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The relationship between myofascial trigger points sensitivity, cervical postural abnormality, and clinical tension-type headache parameters

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ABSTRACT

Background: Myofascial Trigger Points (MTrPs) play a significant role in the pathogenesis of Tension Type Headache (TTH). Abnormal cranio-cervical posture has been linked to various types of headaches. However, the correlation between MTrPs sensitivity, cervical postural alignment, and clinical measures of headache has not been extensively studied in patients with TTH.

Objectives: To investigate the relationship between MTrPs sensitivity in cervical and pericranial muscles, cervical postural abnormality, and clinical headache parameters in patients with TTH. Furthermore, to investigate the effect of sex on the examined variables and their association with headache type (episodic vs chronic TTH).

Methods: A total of 72 patients with TTH of both sexes were enrolled in this study. Headache frequency and disability as clinical measures of headache, pressure pain threshold (PPT) of bilateral upper trapezius (UT) and suboccipital (SUB) muscles, cervical lordosis angle (CA), and anterior head translation (AHT) were measured.

Results: Pericranial MTrPs sensitivity did not demonstrate any correlation with clinical headache parameters or cervical postural abnormality. However, there was a significant correlation between the frequency of headaches and the level of disability ($r = 0.32$, $P < 0.05$). In addition, episodic TTH was more prevalent in females who exhibited greater AHT and MTrPs sensitivity of both bilateral UT and right SUB muscles than males.

Conclusions: There was no correlation found between the frequency of headaches and the level of disability with measures of cervical posture alignment or MTrPs sensitivity in individuals with TTH.. Based on findings, Clinicians should consider sex differences when assessing patients with TTH.

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Tension-type headache; myofascial trigger points; cervical alignment; forward head posture; headache parameters

Introduction

Tension-type headache (TTH) is the most prevalent neurological disorder [1,2]. Based on headache frequency, it is further subdivided into episodic (ETTH) and chronic (CTTH). Patients with CTTH experience at least 15 headache days a month for over three months (≥180 days/year). ETTH is identified when headache episodes occur for ≥ 12 and ˂180 days/year [3]. The global annual prevalence of TTH was reported to be between 26–38%, corresponding to nearly 2 billion people [4]. A one-year study conducted in one of Egypt's governorates, Fayoum, revealed an ETTH prevalence of approximately 24.5%, with a female-to-male ratio of 1.5:1 [5]. It is noteworthy to emphasize that the burden associated with TTH in the Middle East and North Africa (MENA) region was higher than the corresponding global burden [2] for both sexes and across all age groups [2].

The International Classification of Headache Disorders (ICHD) provides a thorough framework for differentiating various categories of headaches. Migraine is characterized by recurrent attacks of moderate to severe headaches, frequently occur unilaterally, exhibit pulsation, and are exacerbated by normal physical activity. Common symptoms associated with migraine episodes include nausea, vomiting, photophobia, and phonophobia. Cervicogenic headache results from diseases or abnormalities in the cervical spine or surrounding tissues. It is often characterized by a single, unilateral headache originating from pain in the frontal, temporal, or orbital regions from the neck or occipital region [3].

Tightening pain, which can impact the entire head but is predominantly experienced in the occipital, temporal, and frontal regions, is the prevailing manifestation of TTH. The pain is typically mild to moderate [5] and has no immediate impact on mobility, rendering it normal [6]. However, chronic, recurrent episodic TTH is characterized by persistent pain that hinders patients' ability to function, resulting in increased work absence and decreased productivity [7,8].

TTH is a form of headache characterized by myofascial pain induced by Myofascial Trigger Points (MTrPs) in skeletal muscle, which may serve as a significant etiological factor and contribute to the

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pain [9,10]. Previous studies have demonstrated a correlation between the referred pain induced by TrPs in the head and neck-shoulder muscles and the pain pattern (episodic or chronic) experienced by individuals with TTH [11] and that the presence of TrPs is also linked with extensive pressure pain hypersensitivity [12]. The trigemino-cervical complex, which is made up of the trigeminal afferent inputs processed by the trigemino-cervical nucleus, receives the nociceptive sensation at the neck through the C1 to C3 afferents [2]. The referred pain provoked by manual palpation of the upper cervical joints and myofascial TrPs resembles the pain pattern in TTH. This may overlap with findings of cervicogenic headache, as in cervicogenic headache, the neck can be the cause (source) of the headache. Conversely, in the case of TTH, the neck may play a role in the pain pattern. Nevertheless, it is not the underlying cause since it is a primary headache. Various clinical characteristics and diagnostic criteria can contribute to differentiating between the two types. The characteristic symptom of a cervicogenic headache is a unilateral headache pain that extends from the neck or occipital region to the frontal, temporal, or orbital regions. The discomfort experienced in TTH manifests as a headache affecting both sides of the head. It is triggered by musculoskeletal issues, although it may not be exclusively confined to the neck [13].

TrPs are defined as "hyperirritable spots within the taut band of skeletal muscles that are painful on compression, stretch, overload, or contraction of the tissue which typically respond with referred pain perceived distant from the site [14]. Prior research determined that the suboccipital, temporalis, upper trapezius, and sternocleidomastoid muscles are the most commonly affected by TrPs in patients with TTH [15].

Earlier studies reported that patients with headaches, particularly CTTH, have a higher relative frequency of MTrPs than controls [11,16]. A study conducted by Fernández-de-las-Peas et al. [17] found a correlation between trigger points in the suboccipital muscle and referred pain in the occipital and temporal regions in patients with TTH. Additionally, increased nociception at TrPs might increase the sensitivity of central nociceptive pathways [18,19]. However, data regarding the correlation between MTrPs and the severity and frequency of TTH episodes has been contradictory [11].

Different types of headaches have previously demonstrated signs of musculoskeletal dysfunction [20]. Marcus et al. illustrated that TTH patients exhibited more abnormal postures than healthy controls [21]. Forward head posture (FHP) is a common example of an abnormal posture where the head is displaced forward in relation to the trunk due to flexion of the lower cervical spine and extension of the upper cervical spine [22]. According to Ashina et al., there is a correlation between TTH and FHP, the most prevalent postural problem in adults [23]. Cervicogenic headache is commonly associated with higher FHP [24], which has been reported in both ETTH and CTTH [25,26].

The cranio-cervical region may experience a significant mechanical strain from FHP, which can sensitize various tissues and contribute to the perpetuation of pain [27]. Evidently, forward head posture is commonly observed in individuals with a chronic primary headache, supported by moderate-to-strong evidence [28]. A systematic review by Castien et al. [29] reported that in most studies, no significant associations were found between pain pressure threshold values for myofascial TrPs of trapezius and suboccipital muscles and headache characteristics such as frequency, duration, or intensity.

According to Sohn et al., long-term MTrP activity can cause muscle shortening, resulting in postural abnormalities and sustaining MTrP activity. They concluded that CTTH cases with more MTrPs exhibited higher FHP than control subjects [30]. Fernandez-de-las-Penas et al. also discovered that CTTH participants had higher FHP than control subjects. Furthermore, there was a positive correlation between FHP and headache frequency [26].

Many researchers have studied the relationship between posture alternation and various types of headaches. A study found that there was a significant association between cervical lordosis and an increased likelihood of having cervicogenic headache [31]. Fernandez-de-las-Penas et al. also found that migraine patients presented a greater FHP than the control group [32]. Previous studies on TTH reported contradictory findings. A previous study discovered a correlation between posture and headache [26], while prior research did not detect any correlation [33].

A better understanding of sex differences in the correlation between headache clinical features and headache burden in cases with TTH could assist clinicians in determining better interventional strategies based on the patient's sex. Therefore, the impact of headaches is higher in females, regardless of the headache diagnosis [34]. However, studies investigating whether sex could influence the variables associated with headache burden are inconsistent in their conclusions. Prior studies revealed sex-related differences in TTH [35,36], while other studies found no significant difference [37]. As a result, the current study aimed to assess the association between MTrPs sensitivity in cervical and pericranial muscles, cervical postural malalignment, and clinical headache parameters (headache frequency and disability) in TTH. Furthermore, to investigate sex differences in the examined variables and their association with headache type (episodic vs chronic TTH).

Methods

This study conducted a secondary analysis of data from a randomized controlled trial comparing the effectiveness of instrument-assisted soft tissue mobilization to pressure algometry on the clinical measures of headache, MTrPs sensitivity, and cervical alignment in patient with TTH [38]. The trial was carried out at the Outpatient Physical Therapy Department, El Gomhorya Hospital, and approved by the local ethics committee of the Faculty of Physical Therapy, Cairo University (P.T. REC/012/004368).

Participants

Patients diagnosed with TTH were enrolled in the trial. Patients were of both sexes, aged 28–52 years. They were recruited by the word of mouth after providing comprehensive information about the study and then signed an informed consent form. The study participants were diagnosed with TTH and subtype by experienced neurologists through structured interviews and clinical examination according to the International Classification of Headache Disorders. Patients with ETTH were defined as individuals experiencing headaches on a minimum of 15 days per month for a duration exceeding three consecutive months. In order to eliminate the possibility of migraine headaches (by excluding other primary headaches), patients were mandated to have a minimum of one year of headache history prior to being enrolled in the current study. In order to be eligible for inclusion in the TTH group, patients had to exhibit all the characteristic features of TTH as defined by the International Headache Society: pain that is felt on both sides of the head, with a sensation of pressure and tightness, of mild to moderate intensity, and without any worsening of the headache during normal physical activities. In order to differentiate between mixed headaches (i.e. the coexistence of tension-type headache and migraine) and other conditions, patients who exhibited migraine symptoms such as nausea and vomiting were excluded. Inclusion criteria were patients with TTH with moderate intensity (6.5 out of 10 on NPRS). In addition, participants reported: 1. no nausea or vomiting; 2. no more than one photophobia or phonophobia [39]. Patients on any antipsychotic or antidepressant drugs; patients who had cervical problems such as traumas, discs, and cervical osteoarthritis; any form of primary headaches such as migraine or secondary headaches such as medication-overuse headache; degenerative diseases such as rheumatoid arthritis and lupus erythematosus were excluded from the study.

Procedures

A licensed physiotherapist with 15 years of clinical experience in manual physical therapy conducted screenings to identify MTrPs in patients. The identification of MTrPs was established using four proposed criteria: (1) the presence of a taught band with a palpable nodule, (2) the reported painful sensation in an area remote from the compressed palpable nodule in the taut band, (3) the presence of a visible or palpable local twitch response, (4) jump sign which is known as presence of a general pain response during palpation [40,41]. It is necessary to identify at least one active MTrPs in the examined bilateral muscles (upper trapezius and suboccipital muscles). The participants were provided with a questionnaire to complete, which asked about the frequency, duration, and severity of headaches they had experienced in the past four weeks. The headache frequency (days/week) was determined by dividing the number of headache days by four weeks [42,43].

Outcome measures

(1) Headache Frequency: Each patient was instructed to maintain a daily log of the number of headache attacks for the past week. In order to measure headache frequency, the number of headache days per month was recorded.
(2) Headache Under-Response to Treatment (HURT) questionnaire: The patient answered eight questions on the HURT Questionnaire regarding headache frequency and disability, medication use and effect, perception of headache 'control,' and knowledge of diagnosis with higher scores denoting worse clinical outcome [44]. The reliability of the Arabic Version of the HURT questionnaire was reported [45].
(3) Pressure pain threshold (PPT): PPT of MTrPs of the bilateral UT and suboccipital muscles were measured using the FPK (Wagner Pain TestTM Instruments- Model FPK/FPN-Greenwich-USA) model algometer. A blinded physiotherapist with over 15 years of clinical experience took the measurements with an excellent intra-rater reliability (Intra-class correlation coefficient (ICC) = 0.96-0.99, standard error of measurement (SEM) = 0.12–0.19 Kg/cm2, and minimal detectable change (MDC) = 0.33-0.52 Kg/cm2) [38].
(4) Cervical lordosis angle (CA): The posterior tangent method was used to assess CA using the two tangent lines drawn on the posterior vertebral body margins of (C2-C7) on the lateral aspect of the cervical spine X-ray. The average angle is between 34° and 42° [46].
(5) Anterior head translation (AHT): A standard radiograph was obtained in a lateral view, and the amount of AHT was calculated [47]. AHT is the horizontal distance measured from posterior superior C2 and a vertical line drawn from posterior inferior C7. This measurement often falls within the range of 10 mm [46].

Both CA and AHT were measured utilizing the Surgimap Spine software, a clinical imaging tool, by a blinded assessor with excellent intra-rater reliability (For CA, ICC = 0.99, SEM = 0.44°, and MDC = 1.22°. For AHT: ICC = 0.99, SEM = 0.6 mm, MDC = 1.68 mm) [38].

Statistical analysis

A normal distribution of the data was assumed based on the central limit theorem, as the sample size is more than 30 participants. For the descriptive analysis of the continuous data, the mean and standard deviation were reported. The correlation between PPT of MTrPs of bilateral UT and suboccipital (SUB) muscles, AHT, CA, headache frequency, and disability was determined using the Pearson correlation coefficient (r). For the correlation analysis between sex or headache type (CTTH/ETTH) and quantitative variables, point-biserial correlation coefficients (r_{pb}) were calculated. Independent t-tests were used to determine the difference between females and males in the correlated measures. Furthermore, the Chi-square test was used to examine the association between sex and headache type. All the analyses were conducted using the statistical software SPSS v25.00 (SPSS Inc., Chicago, IL, USA). An α level of 0.05 and 95% confidence intervals (CIs) were assumed for all analyses.

Results

A total of 80 patients were assessed for eligibility. Among them, 72 patients with a mean headache duration of 8.9 years (SD = 6.9) fulfilled the inclusion criteria and were enrolled in the study. A total of 37 males and 35 females were included in the study, with a mean age of 41.15 (SD, 6.85) years. On average, 41 participants had a chronic tension-type headache (CTTH), and 31 participants had an episodic tension-type headache (ETTH) based on headache frequency. The characteristics of the participants are displayed in Table 1.

Relationship between clinical headache parameters, MTrPs sensitivity, and cervical postural parameters

There was no correlation between MTrPs sensitivity and clinical headache measures or postural parameters (cervical lordosis angle and anterior head translation) (Table 2).

Relationship between anterior head translation, cervical lordosis angle, headache frequency, and disability

A significant correlation was found between AHT and CA and headache frequency and disability ($p < 0.05$). However, the associations between postural parameters, headache frequency, and disability were non-significant. (Table 2).

Correlation between sex and quantitative variables

There was no significant correlation between sex and cervical angle (CA). However, the relationship between sex, AHT, and PPT of the bilateral UT and right suboccipital muscle was significant. The correlation between sex and anterior head translation was negative, whereas weak positive correlations were observed between sex and the right suboccipital and bilateral UT muscles ($p < 0.05$) (Table 3).

Correlation between PPT of LT upper trapezius and headache type

The LT upper trapezius PPT demonstrated a positive correlation with the type of headache (CTTH/ETTH), although the correlation was weak ($r = 0.28$, $P = 0.017$).

Table 1. Characteristics of the participants ($n = 72$).

	Mean ±mean		
Variables	Female (35)	Male (37)	Overall
Age (yrs)	43.60 ± 6.07	38.83 ± 6.81	41.15 ± 6.85
Body mass (Kg)	79.17 ± 8.14	80.32 ± 8.16	79.76 ± 8.12
Height (m)	1.66 ± 0.06	1.69 ± 0.04	3.87 ± 18.54
BMI (Kg/m^2)	23.02 ± 4.48	23.67 ± 2.37	23.35 ± 3.55
PPT UT_{Rt} (Kg/cm^2)	2.24 ± 0.55	2.87 ± 0.64	2.56 ± 0.71
PPT UT_{Lt} (Kg/cm^2)	2.07 ± 0.55	2.59 ± 0.61	2.34 ± 0.64
PPT SUB_{Rt} (Kg/cm^2)	1.90 ± 0.44	2.16 ± 0.49	2.03 ± 0.49
PPT SUB_{Lt} (Kg/cm^2)	1.79 ± 0.50	1.98 ± 0.47	1.89 ± 0.49
AHT (mm)	24.64 ± 4.69	22.18 ± 4.24	23.38 ± 4.6
CA (°)	19.11 ± 5.04	20.82 ± 5.89	19.99 ± 5.52
HURT	19.26 ± 2.57	18.92 ± 1.89	19.08 ± 2.24
Headache frequency (days/month)	18.77 ± 5.78	20.94 ± 5.90	19.89 ± 5.9

SD: Standard Deviation; AHT: Anterior Head Translation; BMI: Body Mass Index; PPT: Pain Pressure Threshold; UT_{Lt}: Right Upper Trapezius; UT_{Lt}: Left Upper Trapezius; SUB_{Rt}: Right Suboccipital; SUB_{Lt}: Left Suboccipital; CA: Cervical Lordosis Angle; HURT: Headache Under Response to Treatment.

Table 2. Relationship between clinical headache parameters, anterior head translation, cervical lordosis angle, and MTrPs sensitivity.

	r (*P* value)			
Variables (95%CI)	Headache frequency (18.50,21.28)	HURT (18.56,19.61)	CA (18.69,21.29)	AHT (22.21, 24.46)
PPT UT_{Rt} (2.39, 2.73)	0.18 (0.13)	0.02 (0.86)	−0.08 (0.47)	−0.95 (0.43)
PPT UT_{Lt} (2.19, 2.49)	0.2 (0.08)	0.00 (0.98)	−0.00 (0.45)	−0.12 (0.32)
PPTSUB$_{Rt}$ (1.92,2.15)	0.01 (0.37)	0.01(0.89)	0.01 (0.98)	−0.00 (0.94)
PPTSUB$_{Lt}$ (1.77,2.00)	0.08 (0.46)	−0.06 (0.56)	0.07 (0.53)	0.13(0.29)
Relationship between AHT, CA, Headache frequency and disability				
Headache Frequency (18.50,21.28)	——————	0.32 (0.006)	−0.07(0.21)	−0.11 (0.35)
HURT (18.56, 19.61)	———————	——————	0.15 (0.56)	0.16 (0.19)
CA (18.69, 21.29)	———————-	——————	——————	−0.8 (<0.001)

AHT: Anterior Head Translation; PPT: Pain Pressure Threshold; UT_{Rt}: Right Upper Trapezius; UT_{Lt}: Left Upper Trapezius; SUB_{Rt}: Right Suboccipital; SUB_{Lt}: Left Suboccipital; CA: Cervical Lordosis Angle; HURT: Headache Under Response to Treatment; r: Pearson Correlation coefficient.

Table 3. The correlation analysis between sex and quantitative variables.

Variables	r_{pb} Sex	P value
CA	0.16	0.19
AHT	−0.43	0.002
PPT UT_{Rt}	0.45	<0.001
PPT UT_{Lt}	0.42	<0.001
PPT SUB_{Rt}	0.28	0.017

PPT: Pain Pressure Threshold; UT_{Rt}: Right Upper Trapezius; UT_{Lt}: Left Upper Trapezius; SUB_{Rt}: Right Suboccipital; AHT: Anterior Head Translation; CA: Cervical Lordosis Angle; r_{pb}: point-biserial correlation coefficient.

The difference between females and males in the correlated measures: anterior head translation

The independent t-test revealed a statistically significant difference between males and females in anterior head translation. In addition, females had more anterior head translation than males ($p < 0.05$) (Table 4).

Pain pressure threshold of right and left upper trapezius and right suboccipital muscles

The independent t-test revealed that PPT of the bilateral upper trapezius and right suboccipital muscles was higher in males ($p < 0.05$) (Table 4).

Pain pressure threshold of LT upper trapezius and headache type

The independent t-test showed a significant difference between CTTH and ETTP in the PPT of MTrPs of LT upper trapezius. Additionally, the PPT of LT upper trapezius was significantly higher in CTTH than ETTH ($p < 0.05$) (Table 5).

Headache type and sex

A significant relation between headache type and sex was reported. Males had a CTTH, while females had ETTH ($p < 0.05$) (Table 6).

Discussion

The current study's most important clinically relevant findings revealed no correlation between clinical headache parameters (headache frequency and disability) and MTrPs sensitivity, or cervical posture alignment in TTH. Only one study by Nagasawa et al. (1993) [48] examined the relationship between abnormal cervical posture and TTH. They reported that a vast majority of patients with TTH exhibited straightened cervical lordosis based on radiological findings. This finding aligns

Table 4. The difference between females and males in the pain pressure threshold of the right and left upper trapezius, right suboccipital muscles and anterior head translation.

	Sex			
	Female (35)	Male (37)	t value	P value
PPT UT_{Rt}	2.24 ± 0.64	2.87 ± 6.45	4.16	<0.001
PPT UT_{Lt}	2.07 ± 0.55	2.59 ± 0.60	3.83	<0.001
PPT SUB_{Rt}	1.9 ± 0.44	2.17 ± 0.49	2.44	0.017
AHT	24.64 ± 4.69	22.18 ± 4.24	−2.33	0.022

PPT: Pain Pressure Threshold; UT_{Rt}: Right Upper Trapezius; UT_{Lt}: Left Upper Trapezius; AHT: Anterior Head Translation.

Table 5. The difference between the frequency type of headache and pain pressure threshold of LT upper trapezius.

	Headache type	Mean ± SD	T	P value
PPT UP_{Lt}	ETTH (*n*=31)	2.14±0.69	2.44	0.02
	CTTH (*n*=41)	2.49±0.55		

PPT: Pain Pressure Threshold; UT_{Lt}: Left Upper Trapezius; ETTH: Episodic Type Tension Headache; CTTH: Chronic Type Tension Headache.

Table 6. The association between sex and headache type (CTTH/ETTH).

		Sex		Value	df	P value
		Females	Males			
Headache Type	CTTH	18	23	73.86	4	0.001
	ETTH	17	14			
Total		35	37			

ETTH: Episodic Type Tension Headache; CTTH: Chronic Type Tension Headache.

with the postural characteristics of our examined sample, who showed hypolordotic cervical curvature.

Relationship between clinical headache frequency and MTrPs sensitivity

The relationship between MTrPs sensitivity, and clinical headache parameters was not observed. This agrees with the findings of Fernández-de-las-Peñas et al., 2007a [49], who found that PPT in the bilateral UT was not related to headache intensity, frequency, or duration in CTTH. Further, Palacios-Cen˜a et al., 2018 [18] did not find any association between clinical pain features of TTH, such as frequency, intensity, or duration, and MTrPs in both chronic and frequent episodic TTH. Consistent with our findings, Fernández-de-Las-Peñas et al., 2007b [25] and Alonso-Blanco et al., 2011 [50] did not detect any correlation between MTrPs and headache parameters concerning the frequency, duration, and intensity in episodic [25] and chronic [50] TTH patients. Previous studies [18,25,50] utilized manual palpation to identify MTrPs despite reaching similar conclusions. In contrast to the current study, which used a pressure algometer to objectively measure PPT, the aforementioned studies [18,25,50] merely considered the number and presence of MTrPs. In contrast, our results are inconsistent with those reported by Fernández-de-las-Peñas et al., 2006c [17] and Sohn et al., 2010 (30) revealed a significant association between the number of active MTrPs and clinical headache parameters (headache frequency, intensity, and duration) in TTH patients.

Relationship between clinical headache frequency and cervical postural alignment

Contrary to the present results, Fernández-de-las-Peñas et al., 2006a [26] found that greater FHP is associated with higher headache frequency in patients with CTTH (a negative correlation between the craniovertebral angle as a measure of FHP and headache frequency in patients with CTTH). This discrepancy in the findings may be attributed to the method used to measure FHP. However, the current findings seem to be consistent with that of Sohn et al., 2010 [30] who did not detect correlations between FHP and any of the headache clinical parameters.

Relationship between headache frequency and disability

The findings indicate a positive correlation between increased frequency of headaches and greater levels of disability caused by headaches, as measured by the HURT questionnaire. These results align with the previous research conducted by Palacios-Ceña et al. (2017a) [51], which established a connection between the frequency of headache attacks and the physical burden of headaches, as assessed by the Headache Disability Inventory, in individuals with TTH. In addition, Palacios-Ceña et al. (2017b) [52] hypothesized that headache frequency is related to the emotional burden of the condition.

Relationship between MTrPs sensitivity and cervical postural alignment

Regarding abnormal cervical alignment, the finding of the current study agrees with Fern´andez-de-las-Pe ˜nas et al. (2006b) [53], who concluded that there is no correlation between FHP and hyperactivity of MTrPs, as measured by electromyography in TTH patients. Kim et al. (2010) found a correlation between the sensitivity of trigger points and the activity measured by electromyography [54]. Therefore, it could be concluded that FHP is not associated with MTrPs or sensitivity in patients with TTH, which supports the findings of Sun et al. [55]. They determined that there was no correlation between the location or the number of long-lasting MTrPs and FHP in patients with neck pain. This finding elucidates the occurrence in clinical examinations, wherein clinicians frequently observe that many patients undergoing examination exhibit postural irregularities, yet no trigger points are identified during the assessment. Trigger points do not cause abnormal posture in patients. Sohn et al. [30] suggest that factors such as the patient's lifestyles and sociocultural background may contribute to this causal relationship. FHP is a compensatory position taken to alleviate headaches. Postural adjustments can be observed as a coping mechanism, especially in adjacent body segments [56]. FHP maybe brought on by CTTH. The presence of MTrPs does not significantly contribute to patients adopting such aberrant postures, although posture may stimulate trigger points [30]

Headache type, cervical postural alignment and sex

Sex differences are observed in the past occurrence of primary headaches, such as TTH, with a female-to-male ratio of 3:1 [57]. Nevertheless, the study on the prevalence of tension-type headache (TTH) in the MENA region concluded no significant difference between males and females, with a female-to-male ratio of TTH of approximately 5:4 [2]. Similarly, a recent review in 2023 mentioned that the prevalence in TTH is more equally distributed with a female-to-male ratio of 1.2:1 [58], which aligns with sex distribution in the current study.

There is inconsistency in the findings of previous studies related to sex-related differences in clinical features of TTH. A previous study has observed the presence of potential sex differences in the role of TrPs between men and women with TTH. Females with TTH exhibited a higher number of active TrPs and greater TrPs sensitivity (lower PPTs) than their counterpart males [36], which supports the current study findings. In addition, our findings revealed that females exhibited greater AHT (more FHP) and lower PPT (greater pain sensitivity) of bilateral UT and right suboccipital muscles than males. Consistent with our finding, a recent meta-analysis by Ferna´ndez-de-las-Pe~nas et al. 2021] [59] concluded that women were more sensitive than men as they exhibited lower PPTs than men with TTH. In addition, ETTH was observed more frequently in females than males, which aligns with the work of Bayraktutan et al., 2014 [60]. This result can be attributed to the higher likelihood of women with TTH experiencing musculoskeletal disorders (MSDs) that are associated with hyperalgesia and anxiety compared to males. Females have a greater abundance of mechanically sensitive C and Aδ afferents in their muscles compared to males. These afferents respond to mechanical distortion [61]. In addition, females tend to produce more cytokines in response to tissue damage than males (resulting in a larger inflammatory response) [62]. Therefore, the management of individuals with TTH should consider sex differences [63].

A recent global analysis of headache disorders in 2023 confirmed previous investigations related to significant age-specific and sex-related discrepancies widely observed in headache patients, supporting the current study's findings [64]. Contrary to our findings, Neumeier et al. 2021 concluded that the burden of headaches was higher in women than men with migraine in many aspects, but not with TTH [37]. In addition, Cigaran-Mendez et al., 2019 found no association between the number of active TrPs and any clinical pain feature of headache, intensity, frequency, or duration for either men or women with TTH. There were no discernible differences between the sexes in terms of clinical data, such as CTTH and ETTH [36]. However, we could not reach a similar conclusion based on our findings.

MTrPs sensitivity and headache type

Only one meta-analysis compared hypersensitivity to pressure pain in patients with TTH between episodic and chronic. Sensitivity to pressure pain was higher and more widespread in people with the chronic form of TTH. Our findings confirmed that the widespread hypersensitivity to pressure pain is present in CTTH but to a lesser extent or absent in ETTH [56].

The impact of sex on tension-type headaches is a multifaceted process, and the burden may vary across different geographic regions. Therefore, further extensive research is necessary to investigate the sex-related differences in TTH. This secondary analysis opens several questions for future research. There is a need for studies to examine the presence of lower PPT specific to TrPs in chronic versus episodic headaches. PPTs should be provided based on sex, age, and frequency of headaches, which can contribute to more solid and robust conclusions and better differentiation between episodic and chronic forms of TTH.

Relationship between headache disability and MTrPs, sensitivity and cervical postural alignment

Regarding headache disability, MTrPs′ sensitivity nor cervical postural alignment were found to be correlated with the scores of HURT questionnaire. To our knowledge, no previous studies have examined the correlation between the HURT questionnaire's measurement of headache disability and postural parameters or MTrPs′ sensitivity. As a result, it is not possible to draw comparisons between the current findings and those of previous studies.

The present study has some limitations. First, due to the fact that it was a secondary analysis of a prior study, the sample size was modest, and the recruitment of patients was restricted to a solitary center and convenient sampling. Our findings need to be validated by recruiting a substantial number of participants across multiple centers. Additionally, one can analyze other clinical aspects of headaches, such as the severity and length of headache episodes. Assessing the quality of life, anxiety, and depression can enhance our comprehension of the psychological elements of TTH. Finally, some challenges remain with differential diagnosis as significant overlap exists between the symptoms of cervicogenic headache and TTH. In light of the potential that patients with cervicogenic headache may have been among those identified with TTH, examining the changes in the headache clinical parameters, such as intensity following joint or nerve block, may become pertinent (30).

Clinicians must consider sex differences when managing patients with headaches in order to promptly deliver optimal treatment. Therefore, determining the degree of disability caused by TTH can aid clinicians in developing effective strategies to alleviate the effects of TTH.

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