



Impact of Therapeutic Ultrasound and Myofascial Release Technique on Quality of Life of Students Having Neck Pain Following Virtual Learning

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Authors' contributions

This work was carried out in collaboration among all authors. The study's design was suggested by author AWB. The study was created and designed by authors CAC and AWB. This article's manuscript was written by author CAC. Authors AWB and CAC read the final paper and gave their approval for publishing. All authors read and approved the final manuscript.

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Study Protocol

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ABSTRACT

Background: Neck pain is a ubiquitous complaint leading to work place absenteeism, disabilities and disturbed sleep wake cycle in many young working and studying people. In ongoing covid scenario, since there is increased use of laptops and mobile phones facilitating work from home for employee and virtual learning for students, there has been increased prevalence of non-specific neck pain among the people due to prolonged fixed flexion posture. Neck pain has become the condition of major consideration since 45% of UG students had experienced neck pain in last 12 months.

Aims and Objectives: to evaluate combined and individual effects of Therapeutic Ultrasound and Myofascial Release Technique on Quality of Life of students suffering from neck pain owing to virtual learning.

Methods: The participant (n=33) will be recruited in study experiencing non-specific neck pain and meeting the inclusion criteria. Three groups will be formed such that the patient in Group A will receive treated with therapeutic ultrasound. Group B will be receiving treatment using Myofascial Release Technique and Group C will be treated using combined use of both Therapeutic Ultrasound and Myofascial release Technique. The protocol will cover 1 week of treatment. Regular assessment at 0, 3rd and 7th day of week will be carried out. We will evaluate using Numerical Pain Rating Scale (NPRS), Neck Disability Index (NDI), and Range of motion of neck and Manual Muscle testing of cervical musculature.

Results: The result of the study will provide affirmation on using combination therapy of Therapeutic Ultrasound and Myofascial Release Technique in people having nonspecific neck pain.

Keywords: Neck pain; therapeutic ultrasound; myofascial release technique; combination therapy; physiotherapy.

1. INTRODUCTION

Whole world is facing an unexpected pandemic, named as Covid 19 by the World Health Organization and triggered by a novel corona virus [1]. In 2019, the Coronavirus disease, also known as COVID-19, which has spread all over the globe, has resulted in a pandemic situation. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been declared a public health emergency of international concern [2]. Online learning platform has changed the direction of remote learning, resulting to online mobile phone or laptop based learning owing to the current situation [3]. For both faculty and students, the unanticipated change from classroom teaching to online education is a challenging situation [4]. The COVID 19 epidemic ushered in a new paradigmatic shift in education, shifting from traditional education system to virtual learning strategies, utilizing mobile phones and laptops as a device for online learning [3]. People using mobile devices and laptops report pain in various site of their upper limb, glenohumeral joint pain, pain in upper back or neck, wrist and hand pain, and finger discomfort. Prolonged smartphone utilization puts constant mechanical stress on tendons, muscles and various other tissues, resulting in a variety of musculoskeletal problems. In a seated position, using a smartphone may cause a greater shifting in angle between head and neck as compared to in standing posture [5]. Neck pain is a ubiquitous complaint which eventually leads to work place absenteeism, disabilities and disturbances in sleep wake cycle in many young working people. One can observe higher prevalence of neck pain

in UG and PG students associated with modifiable and non-modifiable risk factors [6]. However neck pain is the mild musculoskeletal condition, but in recent years it has been taken under serious consideration and may have pessimistic impact on both physical and psychological aspects [7]. Neck pain is divided into two sub types: specific neck pain and non-specific neck pain (aka mechanical neck pain). Mechanical neck pain is mainly caused because of prolonged neck posture, neck movements with no underlying pathologies and may result in restricted neck movements and pain inflicted during movements and pain may spread to upper extremity [8]. Owing to COVID 19 scenario there is increased usage of devices such as mobile phones and laptops in the process of virtual learning in which there is prolonged periods of neck flexion position which directly leads to neck pain among the students. According to studies and research, there is a considerable link between the length of time spent on a mobile phone or laptop and the degree of neck pain [9]. Also many researches has reported higher prevalence of headache and neck pain among students sitting for longer duration in fixed position while operating on mobile phones and laptop /computers [10].

Neck pain is the condition of major consideration since 45% of UG students had experienced neck pain in last 12 months in which 17% of UG students had current neck pain. Physiotherapy and Nursing students are have higher frequency of occurrence of non-specific neck pain which is 26.5% and 26.1% respectively [6]. Also the sophomores of third and fourth year had around 2.9 times increased chances of having current

neck pain than that of first year students [11]. Some studies report that females(57%) and adolescent(60%) have higher rate of occurrence of neck pain as compared to males(43%) and children (40%) [12]. There are various Physiotherapeutic interventions which can prove helpful to relief neck pain that includes TENS, ultrasound, cryotherapy and some manual techniques such as MET and MFR.

Myofascial release technique (MFT) is the type of manual therapy which allows the implementation of low load, prolonged stretching to myofascial, helps to regain optimum length, reduces pain and restore tissue mobility [13]. It contributes to release myofascial trigger points which are hyperirritable points resides within taut bands of muscle fibers which majorly leads to musculoskeletal pain [14]. Studies have shown effectiveness of MFT in releasing area of impaired tissue flexibility and hence reduces the intensity of pain perceived in people having non-specific neck pain [15]. MFT can help patients with persistent non-specific neck pain reduce pain perception and local pressure pain sensitivity, as well as enhance cervical mobility [16].

Therapeutic Ultrasound (US) is most commonly and widely used modality in clinical practice. It is used in various musculoskeletal condition which includes pain, muscle spasm, joint contracture and soft tissue injury [17]. The treatment parameter for therapeutic US includes frequency, duration, duty cycle, treatment time and area. The range of frequency used in US are 1MHz which is used for treating deeper tissue and 3MHz used for treating superficial tissue [18]. It provides combination of both thermal and mechanical effect which results in physiological effects such as increased local blood flow [19], increased tissue temperature, [20] increases flexibility of tissue and improves flow of fluid content in tissue also facilitates cellular permeability and ion transport, which speeds up tissue metabolism [18] Owing to this reason ultrasound has been widely utilized as a modality for treating painful conditions and muscle spasm, muscle stiffness and improving active movements of various joints [18,21].

1.1 Aim

The study aims is to find the impact of Therapeutic Ultrasound and Myofascial release technique on Quality of life of students having neck pain following virtual learning.

2. MATERIALS AND METHODOLOGY

2.1 Methodology

Study setting - The study would be done in the community Physiotherapy OPD of Ravi Nair Physiotherapy College, Sawangi (Meghe), Wardha.

Study design and sample size –The design of the study is experimental study enrolling 33 participants. The participants enrolled in this study will be distributed in three groups. Group A receiving treatment through therapeutic ultrasound, Group B receiving treatment through Myofascial Release Technique and Group C receiving combination therapy including both Therapeutic Ultrasound and Myofascial Release Technique for 1 weeks each. Before inclusion, the participants will be explained about objectives and approaches of the study, and written informed consent forms will be signed by them. The study schedule of enrollment, intervention and assessment of study (according to standard protocol items: a recommendation for intervention trials (spirit), 2013) [22] is illustrated in Table 1.

2.2 Participants

The study will include the participants clinically diagnosed with nonspecific type of neck pain. Age group of 18-27 years. Willingness to participate in study. 5 or more than 5 point on Numerical pain rating scale. Both male and female.

The participants will be excluded Specific causes of neck pain including myelopathy along with weakness, lack of sensation, prolapsed cervical disc, spinal stenosis in cervical region, cervical spondylitis. Previous upper limb or neck surgical operation. Past History of any type of cervical trauma (whiplash injury, fracture, dislocation). Having congenital torticollis. Recurrent and frequent migraine. Metastatic condition. Pregnant women. Above 27 years of age and below 18 years of age.

2.3 Participant Timeline

As study duration is of 6 months and intervention duration is 1 week so participant will be enrolled mostly during first 4 months of study so 1 week intervention will be completed successfully. Assessment will be done on 1st day of visit then on 3rd day and lastly on 7th day i.e. last day of intervention. Participant will have to visit every day for a week for treatment.

Table 1. Schedule of enrollment, assessment and intervention

TIMEPOINT	Study Period				
	Enrollment	Allocation Post – allocation			Follow-up test
	-t ₁	Intervention (t ₁ – t ₇)			t _x
		t ₁	t ₃	t ₇	
ENROLLMENT					
Eligibility Screen	X				X
Informed consent	X				
Allocation		X			
Intervention:					
1. Therapeutic ultrasound		X	X	X	
2. Myofacial release technique		X	X	X	
3. Combination of Therapeutic US and MRT		X	X	X	
Assessment					
Primary outcome measure- NPRS, NDI	X				
Secondary outcome measure- ROM, MMT		X	X	X	X

2.4 Recruitment

The patients undergoing rehabilitation in our Out Patient Department having non-specific neck pain will be systematically assessed for the eligibility in the study as per inclusion and exclusion criteria. After enrollment in the study participants will be randomized in one of the group A or B or C and accordingly will undergo the rehabilitation program for 1 week with intermediate assessments. Informed patient consent will be taken before allocation and after explaining the purpose of the study, procedure, prospective benefits and after effects of intervention.

2.5 Implementation

Randomization will be supervised by the research coordinator and principal investigators. Participants will be asked to handpick a sealed group allocation for the recruitment into either group from the envelope.

2.6 Blinding

Tester(s) will be blinded to assign the subjects to the group. To ensure blinding, subjects will be mandated not to reveal any details of their treatment to the tester.

2.7 Study Procedure

The participants will be categorized into three groups.

Intervention for group A – It includes application of Therapeutic Ultrasound which will be given to the patient in prone lying position for 8 minutes. The patient should be in comfortable position with proper pillow support. Then by applying aquasonic gel along with diclofenac gel on the head of the probe of ultrasound and moving the probe in circular pattern which will facilitate phonophoresis and hence relieves pain through deeper penetration of tropically applied diclofenac gel. The frequency to be used is of 1 MHz as for suboccipital muscles and upper and middle fibers of trapezius and covering the whole muscle belly.

Intervention for group B – It will involve Myofascial Release Technique for neck muscles which includes suboccipital muscles and upper and middle fibers of trapezius will be given in prone lying position with pillow under the neck for support. We will be applying some neutral non irritating lubricant on the neck of the patient for ease of movement and then with finger pulp or knuckle we will move from proximal to distal portion of muscle. This will be done for 1-2mins for each muscle and hence relaxing the muscle and reducing pain and restoring tissue mobility.

Intervention for group C – It will include combined application of therapeutic ultrasound and myofascial release technique for relaxing cervical musculature and hence reliving neck

pain. While patient in prone lying position with pillow under the neck for support, initially we will apply therapeutic ultrasound having frequency of 1MHz, using aquasonic and diclofenac and moving probe in circular pattern for 8 minutes, followed by applying myofascial release technique for about 1-2 min.

2.8 Outcome Measures

Primary outcome measure-

1. **Numerical Pain Rating Scale** - Numerical pain rating scale (NPRS) is a unidimensional measure of neck pain used to measure intensity of pain in adults including those having non-specific neck pain or chronic pain. It is an 11-point scale starts from "0" which indicates "no pain" to "10" which indicates "worst possible pain". It is easy to administer and score. NPRS is very commonly used, valid and reliable measurement tool for measuring pain intensity [23,24].
2. **Neck Disability Index** - Neck disability index (NDI) frequently and widely used questionnaire for assessing QoL of people suffering from neck pain. The NDI was the first and most thoroughly validated 10-item questionnaire designed to assess self-reported disability in individuals with neck discomfort. It is the effective questionnaire used both in clinical and research setting [25].

Secondary outcome measures-

1. **Range of Motion** – Range of motion (ROM) need to be assessed on first, third and last day of the treatment by using goniometer and hence allowing us to compare the improvement in range of motion of neck pre and post treatment. Motions to be assessed includes flexion(80⁰-90⁰), extension(70⁰), lateral flexion(20⁰-45⁰) and rotation to left and right(upto 90⁰) [26].
2. **Manual Muscle Testing (MMT)** - MMT has to be done for cervical musculature in order to assess strength of the muscles responsible for neck range of motion. Pre and post treatment assessment has to be done. MMT for cervical muscles includes grade 0 (no strength), grade 1 (trace), grade 2 (poor), grade 3 (fair), grade 4 (good) and grade 5 (normal) [27].

2.9 Data Collection and Management

• Data collection

The data for the evaluation will come from a pre-made spreadsheet with varied baseline attributes. The results of the research will be stored in a secure database. Hard copies of evaluation forms, signed informed consent, and other non-electronic documents will be safely preserved in the study setting.

• Data management

Under the direction of the lead investigators, data will be collected and reported. The accuracy of the research papers must be double-checked. The Excel file will be published and handed to the statistician for analysis after the study is completed. To prevent data loss due to erroneous staff processes, a checklist might be utilized.

2.10 Statistical Analysis Plan

Data will be analyzed by utilizing qualitative and interpretation statistical data through using Chi-square test and the student's unpaired t test. The device used for interpretation will be SPSS 24.0 version, Graph pad prism version 7.0 and $p < 0.005$ are considered to be of relevance ($p > 0.005$).

2.11 Bias

To avoid attrition bias, reminder calls will be made before to each intervention, and travel help will be provided to those who require it. As a result, we anticipate a low number of dropouts.

3. RESULTS

Successful accomplishment of this study will provide evidence on the best treatment strategy out of individual Therapeutic ultrasound and Myofascial release technique (MRT) and combination therapy using both Therapeutic US and MRT for the patients having neck pain to improve their function and result of this study will lead us to better understanding on both treatments. Once the study result is complete data will be analyzed using paired t-test and will be submitted in form of research paper.

4. DISCUSSION

Neck pain is a ubiquitous complaint which eventually leads to work place absenteeism, disabilities and disturbances in sleep wake cycle in many young people. This study aims to evaluate the extent to which the individual therapeutic US and MRT therapy to combination of both Therapeutic US and MRT, reinforces in reducing the neck pain and restoring functional motion of neck. Myofascial release is the type of manual therapy, effectiveness of which is mixed in both quality and result and application of which helps to restore optimal length of myofascial, decreases pain and improves function and can be used in treatment of various condition [13]. According to the studies of Paolo Tozzi et al in 2011 patients with non-specific neck discomfort, myofascial release technique can be a helpful manual treatment for releasing areas with reduced sliding myofascial flexibility and minimizing pain perception [15]. Therapeutic ultrasound is an efficacious electrotherapy modality which can produce noticeable increase in local blood flow in cutaneous tissue and resulting in accelerating healing in soft tissues [19]. V J Robertson et al [17] in their studies had found that Therapeutic ultrasound is an effective modality used as treating modality for people suffering with pain or various musculoskeletal injuries or for facilitating healing of soft tissues [17].

5. CONCLUSION

This research seeks to explore the combined effect of Therapeutic US and MRT in patients having neck pain. The result of the study will help patients for faster recovery and improve their quality of life. Major Outcome measures of the study are Numerical Pain Rating Scale (NPRS) and Neck Disability Index (NDI).

CONSENT

The patient and one of their families will sign a printed form with their informed consent, and the Principal Investigator will be given confirmation of secrecy.

ETHICAL APPROVAL

The institutional ethical committee will provide its approval. The major findings of the research can be accessed by both the Datta Meghe Institute of Medical Sciences who will fund the research and the people who will participate in the study. Data

is kept for a minimum of five years for the registered subjects. Following the completion of data collection and statistical analysis, a completion report will be prepared and sent for publication after being reviewed by the institutional research cell.

CONFIDENTIALITY

The participant and one of his or her relatives will be informed about the study, and the primary investigator will collect personal information as part of the procedure. The confidentiality declaration, as well as the signatures of the principle investigator, patient, and two witnesses, will be included on the permission form. If the patient's consent is required to release some information for the study, the patient's consent will be sought with complete assurance of his or her anonymity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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