https://doi.org/10.48047/AFJBS.6.Si4.2024.838-845

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Effect of Craniocervical Neural Mobilization on Quality of Life in Patients with Primary Tension Headache

Amira M. Elgendy[1],Nahed Salem[2], Ebtesam Fahmy[3], Enas Elsayed[4],Rasha M. Hegazy[2,5],Noura A. Elkafrawy[2].

1- Department of Physical Therapy,Mubarak Central Hospital, Giza, Egypt.
2-Department of Physical Therapyfor Neurology and Neurosurgery, Faculty of Physical Therapy, Cairo University,Egypt.
3-Department of Neurology, Faculty of Medicine, Cairo University,Egypt.
4-Department of Neurorehabilitation, Facultyof Physical Therapy, Galala University,Suez, Egypt.
5-Department of Physical Therapy, Faculty of Medical Rehabilitation Sciences, King Abdulaziz University, Jeddah, Saudi Arabia.

Article History

Volume 6, Issue Si4, 2024
Received: 25 May 2024
Accepted: 15 June 2024
doi:
10.48047/AFJBS.6.Si4.2024.838-845

Abstract

Background: Tension-type headache (TTH) ranks among the most frequentand highly widespread primary headaches that affect people's daily tasks and reduce their quality of life (QoL).

Objective: To evaluate the effect of the craniocervical neural mobilization technique on pain intensity and QoLin patients suffering from TTH.

Methods:A sample of 30 patients, aged between 25-40 years, with primary tension headache, including both male and female participants, was recruited for this study. They were randomly assigned into two equal groups using closed envelopes: Study group (GI) andControl group(GII). The study group received craniocervical neural mobilization technique and aselected physiotherapy program. The control group received the same selected physiotherapy program only. Each group attended eight sessions, with sessions held twice weekly for four weeks. The outcome measures pre and post-treatment included Visual Analogue Scale (VAS) for pain intensity and Headache Impact Test-6 (HIT-6), and Headache Disability Index (HDI) for quality of life.

Results: There was a significant decrease in the mean scores of VAS, HIT-6, and HDI in both groups after treatment, with more significant improvement of the study group compared to the control group ($P<0.05$).

Conclusion: Neural mobilization is an effective method to decrease pain intensity and improve the QoLin patients suffering from TTH.

Keywords: Tension headache,Neural mobilization,Quality of life.

1.INTRODUCTION

Headaches are awidespread neurological symptomexperienced by virtually every person throughout their lifetime[1].Based on the third version of the International Classification of Headache Disorders (ICHD-3), tension-type headache (TTH) is the main type of headache globally[2]. In addition,its chronic form (CTTH) affects 0.5 to 4.8% of individuals worldwide[3].

The Middle East and North African region has a considerable burden of TTH, with over 17 million individuals affected[4]. Headache disorders, as ranked by the Global Burden of Disease, are among the principal ten contributors to disability-adjusted life years in males and females aged 10 to 49[5].It was recognized that headache sufferers report a poorer quality of life (QoL) than those without headaches, and this very prevalent condition has detrimental effects on one's health in terms of social, occupational, and economic elements[6].

Despite being common, TTH is the major headache that receives the least attention, partly because its underlying processes are not well understood[7].The origin of TTH, stemming from either central brain mechanisms or peripheral myofascial sources, remains a point of debate. However, it is supposed that central and peripheral mechanisms interact to cause TTH [8].As pharmacological interventions are not optimally effective for treating those patients, interest in nonpharmacological interventions has increased in recent years[3].

Neurodynamic therapy focuses on reestablishing homeostasis within and around the nervous system by mobilizing it and promoting movement between neural structures and their adjacent tissues[9].In addition, techniques of neural mobilization aim to enhance adaptability, decrease mechanosensitivity, and trigger pain-relief mechanisms through mechanical nerve stimulation achieved via palpation, stretching, and gliding [10]. Based on basic science, the dura mater may be a potential factor in headache development [11].Craniocervical neural mobilization might decrease pain and disability associated with TTH and decrease the need for pharmacological treatment.So, this study aimed to examine the effect of the craniocervical neural mobilization technique on pain intensity and QoL of patients suffering from primary tension headache.

2.MATERIAL AND METHODS

This randomized controlled trial (RCT) was carried out atMubarak Central Hospital, Giza governorate, Egypt, during the period between November 2022 and February 2023.

The Ethical Committee of Scientific Research— Faculty of Physical Therapy— Cairo University approved this study(No: P.T.REC/012/003179). In addition, the study had a clinical trial.gov registration (No: NCT05999201). All participants signed an institutionally approved informed consent form after a detailed explanation about the aim, benefits, and risks of this study.

Participants

Prior to the study, a sample size calculation was performed using G*Power 3.1.9 (G Power program version 3.1, Heinrich-Heine-University, Düsseldorf, Germany) to determine the required number of participants for a two-tailed test. The calculation was based on a t-test for independent means, with an alpha level of 0.05, a power of 0.80, and an effect size of 1.0987563 for the primary outcome variables. The results indicated that a sample size of 30 patients, with 15 patients in each group, would be sufficient for the study.

Forty-onepatients with primary tensionheadaches from both sexes were screened for eligibilitycriteria. Patients' diagnosis followed the International Headache Society (IHS) criteria [12].Post-screening, thirty patientsfulfilled the eligibility requirements to be included in this research, as clarified in figure(1).

To be enrolled in this study, patients had to be (i)with a unilateral headache for one year or more (according to HIS criteria),(ii) inthe age group between 25 and 40 years, and (iii)with a BMIof 18-29 kg/m². Individuals were not eligible for participation in the study if they had (i)majorneurological conditions (e.g.,meningitis, brain tumors, epilepsy, multiple sclerosis, stroke, or hypertension),(ii)cervical cord injury,(iii)recent traumatic brain injury, (iv)auditory or visual impairments,(v)psychiatric disease, smokers,addicted subjects, or pregnant women, (vi)headache worsened by head movements,(vii)metabolic or musculoskeletal conditions manifesting headache-like symptoms, and (viii)laxity of neck soft tissues or joint instability.

The participants were randomly assigned into two equal groups (15 participants each) using closed envelopes:(a)study group(GI)who received craniocervicalneural mobilization using three techniques (passive craniocervical flexion, passive lateral cervical sliding, and craniocervical flexion with mouth opening) in addition to aselected physiotherapy program (suboccipital muscle inhibition (SIT) and myofascial release), (b)control group(GII) who received only the same selected physiotherapy program.

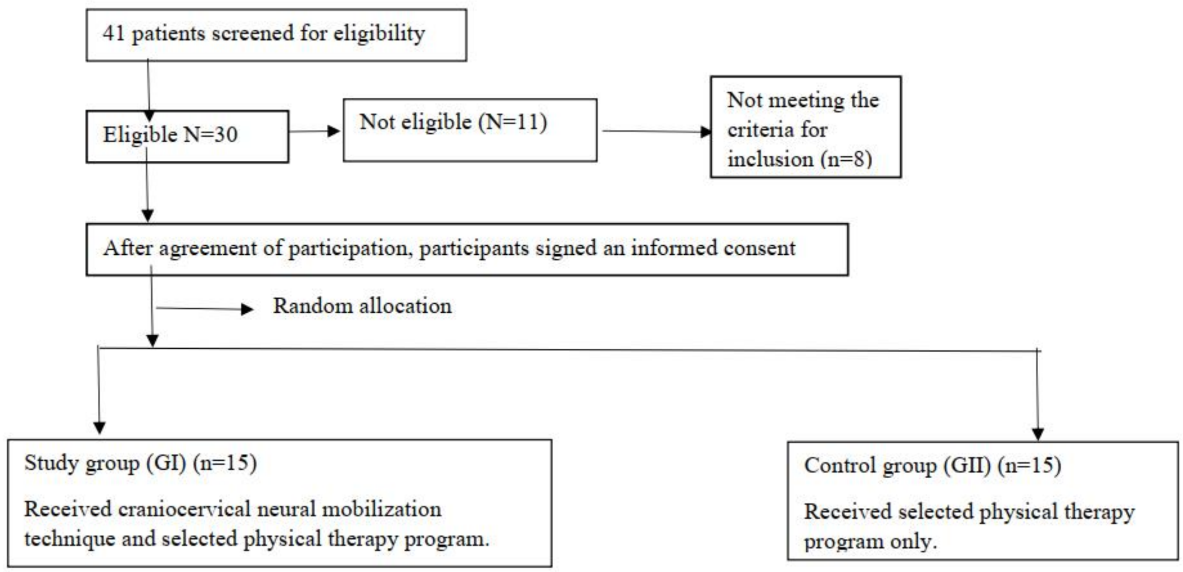

Fig. (1): flow chart of study participants.

<u>procedures:</u>

Before the initial session, relevant demographics like name, age, weight, height, BMI, and medical history were recorded for all patients. Each group of patients underwent assessments of outcome measures twice: once before starting the treatment interventions and again after four weeks of receiving the assigned treatments.

Assessment of pain intensity:

The visual analogue scale (VAS) was utilized to measure headache severity, quantifying the patient's pain intensity. It demonstrates strong construct validity and excellent test-retest reliability [13].Participants wereinstructed to represent theirheadache severity on a 10-cm line. The scoring system involved measuring the millimeters between the "no pain" anchor and where the participant marked, producing a score range of 0 to 100. Greater values indicated more intense pain, with the following levels: pain-free (0 to 4mm), low-level pain (5 to 44mm), medium-level pain (45 to 74mm), and high-level pain (75 to 100mm)[14].

Assessment of QoL:

The patient's QoLwas evaluated by the Headache Impact Test-6 (HIT-6)and the Headache Disability Index (HDI).The patient completed the index by himself. TheHIT-6 addressesQoLdimensions like pain, social function, cognitive function, and psychological distress. Patients are guided to quantify their response by indicating its frequency; they must choose one of never, rarely, sometimes, very often, or always. The HIT-6 categorizes patients into four severity levels: no or minimal effect, some effect, considerable effect, and very severe effect.The scale has undergone validation and has demonstrated strong internal consistency [15]. The HDI identifies the challenges patients may face as a result of headache. The questionnaire is composed of 25 items, with 12 of them in the functional subscale and the other 13 in the emotional subscale.The scoring system assigns 0 points for "No," 2 points for "Sometimes," and 4 points for "Yes". Scores on the scale range from 0 to 100 points, with 0 indicative of absent disability and 100 indicative of severe disability. Disability levels were classified as mild (10-28), moderate (30-48), severe (50-68), and complete (≥72), respectively [16].

TreatmentProcedures:

Patients of both groups received two sessions per week of their rehabilitation program for four weeks.

The study group(GI):receiveda craniocervical neural mobilization treatment protocol and a selected physiotherapy program.

The craniocervicalneural mobilization protocol included three techniques: passive craniocervicalflexiontechnique, passive lateral cervical sliding,and craniocervical flexion with mouth opening. These techniques were applied gently, progressively, and slowly. The entire protocol took 15 minutes (5 minutesfor each protocol)[10]. Passive craniocervical flexion was done for meningeal stimulation[17].Participants were instructed to perform shoulder depression and retraction with elbow and hand extension to apply more mechanical stress to the nervous system [10]. Then, a lateral slide of the cervical region was done for brachial plexusstimulation.Participantswere instructed to perform a downward shoulder movement. To enhance mechanical load on the nervous system, participants were asked to perform progressive elbow extension, then supinate their forearms and extend their wrists and fingers [10]. After that,passive craniocervical flexion with mouth opening was achieved by one hand maintaining the craniocervical flexionand the other aiding in opening the mouth (active-assisted)[11].Mouth opening causes greater trigeminal nerve deformation, predominantly in the mandibular branch [18]. To enhance the neural load, participants were instructed to perform progressive elbow extension, then supinate their forearms and extend their wrists and fingers [10].

The selected physiotherapy programincluded suboccipital inhibition technique (SIT) and trigger point muscle release. Which was applied in slow, mild, and progressivepatterns. The protocol lasted for 15 minutes (3 minutes for the suboccipital inhibition technique and 12 minutes for the trigger point release of selected muscles).During the suboccipital inhibition technique (SIT), participants lay on their backs while the therapist, sitting at the patient’s head, rested the elbows on the plinth. Subsequently, the therapist positioned their hands at the back of the patient’s head, with palms upturned, fingers bent, and fingertips gently resting on the atlas's posterior arch, allowing the occiput to rest comfortably in the therapist's palms[19].The atlas was subjected to a cranially directed force, using the fingertips to push toward the ceiling with slight traction. This position was applied once and maintained for 3 minutes once.Trigger point muscle release using ischemic compression had been done for four muscles in the craniocervical region. The pain felt by patients should not exceed a two-point score on the VAS [20].The muscle was positioned in its relaxed position, while the patient was lying comfortably. The trigger point received slowly increasing pressure for around 90 seconds until reaching a tissue resistance barrier [21].The techniques were sequentially applied to the sternocleidomastoid, temporal, upper trapezius, and splines muscles[22]. The protocol lasted 12 minutes (3 minutes for each muscle).

The control group (GII): received the same previously mentioned selected physiotherapy program of suboccipital inhibition and trigger point release.

Statistical analysis

The statistical analysis was performed using SPSS version 25 for Windows (SPSS, Inc., Chicago, IL). Quantitative data (age, weight, height, and BMI) are presented as mean and standard deviation, while qualitative gender data are shown as number and percentage. An independent t-test compared demographic variables between the study and control groups. The Wilcoxon signed ranks test compared pre- and post-treatment within each group for VAS, HIT-6, and HDI variables. The Mann-Whitney U test compared VAS, HIT-6, and HDI variables between the groups pre- and post-treatment. The chi-square test compared gender distribution between the study and control groups. All analyses were considered significant at $P \leq 0.05$.

3.RESULTS

The demographic characteristics of patients of both groups are represented in (Table1).

Table 1. General characteristics of patients in both groups

Items	Groups: Study group (n=15)	Groups: Control group (n=15)	*P*-value
Age (year)	29.73 ±3.17	30.73 ±4.31	0.476
Weight (kg)	70.45 ±4.99	70.47 ±4.92	1.000
Height (cm)	163.20 ±5.95	162.27 ±5.87	0.669
BMI (kg/m^2)	26.42 ±1.48	26.87 ±1.93	0.476
Gender (Males: Females)	5 (33.30%) : 10 (33.70%)	5 (33.30%) : 10 (33.70%)	1.000

P-value: probability value P-value > 0.05 non-significant.

Pairwise comparison tests (time effect) for the measured variables (VAS, HIT-6, and HDI) within each group showed that there was a significant decrease in mean scores of VAS, HIT-6, and HDI post-treatment within the study group and control group (P<0.05). The significant decreases in mean scores of VAS, HIT-6, and HDI post-treatment were more in the study group(GI) compared to the control group, So, patients of the study group had higher improvement in VAS, HIT-6, and HDI (72.25, 27.41, and 52.28%, respectively) compared to the control group (34.30, 8.13, and 21.78%, respectively),(Table 2.)

Table 2: Within and between groups comparison for VAS, HIT-6, and HDI variables

Variables	Items	Groups: Study group (n=15)	Groups: Control group (n=15)	Change	*P*-value
VAS	Pre-treatment	6.99 ±1.66	7.58 ±0.78	0.59	0.412
	Post-treatment	1.94 ±0.77	4.98 ±0.84	3.04	0.0001*
	Change (MD)	5.05	2.60		
	Improvement %	72.25%	34.30%		
	P-value	0.001*	0.001*		
HIT-6	Pre-treatment	58.20 ±4.05	58.27 ±3.86	0.07	1.000
	Post-treatment	42.13 ±4.91	53.53 ±2.87	11.40	0.0001*
	Change (MD)	16.07	4.74		
	Improvement %	27.41%	8.13%		
	P-value	0.001*	0.001*		
HDI	Pre-treatment	60.20 ±7.94	56.67 ±7.57	3.53	0.187
	Post-treatment	28.73 ±3.71	44.33 ±9.46	15.60	0.0001*
	Change (MD)	31.47	12.34		
	Improvement %	52.28%	21.78%		
	P-value	0.001*	0.001*		

Data are expressed as mean ± standard deviation (SD) MD: mean difference P-value: probability value
* Significant (P<0.05)

4.DISCUSSION

The current study resultsreflected that soft tissue techniques (suboccipital inhibition and trigger point release) are successful in lowering pain and enhancing the QoL for those with TTH. Regarding this, the predominant theory on TTH suggests a peripheral mechanism, wherein sensitized neuromusculoskeletal structures deliver pain messages to the central nervous system (CNS)[23]. Pain signals originating from the trigeminal nerve and craniocervical muscles are processed by the trigeminocervical nucleus (TCN), resulting in its sensitization and that of the CNS through continuous stimulation [23].

Therefore, by mechanically stimulating the neuro-musculoskeletal tissues conveying pain signals to the TCN, suchsignals might be diminished, resulting in less nociceptive information reaching the CNS.In addition, reducing nervous tissue mechanosensitivity can minimize muscular responsesaimed at protecting the nerve tissue from tension and deformation stimuli induced by movement [24].

The finding of this study coincides withDoraisamy, 2010[21] and FalsiroliMaistrello, 2018[20] who found that soft tissue techniques have a favorable influenceon loweringpain intensity and frequency inTTH patients.

The present study also showed that the craniocervical neural mobilization technique provides more effective management of TTH when combined with soft tissue techniques.This could be explained by the neural mobilization technique's activation of inhibitory pathways that regulate neuromusculoskeletal tissue mechanosensitivity[10]. Combining neural mobilization with soft tissue interventions activates both central and peripheral receptors, resulting in an interplay between neurophysiological and mechanical factors that may enhance mechanosensitivity and alleviate pain in TTH patients [16].

The result of the current study is consistent withVan Ettekoven, 2006[25]who showed that a craniocervical training program is effective in reducing TTH intensity, frequency, and duration over a long-term program. Ferragut-Garcías, 2017 [10]also confirmed that neural mobilization and soft tissue interventions, whether alone or in combination, effectively enhance the pain pressure thresholds in the cranial area, decrease pain episodes' frequency and maximum intensity, and enhance the QoL for TTH sufferers. However, their combinationdemonstrates greater efficacy in managing TTH [10] and other types of headaches [26] than these techniques applied separately.

Moreover, Rajalaxmi, 2022[27], found that neural mobilization had a favorable influence on headache and QoL of these patients. This highlighted a significant enhancement in pain relief for TTH sufferers. Nevertheless, combining soft tissue inhibition with neurodynamic techniques was more effective.

Similarly, Cumplido-Trasmonte, 2021[28] andFalsiroliMaistrello, 2019[6]found that manual therapy, comprising soft tissue techniques and neural mobilization, yields favorable results in minimizing frequency and intensity of pain, reducing disability, alleviating headache impact, enhancing QoL, and improving craniocervical range of motion among adult persons suffering from TTH. Additionally, a multimodal approach that integrates various techniques appears to yield the best results. Manual therapy can be considered a valid strategy for improving the QoL of patients with TTH, as demonstrated by the significant enhancements in outcomes and the lack of negative consequences.

5.CONCLUSION

Craniocervical neural mobilization is a valuable technique for minimizing pain and enhancing QoL when incorporated into the rehabilitation protocol for patients suffering from TTH.

CONFLICTS OF INTEREST: The authors have no conflicts of interest.

References:

1. **Sobieski M, Korzeniewska A.** Tension-type headache–most prevalent, still unknown. World Scientific News. 2019(135):14-31.
2. **Headache Classification Committee of the International Headache Society (IHS).** The international classification of headache disorders, (beta version). Cephalalgia. 2013 Jul;33(9):629-808.
3. **Yu S, Han X.** Update of chronic tension-type headache. Current pain and headache reports. 2015 Jan;19:1-8.

4. **Safiri S, Kolahi AA, Noori M, Nejadghaderi SA, Aslani A, Sullman MJ, Farhoudi M, Araj-Khodaei M, Collins GS, Kaufman JS, Gharagozli K**. Burden of tension-type headache in the Middle East and North Africa region, 1990-2019. The journal of headache and pain. 2022 Dec;23(1):77.
5. **Onan D, Younis S, Wellsgatnik WD, Farham F, Andruškevičius S, Abashidze A, Jusupova A, Romanenko Y, Grosu O, Moldokulova MZ, Mursalova U.** Debate: differences and similarities between tension-type headache and migraine. The journal of headache and pain. 2023 Jul 21;24(1):92.
6. **Falsiroli Maistrello, L., Rafanelli, M., & Turolla, A. (2019).**Manual therapy and quality of life in people with headache: systematic review and meta-analysis of randomized controlled trials. Current pain and headache reports, 23(10), 1-14.
7. **Fernández-de-Las-Peñas C, Plaza-Manzano G, Navarro-Santana MJ, Olesen J, Jensen RH, Bendtsen L.** Evidence of localized and widespread pressure pain hypersensitivity in patients with tension-type headache: A systematic review and meta-analysis. Cephalalgia. 2021 Feb;41(2):256-73.
8. **Schmidt-Hansen PT, Svensson P, Bendtsen L, Graven-Nielsen T, Bach FW.** Increased muscle pain sensitivity in patients with tension-type headache. Pain. 2007 May 1;129(1):113-21.
9. **Basson A, Olivier B, Ellis R, Coppieters M, Stewart A, Mudzi W.** The effectiveness of neural mobilization for neuromusculoskeletal conditions: a systematic review and meta-analysis. journal of orthopaedic& sports physical therapy. 2017 Sep;47(9):593-615.
10. **Ferragut-Garcías A, Plaza-Manzano G, Rodríguez-Blanco C, Velasco-Roldán O, Pecos-Martín D, Oliva-Pascual-Vaca J, Llabrés-Bennasar B, Oliva-Pascual-Vaca A.** Effectiveness of a treatment involving soft tissue techniques and/or neural mobilization techniques in the management of tension-type headache: a randomized controlled trial. Archives of physical medicine and rehabilitation. 2017 Feb 1;98(2):211-9.
11. **Fernández-de-las-Peñas C, Arendt-Nielsen L, Gerwin RD.** Tension-type and cervicogenic headache: pathophysiology, diagnosis, and management. Jones & Bartlett Publishers; 2010 Oct 22.
12. **Sait A, Mitsikostas DD, Ji LM, Nooshin Y, Shuu-Jiun W, Messina R, Håkan A, Buse DC, Pozo-Rosich P, Jensen RH, Hans-Christoph D.** Tension-type headache (Primer). Nature Reviews: Disease Primers. 2021;7(1).
13. **Sillevis R, Tew M, Wyss K.** The Management of Balance and Proprioception Discrepancies for a Patient with Cervicogenic Headache: A Case Report. Medical & Clinical Research. 2021 Jun 1;6(6):546-54.
14. **Weigl K, Forstner T.** Design of paper-based visual analogue scale items. Educational and psychological measurement. 2021 Jun;81(3):595-611.
15. **Sauro KM, Rose MS, Becker WJ, Christie SN, Giammarco R, Mackie GF, Eloff AG, Gawel MJ**. HIT-6 and MIDAS as measures of headache disability in a headache referral population. Headache: The Journal of Head and Face Pain. 2010 Mar;50(3):383-95.
16. **Espi-Lopez GV, Rodríguez-Blanco C, Oliva-Pascual-Vaca A, Benítez-Martínez JC, Lluch E, Falla D.** Effect of manual therapy techniques on headache disability in patients with tension-type headache. Randomized controlled trial. European journal of physical and rehabilitation medicine. 2014 Apr 30;50(6):641-7.
17. **Breig A.** Adverse mechanical tension in the central nervous system: An analysis of cause and effect: Relief by functional neurosurgery.
18. **Von Piekartz HJ.** Craniofacial pain: neuromusculoskeletal assessment, treatment and management. Elsevier Health Sciences; 2007 Apr 23.
19. **Jiang W, Li Z, Wei N, Chang W, Chen W, Sui HJ.**Effectiveness of physical therapy on the suboccipital area of patients with tension-type headache: A meta-analysis of randomized controlled trials. Medicine. 2019 May 1;98(19):e15487.

20. **FalsiroliMaistrello L, Geri T, Gianola S, Zaninetti M, Testa M.** Effectiveness of trigger point manual treatment on the frequency, intensity, and duration of attacks in primary headaches: a systematic review and meta-analysis of randomized controlled trials. Frontiers in neurology. 2018 Apr 24;9:254.
21. **Doraisamy MA, Kumar CP, Gnanamuthu C.** Chronic tension type headache and the impact of myofascial trigger point release in the short term relief of headache. Global Journal of Health Science. 2010 Oct 1;2(2):238.
22. **Andersen S, Petersen MW, Svendsen AS, Gazerani P.** Pressure pain thresholds assessed over temporalis, masseter, and frontalis muscles in healthy individuals, patients with tension-type headache, and those with migraine—A systematic review. Pain. 2015 Aug 1;156(8):1409-23.
23. **Hu JW, Sun KQ, Vernon H, Sessle BJ.** Craniofacial inputs to upper cervical dorsal horn: implications for somatosensory information processing. Brain research. 2005 May 17;1044(1):93-106.
24. **Coppieters MW, Stappaerts KH, Wouters LL, Janssens K.** Aberrant protective force generation during neural provocation testing and the effect of treatment in patients with neurogenic cervicobrachial pain. Journal of Manipulative and Physiological Therapeutics. 2003 Feb 1;26(2):99-106.
25. **Van Ettekoven H, Lucas C.** Efficacy of physiotherapy including a craniocervical training programme for tension-type headache; a randomized clinical trial. Cephalalgia. 2006 Aug;26(8):983-91.
26. **Bevilaqua-Grossi, D., Gonçalves, M.C., Carvalho, G.F., Florencio, L.L., Dach, F., Speciali, J.G., Bigal, M.E. and Chaves, T.C., 2016.** Additional effects of a physical therapy protocol on headache frequency, pressure pain threshold, and improvement perception in patients with migraine and associated neck pain: a randomized controlled trial. Archives of physical medicine and rehabilitation, 97(6), pp.866-874.
27. **Rajalaxmi V, Alshewaier SA, Nazrin L, Unnikrishnan R, Shinuja O.** Effectiveness of Suboccipital Soft Tissue Inhibition Technique Versus Neurodynamics On Tension Type Headache for Female Physiotherapy Students.(2022). Int. J. Life Sci. Pharma Res.;12(5):L110-115.
28. **Cumplido-Trasmonte C, Fernández-González P, Alguacil-Diego IM, Molina-Rueda F.** Manual therapy in adults with tension-type headache: a systematic review. Neurología (English Edition). 2021 Sep 1;36(7):537-47.