

A prospective study on association of migraine with tension-headache: Is neck pain a common burden in India?

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ABSTRACT

Background. The present study aimed to know the association and causal relationship of neck pain with different primary and mixed-type headache disorders.

Material and methods. The primary patients with headaches attending the Department of Neurology OPD throughout one-year were included in the study. The demographic features, detailed history of headaches, and the characteristics of neck pain were entered in the pre-designed proforma. With the collaboration of the Department of Neurology, All India Institute of Medical Sciences, Jodhpur, Department of Neurology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow and the Department of Neurology, IMS and SUM Hospital, Bhubaneswar, India.

Results. A total of 601 primary headache patients were included in the study, among which a fraction of 66.4% (n=399) had the problem of neck pain either as a pre-disposing event or as a part of the headache. Females were predominately higher than males with a fraction of 67.6%. Among all the patients a fraction of 21% (n=84) had a migraine, 51% (n=203) had a tension-type headache (TTH) and 28% (n=112) had a mixed-type headache. Though several patients with migraine had neck pain as a part of migraine, neck pain was significantly associated with tension and mixed type headache than migraine headache ($p < 0.001$ vs $p = 0.35$). Among the mixed-quality of headaches; chronic TTH (CTTH) with episodic migraine (EM) was most common (54.5%, n=61), followed by CTTH with chronic migraine (CM) at 33% (n=37).

Conclusion. The presence of neck pain in migraine headaches showed an increased association with TTH whereas the reverse may not be true. This is yet to prove whether this is a mere association or a causal relationship.

Keywords: migraine, tension-type headache, mixed-type headache, neck pain, structural neck pain, functional neck pain

List of abbreviations (in alphabetical order):

CTTH – chronic tension-type headache

FETTH – frequent episodic tension-type headache

MRI – Magnetic resonance imaging

M – migraine

NP – Neck pain

TTH – tension-type headache

INTRODUCTION

In the countries like India, neck pain and primary headaches are highly prevalent in the general population and are the most common complaints who vis-

it with neurological problems to the Department of Neurology [1,2]. The tension-type headache and migraine are the most common type of primary headaches seen over the years. The prevalence of migraine (M) is about 10% and tension-type headache

(TTH) is about 38% according to the global statistical estimation for a single calendar year [3,4]. The association of neck pain with a primary headache has been attributed to the convergence of nociceptive afferents i.e., damage of body tissues and sensitization of trigeminal-cervical neurons causes the spread of hypersensitivity and referral of pain. The upper cervical spine also influences the pathophysiology of neck pain in those headache disorders [5].

Neck pain (NP) or cervical pain can arise from different local structures, including muscles, fascia, ligaments, facet joints, and visceral structures of the neck, through direct compression of upper cervical roots or it can also be a referred pain [6]. Thus, the differential diagnosis for neck pain includes various conditions such as cervical spinal cord or root disease, vertebral pathology, direct trauma, neoplasms, fibromyalgia, and myofascial pain. Therefore, in the present study, it was divided neck pain/cervical pain into two categories; structural neck pain (neck pain due to spinal cord/root or vertebral pathology) and functional neck pain (neck pain not attributed to cervical pathology due to myofascial pain).

In population-based studies and clinics, neck pain is common in persons with primary headaches, both in population-based studies and in the clinic, including migraine, tension-type headaches, and other primary headaches [7,8]. Studies on the association of neck pain in migraine and tension-type headaches are rarely documented. Moreover, literature regarding neck pain in trigeminal autonomic cephalalgia and other less common primary headaches is limited. In a study, it was observed that the one-year prevalence of neck pain was 68.4% and was higher in those with a primary headache than those without a primary headache (85.7% vs. 56.7%, $p < 0.001$) observed recently. When adjusted for age, gender, education, and poor self-rated health, in comparison with the patients without headaches, the prevalence of neck pain (56.7%) was significantly higher among the patients with M+TTH (89.3%), pure TTH (88.4%) and the pure migraine (76.2%) when compared with all three groups with p -value less than 0.05 [9]. Contrary to the previous concept, most authors believe that neck pain along with other peri-cranial muscle contractions or tenderness is as common in migraineurs as in tension-type headache sufferers today [10].

A better understanding of neck pain in primary headaches is crucial. Very often clinicians diagnose these types of patients as cervical-genic headaches or headaches secondary to cervical pathology, which results in unnecessary investigation and imaging study, subsequently leading to an economic burden on patients and exposure to toxic radiations. Moreover, structural neck pain co-exists with primary headaches, which creates much confusion during diagno-

sis. Hence, the clinician should be aware of such symptomatology, proper history and clinical examinations are crucial for the exact diagnosis. Secondly, neck pain may influence the treatment response, and that results in increased disability among headache sufferers [11]. There are limited studies and documentation about the coexistence of these two common primary headaches and their association with neck pain. It is unclear whether the neck pain in headache disorder is functional or because of structural pathology. Based on the above problem this study was designed and the details regarding the incidence, demographic profile, and clinical features of neck pain associated with different primary headaches and its causal associations were observed.

The present survey study aimed to observe the characteristics and prevalence of neck pain in patients with the primary headache to classify the type of neck pain into functional neck pain (normal MRI cervical spine) or structural neck pain (MRI shows degenerative cervical spine changes) and to know the link between neck pain and different headaches in mixed type headache disorders.

METHODS

Study design and setting

The present study was a cross-sectional, prospective observational carried out at Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India, from January 2017 to December 2019. The patients were screened on their first visit to the outpatient clinic and followed up directly during a hospital visit and telephonically when required for the clinical details. Patients were advised to report their recent attack semiology immediately by phone or other electronic media (like fax, email, or video call) during the emergency. The patient's history, the data from clinical examination, and the investigations as routine tests during the treatment period were recorded. The current research was approved by the Institutional Ethical Committee of IMS and SUM Hospital, Bhubaneswar and participants provided written informed consent during the study period.

Demographic characteristics

Demographic parameters such as age, gender, religion, address, education, occupation, socio-economic status, dietary habits, and behavioral and social relationships were recorded for each patient in a pre-designed proforma.

Headache interviews

The headache interviews were designed to define different primary headaches according to the International Classification of Headache Disorders-3-beta

(ICHD-3- β). Migraine (M) patients were classified as migraine with or without aura, episodic migraine or chronic migraine, complications of migraine, or episodic syndromes associated with migraine. The tension-type headaches (TTH) were divided into infrequent episodic tension-type headaches, frequent episodic tension-type headaches, and chronic tension-type headaches whether associated with peri-cranial tenderness. The other primary headaches as described in ICHD-3- β were also observed in the study. Associated non-headache symptoms are sensitivity to light, sound, smell, nausea, vomiting, vertigo, aggravation of pain by physical activity, cranial autonomic symptoms, peri-cranial muscle tenderness, agitation/restlessness, sleep pattern, anxiety, depression, and other behavioral symptoms were also recorded.

Neck pain interviews

The neck pain was defined as a subjective unpleasant sensory experience or myofascial pain in the neck, particularly in the nuchal or upper cervical region. This pain was termed *nuchalgia* or *cervical pain*. Individuals were asked about side (unilateral or bilateral), radiation (to the upper extremities, head, or back), character (stabbing, cramping, lancinating, pulsating, and numbness), and aggravating and relieving factors for neck pain. An imaging study was used to differentiate between the etiology of neck pain (cervical structural pathology or functional).

If the patient was diagnosed with a primary headache and had neck pain, the following questionnaires asked during each attack (minimum ten attacks) were whether the patient experienced neck pain anytime during the headache phase, experienced neck pain well before the onset of the headache, experienced neck pain that starts with or just before the onset of the headache and whether experienced neck pain after the resolution of the headache.

Inclusion and Exclusion criteria

The primary headache was diagnosed (as per the definition of ICHD-3- β) among both males and females more than 14 years of age, and neck pain or cervical pain (as defined above) at any time during the attack phase was included in the study. Patients having a minimum of ten attacks of headache associated with neck pain were included in this study. Patients who were known or suspected to have any brain lesions, secondary non-specific headache due to cervical pathology, history of significant brain or cervical trauma or surgery, fibromyalgia, and major psychiatric illness including somatoform syndrome were excluded from the study.

Statistical analysis

Data were summarized using descriptive statistics: The fractional distribution was estimated by means of the percentile of patients in each category. The mean, standard deviation, median, and range were estimated. The statistical analysis was performed using IBM SPSS statistics for windows version 20.0 (Java). The two-tailed p values were calculated and less than 0.05 ($p < 0.05$) was accepted as significant.

RESULTS

During one year period, a total of 624 primary headache patients were interviewed about the semiology and detailed clinical features of the attack. A total of 601 patients with clinical complaints of M or TTH or mixed type M+TTH were included and analyzed and the rest 23 patients were excluded from the study.

Prevalence and demographics of neck pain in primary headache

A fraction of 66.4% ($n=399$) of patients with the chief complaints of neck pain presented at any time during the headache phase, whether as a trigger or part of the attack. Among these, the majority of the patients were females ($n=268$, 67.6%) which was lower as compared to patients without neck pain (female=70.4%), although statically not significant ($p=0.576$). The mean age group was 41.2 ± 12.5 years among neck pain-associated primary headaches and 39.7 ± 15.2 years among those having headaches without neck pain ($p=0.18$).

Incidence of neck pain in migraine, TTH, and mixed type headache (migraine +TTH)

Out of 399 patients of primary headache sufferers with neck pain, 21% ($n=84$) had migraine, 51% ($n=203$) had a tension-type headache, and 28% ($n=112$) patients had mixed type headache (both migraine and TTH coexistence) depicted (Figure 1).

Relative frequency of neck pain in primary headache

The statistical analysis of the frequency of neck pain in migraine, TTH, and mixed type headache showed that the mixed type (M+TTH) and the TTH alone were associated with and without neck pain with significance p-values less than 0.001 in both cases while the migraine with or without neck pain was not associated with p-value > 0.35 represented (Table 1).

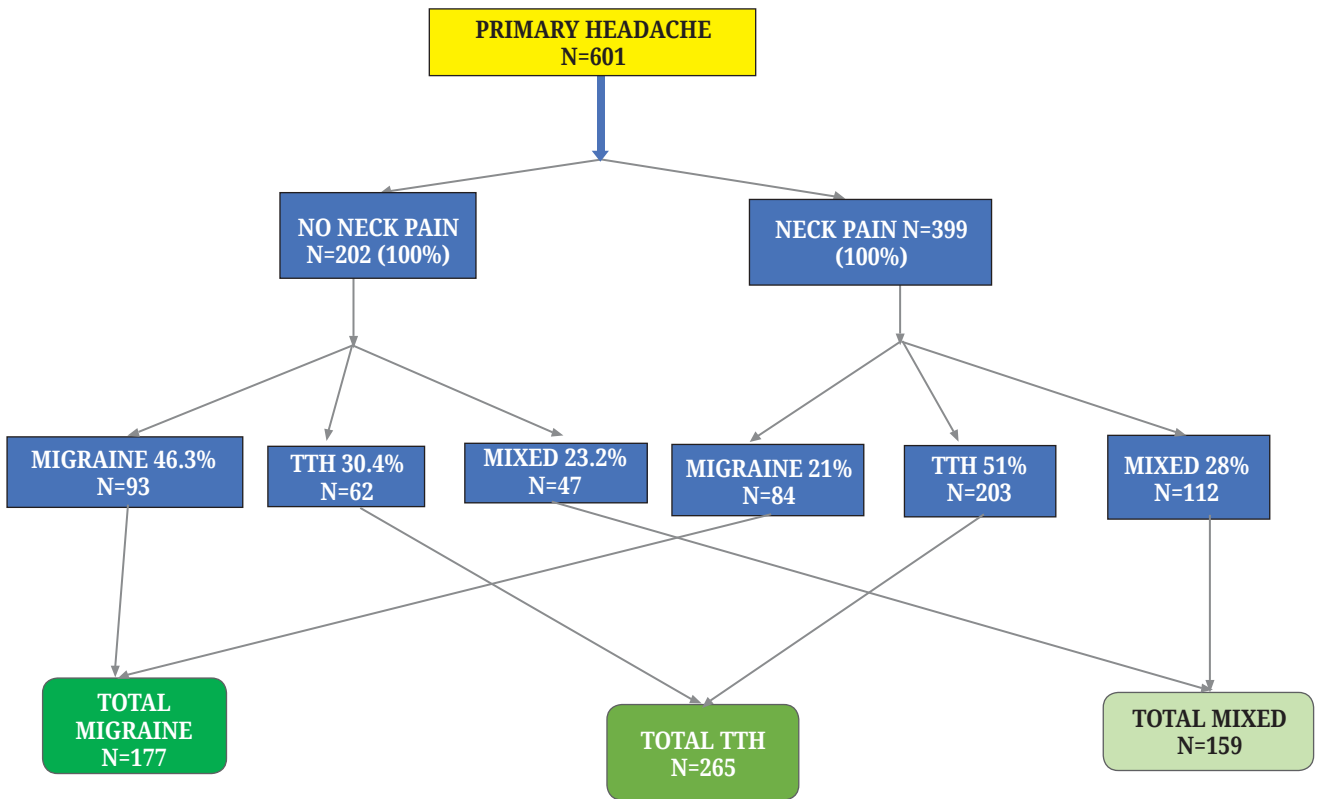


FIGURE 1. Flow chart showing the results of the presence of neck pain among primary and secondary headache disorders

TABLE 1. Frequency of neck pain in migraine, TTH, and mixed type headache

Primary headache	Associated with Neck pain (%)	No neck pain (%)	p-value
Migraine (M) (n=177)	84 (47.5%)	93 (52.5%)	p=0.35
Mixed (M+TTH) (n=159)	112 (70.4%)	47 (29.6%)	p<0.001
TTH (n=265)	203 (76.6%)	62(23.4%)	p<0.001

Subgroup analysis

Among the patients having mixed quality headaches along with neck pain (whether as a part or trigger of attack), chronic TTH (CTTH) with episodic migraine (EM) was most common (54.5%, n=61) followed by CTTH with chronic migraine (CM) seen in 33% (n=37), CM with frequent episodic TTH (FETTH) in 10.7% (n=12) and EM with FETTH was seen in two patients only (1.8%) depicted (Figure 2).

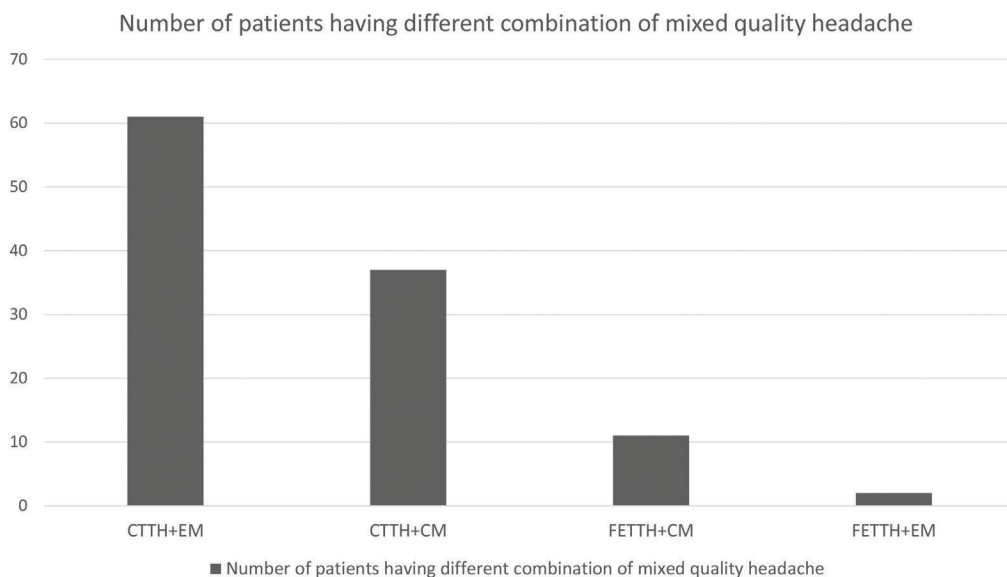


FIGURE 2. Different types of headaches are seen in mixed types of primary headache patients- chronic TTH (CTTH) with episodic migraine (EM), CTTH with chronic migraine (CM), CM with frequent episodic TTH (FETTH)

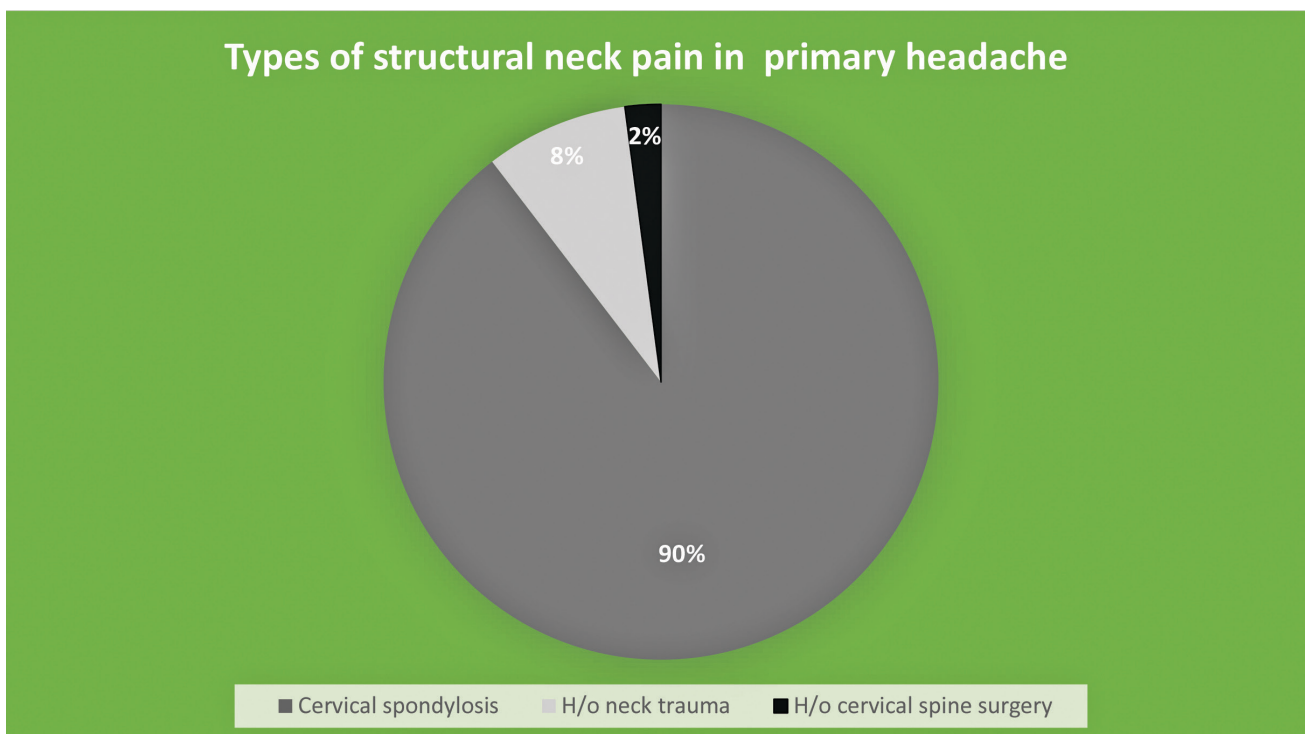


FIGURE 3. Different types of structural neck pain associated with primary headache

Different spectrum of neck pain in association with headache

An imaging study was done to differentiate between structural (cervical structural pathology) and functional neck pain (without any neck pathology). Out of 399 patients having neck pain either as a trigger or as a part of primary headache, 12% (n=48) patients had structural cervical pathology. Among these patients, the majority (89.5%, n=43) had various grades of degenerative cervical spine disease, followed by a history of trauma in 4 patients and a history of cervical spine surgery in one patient depicted (Figure 3).

In 351 patients who had functional neck pain, despite normal cervical imaging neck myofascial tenderness and painful cervical movement were present (61.8 %, n=217) during the headache attack. Functional neck pain was a little higher in TTH patients (86.7%) than in migraine (84.5%) and mixed migraine with TTH patients (84%). Structural neck pain was slightly higher among the mixed-type headache patients (16%) than the other two types of primary headache (15.5% of migraine patients and 13.3% of TTH patients). But in both these conditions, the p-value was not significantly represented (Table 2).

DISCUSSION

Neck pain or cranial myofascial pain is a well-described entity in tension type of headaches according to some studies and ICHD-3-beta. But some others did not believe in the association of neck pain in mi-

TABLE 2. Different spectrum of neck pain in primary headache

Neck pain spectrum (n=399)	Migraine (n=84)	TTH (n=203)	Migraine + TTH (n=112)
Functional neck pain	71 (84.5%)	176 (86.7%)	94 (84%)
Structural neck pain	13 (15.5%)	27 (13.3%)	18 (16%)

graine as a trigger or part of headache, although it is an extra-cranial premonitory symptom in the majority of migraineurs.

There were some recent studies about the incidence of neck pain in migraine and its association with different phases [12,13]. There were limited studies that used strict ICHD criteria to define headache cases or analyzed the group with coexistent migraine and TTH. In a previous study, neck pain was more commonly associated with patients with primary headaches than patients with non-primary. The incidence ranged from 60-70% reported in a previous study which corroborated with the present study with a fraction of 66.4% among the primary headache patients [8]. Though other research teams have mentioned that neck pain is more commonly associated with TTH than migraine, given its hypothesized muscular etiology. Moreover, with a putative neurovascular etiology, some authors have believed that neck pain was observed the association with migraine, with the same or higher incidence as seen in TTH [13]. However, in the present study, it was observed that neck pain is more commonly associated

with TTH (76.6%) than migraine (47.5%). The difference observed might be due to the statistical analysis with mixed-type headaches (both migraine and TTH) separately as a different entity.

Some of the authors still believe in the co-existence of the most common primary headache, TTH, and migraine. The present study was carried out to know the above facts which suggested that the prevalence of neck pain (56.7%) was significantly higher in those with migraine + TTH (89.3%), pure TTH (88.4%), and pure migraine (76.2%) ($p < 0.05$ for all three in the group comparisons) [9]. The present study corroborated and showed a slightly lower incidence of neck pain. Moreover, neck pain was highest in pure TTH (76.6%) followed by migraine + TTH mixed type (70.4%) and pure migraine (47.5%) as represented (Table 3). This may be because we considered the patient having neck pain only when it was consistently felt in at least ten attacks of migraine.

TABLE 3. Comparison of neck pain in primary headache between two studies

Different symptoms	Previous study	The present study
Neck pain incidence with headache	Ashina S et al, Cephalalgia (2015)	Current result
Primary headache	85.7%	66.4%
TTH	88.4%	76.6%
Migraine	76.2%	47.5%
Migraine +TTH	89.3%	70.4%

The subgroup statistical analysis was done to know the exact association of neck pain with the co-existence of migraine and TTH, which was not reported previously. The data generated during this study showed TTH patients with neck pain, a fraction of 35.5% had migraine headaches mixed with TTH

whereas the absence of neck pain migraine was observed with a fraction of 43.1% of patients. This finding suggested that neck pain was not a common triggering factor for migraine in patients with TTH. A fraction of 52% had TTH with the presence of migraine among the patients with migraine whereas a fraction of 35% TTH was present in the absence of neck pain as shown (Figure 4).

Thus, it can be assumed that the presence of neck pain in migraine predisposes to TTH. The questions are whether the migraine and TTH are separate or the same disorders has been debated among the headache community for years. Some state that TTH and migraine constitute the same entity but are distinguished by severity, with TTH lying on the mild end of the severity continuum and migraine lying on the severe end. While some opine that migraine and TTH are separate disorders, one of which arises from abnormal muscle activity and the other arises from neurovascular causes [14,15].

Stress-induced nociception from myofascial tissues is the pathophysiology of chronic tension time headaches. In patients with migraine continuous afferent bombardment of the trigeminal nerve nucleus caudalis and hence activation of the trigeminovascular system is expected corroborated with the previous study [16]. With the presence of neck pain. This can attribute to persistent muscle contraction. The trigeminal-cervical nucleus, a region of the spinal cord, in which descending sensory nerve fibers of the trigeminal nerve are co-localized with sensory fibers from the upper cervical roots, is a likely substrate for overlapping pathophysiology of migraine and tension-type headaches [17]. In addition to providing a substrate for the referral of neck pain to areas of the face, this convergence of trigeminal and cervical fibers provides a substrate for cervical-initiated neurogenic inflammation [18]. As the pathogenesis of migraine is linked to the trigeminal innervations of the

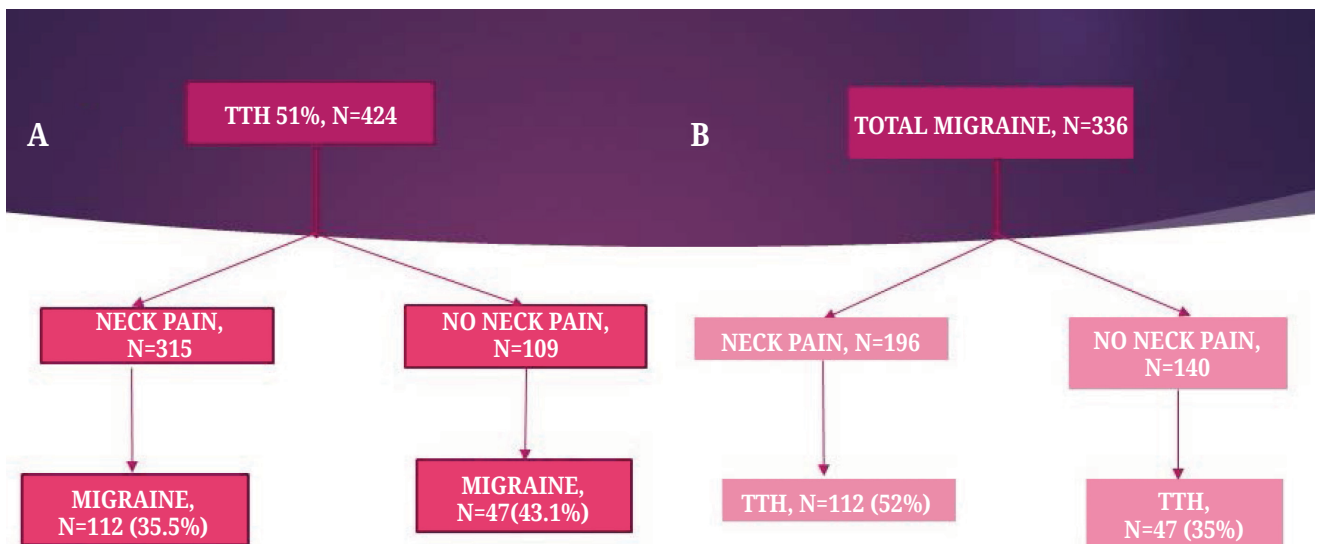


FIGURE 4. Neck pain in primary plus mixed type of headaches A) Tension type headache (TTH) and B) migraine

cranial blood vessels, noxious stimuli from the cervical structures may also play a role in this pathogenesis by facilitating central sensitization as well as cervical muscles per se have an important role in triggering migraine [19].

An interesting fact observed in the current study was some of the patients (12%) had structural neck pain associated with primary headaches. Their cervical spine imaging showed either degenerative cervical spine disease or post-traumatic/post-surgical changes. In the majority of patients, there was various grade of cervical spondylotic changes without significant thecal or cord compression. Hence, ruled out cervi-congenic headache (secondary headache due to cervical pathology) and C2-C3 syndrome, as there was no significant root compression. Therefore, it should be kept in mind that cervical pathology does not always cause secondary headaches (cervical-genic headache); however, at times it may aggravate or trigger the primary headache (commonly, migraine or TTH).

The major limitation of this study is that it was partly a memory-based interview. So sometimes the patients' version required the examiner's interpretation for documentation with its inherent bias. In many migraines and TTH patients, the subtypes of

headache and associated symptoms were not studied in detail. Certain patients' psychological factors such as anxiety and depression, which may have modulating effects on pain perception and also causes both neck pain and headache, were not analyzed in the present study.

CONCLUSION

The present study was unplanned to observe cause-and-effect relationships; however, there was an interesting association between TTH with neck pain. Moreover, however, there was no significant difference when associated between neck pain and migraine. Hence, this study resulted that, there was no significant association between neck pain with TTH and migraine; however, a strong correlation between TTH with neck pain in migraine patients. Though there was no significant difference in the total number of patients with mixed and migraine large proportion of patients had combined TTH and migraine it appears association may be present. There is a requirement for multicentric studies to find the accurate significance and the relationship among those factors strongly.

Conflict of interest: none declared
Financial support: none declared

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