethical Committee of Datta Meghe Institute of Medical Sciences was received in April 2022 and we have registered with the Clinical Trial Registry India (CTRI)-CTRI/2022/08/044588.

Inclusion criteria: Healthy individuals aged between 20-40 years with either gender having CVA less than 50 degrees will be included in this study.

Exclusion criteria: Individuals who have migraine or cervicogenic headache or people who have undergone any surgery involving the spine or with injuries or history of fracture, conditions of the shoulder girdle, spine, trunk, and people who will refuse to participate will be excluded.

Sample size calculation: The participants enrolled in group A will be 35 and in group B will be 35 Total N=70. The following formula have been used to calculate the sample size;

$$n=\frac{(2\propto+2\beta)^2(\delta 1^2+\delta 2^2 1K)}{\Delta^2}$$

Where,

Z_α is the level of significance at 5% that is 95%

Confidence interval=1.96

Z_β is the power of test =80%=0.84

δ 1=SD of past t/t VAS in experimental group=1.39 [7]

δ 2=SD of past t/t VAS in control group=1.58 [7]

K=1

Δ=Difference between 2 means

=4.33-3.33=1

$$n=\frac{(1.96+0.84)^2(1.39^2+1.58^2 1K)}{\Delta^2}$$

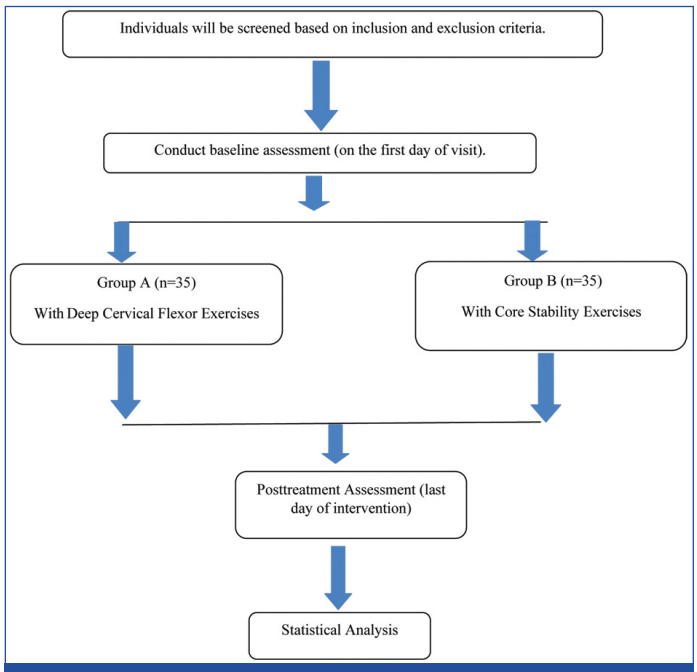
=34.71=35 patients are needed in each group

Individuals who will be visiting physiotherapy OPD in Acharya Vinoba Bhave Rural Hospital and Ravi Nair Physiotherapy College with complaints of neck pain and who will fulfill the inclusion criteria will be included. We will assess the other undiagnosed individuals with FHP and include them in the study.

Study Procedure

All the participants will complete the intervention four weeks after their enrollment in the study. The evaluations will be taken on the first day of the visit, in the 2nd week, and before their last session which is the 4th week. The research coordinator and the lead investigator will distribute the people randomly according to simple random sampling technique.

The participants will be given a thorough description of the technique, and their informed consent will be obtained. The study will cover all people who are willing to participate. Participants will be screened by measuring the CVA (A horizontal line going through the C7 spinous process and a line connecting the midway of the tragus of the ear to the skin above the C7 spinous process forms the CVA) [11]. The NDI, (a 10-item questionnaire that assesses the level of neck pain-related disability as indicated by the patient) will be used to evaluate function [12], and VAS will be used to assess neck pain. In standing, a goniometer will be used to assess ROM. All of the subjects will be categorised into two groups, with 35 participants in each group. The exercise program will be performed under the supervision of the researcher [Table/Fig-1].



[Table/Fig-1]: Flow diagram.

Intervention and Intervention Design

Warm-up session: Both groups will complete a 10-minute warm-up session. The exercises will be repeated twice for a total of two sets of 10 repetitions. There will be a 10-second break between each set.

The session will include:

1. Upper trapezius stretching
2. Seated row
3. Gentle neck ROM which will include neck flexion, extension, and rotation.

Group A (DCFE): They will receive the DCFE for four weeks, 30 minutes each day, five days per week.

They will be instructed to complete three sets with 15 repetitions each.

1. A delicate nod of the head as if to indicate "yes".
2. Chin tucks in supine lying.
3. Neck lateral bending with chin tucked (right and left)
4. Neck isometrics

Group B Core Stability Exercises (CSE): For four weeks, group B will be receiving CSE for 30 minutes each day, five days a week. They will be given three sets of 15 repetitions each.

1. Bridging
2. Plank
3. Bird dog exercise.
4. Hip extension in quadruped.

Outcome Measures

Primary outcome measures: ROM will be assessed by a goniometer [13], CVA [14,15].

Secondary outcome measure: Visual Analogue Scale (VAS) will be used for scoring their pain [16]. NDI will be used for assessing the function [12].

Under the supervision of the lead investigators, data will be collected and reported at baseline, in the 2nd week and the 4th week after the session is completed from May 2022 to May 2023. The documentation will be thoroughly examined for accuracy. The excel spreadsheet will be sent to a blinded statistician who will do the appropriate research after the study is completed.

STATISTICAL ANALYSIS

The data obtained will be written down and then organised in a tabular style. It will be scrutinised with the help of Statistical Package for Social Sciences (SPSS) 27.0, and Graphpad Prism 7.0V, and the statistical methods used will be Chi-square test and Student t-test.

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