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*Original Article*

# Effectiveness of Acupuncture for Chronic Headache due to Perceived stress

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## Abstract

The global prevalence of active headache disorders is estimated to be around 52%. The International Headache Society (IHS) defines chronic daily headache as, having 15 or more headache episodes per month consecutively for at least 3 months. Acupuncture is one of the most common alternative medicines used to treat chronic pain in patients. In Sri Lanka, there are no documented reports to evaluate the prevalence of headaches caused by perceived stress. Therefore, the current study aimed to assess the efficacy of acupuncture for chronic headaches caused by perceived stress in patients who visited the acupuncture clinic at KIU. Forty patients were selected using a convenient sampling method, and their stress levels were assessed using the Perceived Stress Scale (PSS). The Numeric Pain Rating Scale (NPRS) was used to assess the intensity of the headache prior to treatment. Following six weeks of acupuncture treatment, post-intervention PSS and NPRS were assessed. A strong positive correlation (r2=0.929, p=0.001) was determined between the levels of stress and the severity of headache. Furthermore, a statistically significant (p=0.001) decrease in means scores of stress and pain was found following acupuncture treatments. Therefore, it was concluded that acupuncture is an effective treatment method for chronic headache due to perceived stress.

**Keywords:** Chronic headache, perceived stress, Acupuncture

## 1. Introduction

Headache disorders are among the most common and disabling conditions in the world (Stovner et al., 2022), affecting individuals of all ages despite their gender, ethnicity, and socioeconomic status (Ahmed, 2012). The global prevalence of active headache disorders is estimated to be around 52% (Stovner et al., 2022). According to the International Headache Society, (2021), headaches are classified as primary and secondary headaches. Primary headaches are the most common type of headache which are migraine, tension-type headaches (TTH), and cluster headaches while secondary headaches are a manifestation of underlying disorders. Headache is usually regarded as a chronic disorder where one can experience acute episodes of pain which last for minutes to even days (Ahmed, 2012). The International Headache Society (IHS) defines chronic daily headaches (CDH) as "15 or more headache episodes per month for at least 3 months" (International Headache Society, 2021). Chronic headaches affect 1% to 4% of the entire population (Probyn et al., 2017), which accounts for around 39 million people in the United States and 1 billion people worldwide (Murphy & Hameed, 2021). Further, previous studies have highlighted that the prevalence rates of headaches in women are 3 to 5 times higher than in men (IHS, 2018).

Migraine and tension headaches have significant health, economic, and societal implications (Clarke et al., 1996). Despite medication's undeniable advantages, many patients continue to feel anguish and social disturbance. This encourages individuals to attempt, and health practitioners to recommend, non-pharmacological headache treatments (Vickers et al., 2004). Acupuncture is the technique of piercing the skin with needles at specific points on the body to treat or prevent various conditions and has been used for thousands of years by practitioners in many different cultures and societies around the world (Wu et al., 2013). Although it is used to treat a wide range of conditions, one of the most prevalent is the treatment of chronic pain (Vickers et al., 2012), particularly headache and migraine pain (WHO, 2003).

According to acupuncture constitutional traits, improper & unhealthy diet, trauma, excessive sexual activity, and emotional strain can be the etiological factors of headaches. Among these, emotional strain is the most widely spread factor which trouble individuals regardless of age (Nicholson et al, 2007). According to the World Health Organization, stress is the "health epidemic of the 21st century" and is one of the commonest triggers for migraine and tension type headaches (Stubberud et al., 2021). Similarly, young adults are mostly affected by emotional strain as they undergo busy and stressful lives more than the other age groups (Matos et al., 2021).

Hence, according to the principles of acupuncture, transformed migraine (TM), chronic tension-type headache (CTTH), and new daily persistent headache (NDPH) can be categorized as headaches from perceived stress type (Robbins and Crystal, 2010). However, in acupuncture, the manifestations are also treated primarily if the manifestations are severe and disturb the individual's daily life even if the treatment should mainly target the root cause of the ailment. However, during the process, the root cause is also treated simultaneously (Linde et al., 2009).

The most recent Cochrane systematic review update confirmed that acupuncture is effective for frequent episodic and chronic tension-type headaches with moderate to low-quality evidence (K et al., 2016). A brief review using all systematic reviews and metadata described acupuncture as having a 'potentially important role as part of a treatment plan for migraine, tension-type headache, and several different types of chronic headache disorders (Coeytaux & Befus, 2016). Studies in Germany and the UK have found that acupuncture for chronic headaches to be cost-effective (McDonald & Janz, 2017). Further, Ehler & Kraya, (2020)

evaluated the efficacy of acupuncture for migraine among children and adolescents. However, in Sri Lanka, no evidence-based research has been conducted up to date regarding the effectiveness of acupuncture treatment for headaches arising due to perceived stress. Therefore, the present study created a new approach to determine the effectiveness of acupuncture for emotional and subsequent headache which interrupts the day-to-day life of the adult population in Sri Lanka. These findings will justify the use of acupuncture as a successful remedy for headache with almost no side effects.

## 2. Methodology

### 2.1. Design and setting

A prospective case study was conducted among 40 patients who visited the acupuncture clinic at KIU Sri Lanka. The convenient sampling method was used to recruit the participants.

### 2.2. Ethical approval

Ethical approval for the study was obtained from the ethics review committee of KIU (ERC number KIU/ERC/21/165). Informed written consent was obtained from the participants prior to the study.

### 2.3. Data collection

A pre validated interviewer administered questionnaire was used to collect information from the participants which consisted of three sections. First section included questions to collect demographic data of the participants including age, gender, and occupation. The second section consisted of the "Perceived Stress Scale"(Cohen, 1994) to assess the levels of stress and the third section consisted of the "Numeric Pain Rating Scale"(McCaffery & Beebe, 1989) to assess the intensity of pain of the participants. The stress levels and the intensity of pain of the participants were assessed before and after the intervention. Pregnant and lactating women, those with existing neurological disorders, needle phobia, and patients who had a headache following trauma, injury, or brain infections were excluded from the study.

### 2.4. Intervention

Before the acupuncture interventions, the patients were asked to remove all metal objects (Jewellery, etc) on the body and confirm their fed state. The patients were then asked to sit on a chair and their skin was cleaned with alcohol (70% solution) at the location of the acupuncture points. Safety guidelines were followed for hand sanitization and stainless-steel acupuncture needles (Size- 0.25×25mm) were inserted into the selected acupuncture points by a well-trained acupuncture practitioner. Needle insertion procedures took about 3- 5 minutes. Needles were left for 20-30 minutes. The acupuncture points used for each patient were Yuyao (EX3), Yangbai (GB14), Yintang (EX1), Taichong (LIV3), Fengchi (GB20), Waiguan (SJ5), Taixi (K3), Zhaohai (K6), Hegu (LI 4), Shenmen HT 7, Neiguan PC 6 (Figure 1) which included local as well as points addressing the patient's underlying disharmony.

This was done four times a week for six weeks. During the treatment, participants were provided with proper emotional advice, dietary modifications, and consummatory behaviors by the acupuncture practitioners.

### 2.5. Data analysis

The data were analyzed in SPSS; IBM (version 25) using descriptive statistics, including means, standard deviations, frequencies, and percentages. Pearson's correlation and chi-square was used to determine the nature and significance of the relationship between the level of stress and the intensity of pain. Paired sample t-test was used to compare the difference of pre and post intervention level of stress and pain.

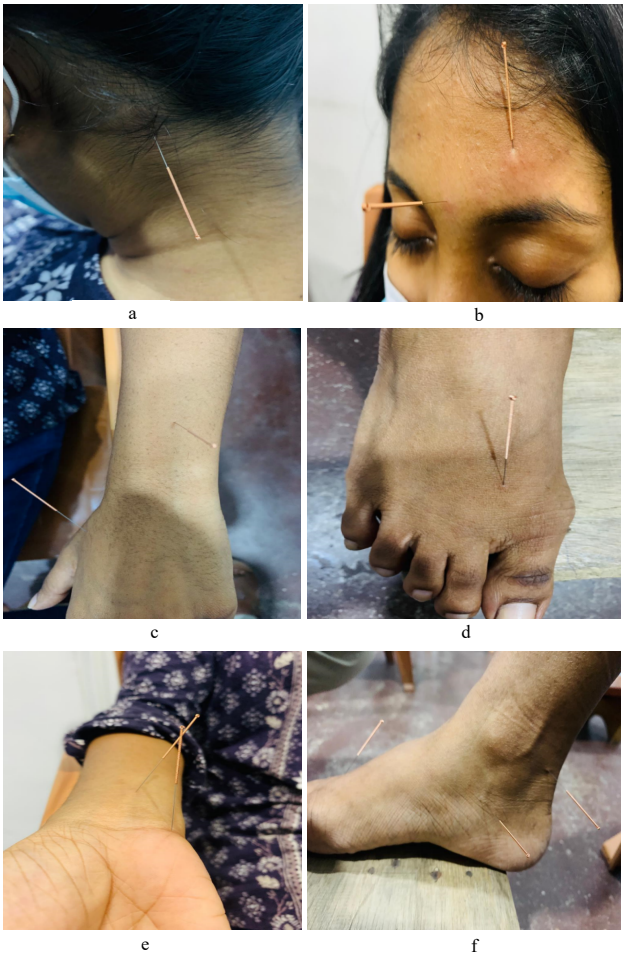

Figure 1. Acupuncture points used in the present study. a. Fengchi (GB20);b. Yintang (EX 1), Yangbai (GB 14) and Yuyao (EX 3); c. Waiguan (SJ 5), Hegu (LI 4); d. Taichong (LV3); e. Shenmen (HT 7), Neiguan (PC 6); f. Taixi (K 3), Zhaohai (K 6)

## 3. Results

### 3.1 Demographic characteristics of the study population

According to the present study population, majority (n=25; 62.5%) were females while 37.5% (n=15) were males. Age of the study sample ranged from 15-48 years with a mean age of 28 years. The majority of the respondents were employed (n= 16, 40%) while 27.5% (n=11) were unemployed and 32.5 % (n=13) were students. In the present study population, 70% (n=28) of the respondents were Muslims while 22.5% (n=9) were Sinhalese and 7.5% (n=3) were Tamils. Majority of the study participants were married (n=21, 52.5%) while 40% (n=16) were unmarried (Table 1).

Table 1. Socio-demographic characteristics

| | | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 15 | 37.5% |
| | Female | 25 | 62.5% |
| Occupation | Employed | 16 | 40.0% |
| | Unemployed | 11 | 27.5% |
| | Students | 13 | 32.5% |
| Ethnicity | Sinhala | 9 | 22.5% |
| | Tamil | 3 | 7.5% |
| | Muslim | 28 | 70.0% |
| Civil status | Married | 21 | 52.5% |
| | Unmarried | 19 | 47.5% |

### 3.2. Pre-intervention level of stress & intensity of pain

Pre-intervention study results showed that majority of the study participants were suffering from higher levels of stress (n=23, 57.5%) while 37.5% (n=15) were suffering from moderate stress and only 5% (n=2) of the participants had low stress levels. Further, according to the results of pre intervention level of intensity of pain, majority of the participants (n=36, 90%) were observed to be suffering from severe pain and 10% (n=4) of the participants were suffering from moderate pain (Table 2).

Table 2. Pre-intervention level of stress & intensity of pain

| **Level of stress** | N | % |
|---|---|---|
| High Stress | 23 | 57.5 |
| Low Stress | 2 | 5.0 |
| Moderate Stress | 15 | 37.5 |
| **Level of intensity of pain** | | |
| Mild pain | 0 | 0.0 |
| Moderate pain | 4 | 10.0 |
| No pain | 0 | 0.0 |
| Severe pain | 36 | 90 |

Concerning the association between level of stress and severity of pain, the present study revealed that the majority (57.5; n=23) of the participants who possessed higher levels of stress was suffering from severe pain levels due to headache, while thirteen (n=13) of the participants with moderate levels of stress were observed to be suffering from severe headache (Table 3). Further, the pearson chi -square test revealed that there was a statistically significant association (p=0.001) between level of stress and severity of pain.

Table 3. Association between level of stress and severity of pain

| | Moderate Pain | Severe Pain |
|---|---|---|
| High Stress | 0 | 23 |
| Low Stress | 2 | 0 |
| Moderate Stress | 2 | 13 |

Interestingly, there was a strong positive correlation ($r^2$=0.929, $p$=0.001) between the level of stress and severity of headache among the participants as analyzed by the pearson's correlation (figure 2).

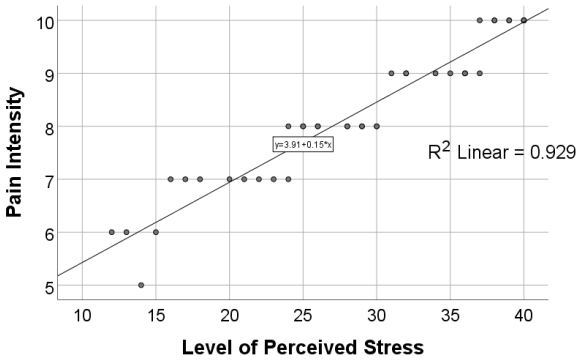


Figure 2. Relationship between level of stress and pain intensity

### 3.3. Post intervention level of stress & intensity of pain

According to the post intervention study results, the majority (n=34,85%) of the study participants possessed low levels of stress after the acupuncture treatment, while 6 (15%) of the participants possessed moderate stress level. In assessing the levels of intensity of pain among the study participants after the acupuncture treatment, it was revealed that majority of the participants (80%, n=32) experienced no pain after the treatment, while 12.5% (n=5) and 7.5% (n=3) of participants experienced moderate and mild pain respectively (Table 4).

Table 4. post-intervention level of stress

| **Level of stress** | N | % |
|---|---|---|
| High Stress | 0 | 0.0 |
| Moderate Stress | 6 | 15.0 |
| Low Stress | 34 | 85.0 |
| **Level of intensity of pain** | | |
| No pain | 32 | 80.0 |
| Mild pain | 5 | 12.5 |
| Moderate pain | 3 | 7.5 |

### 3.4. Comparison of pre- and post-intervention level of stress and intensity of pain

As shown in figure 3, the level of stress is reduced after six weeks of acupuncture treatment compared to the pre-intervention stress. Further, a paired sample t-test analysis revealed that there was a reduction in the pre-intervention mean stress score of 28.48 ± 8.590 than the post-intervention mean stress score of 9.75 ± 3.028 with a significant difference observed before and after the acupuncture treatment; t(39) =16.783, p=0.001.

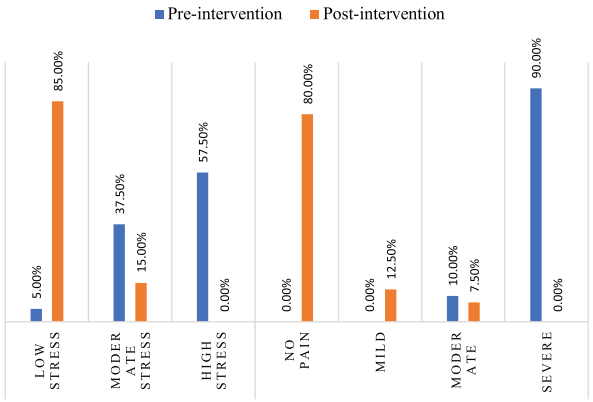


Figure 3. Pre- and post-intervention level of stress and intensity of pain

Similarly, the level of intensity of pain was reduced after six weeks of acupuncture treatment from severe to no pain (Figure 3). Moreover, a paired sample t-test confirmed that the reduction of mean pain score before (8.23 ± 1.349) and after the treatment (0.75±1.565) was significantly different in pre intervention and post intervention mean score of pain; t(39)=34.800, p=0.001.

## 4 Discussion

As observed in this study, majority of the participants were females. The fact that the vast majority of the research participants were female is most likely due to the fact that headaches, especially migraine, are more common in women than men (Lipton et al., 2001; Melchart et al., 2006). Secondly, there is consistent evidence that women are more prone to seek complementary therapies (Melchart et al., 2006; Thomas et al., 1991).

A study conducted by Kelman showed that stressful life events were a risk factor for the development of chronic headaches. Further, stress is also the commonest trigger for acute episodes of chronic headaches as reported by patients (Kelman, 2007; Stubberud et al., 2021). The result of the current study showed that the majority of the study participants had higher levels of stress during the pre-intervention while 37.5% showed moderate stress and only 5% of the participants had low stress levels. The study also reported that the majority were observed to be suffering from severe headache and 10% of the participants were suffering from moderate pain. The results of the present study further revealed that that there was a statistically significant association between level of stress and intensity of pain. Further, the study revealed that the levels of stress among the participants and the intensity of headache had a strong positive correlation. These results are in accordance with some of the previous studies conducted. Schramm et al, in a prospective study with over 5000 participants observed that the level of stress was associated with headaches in those who had tension-type headache, migraine, or both tension-type headache and migraine (Schramm et al., 2015). Similarly, some observational studies also showed an association between stress and migraine symptom burden. It was also noted in a study by Santos et al, that there is an association between the increase risk of migraine due to high job stress, which results in less time for personal care and recreation (An et al., 2019; Santos et al., 2014; Stubberud et al., 2021).

The current study indicated that majority of the study participants had low levels of stress after the post intervention while 6 participants had moderate stress level, post intervention. It was also revealed that when assessing the levels of intensity of pain among the study participants, the majority of the participants experienced no pain post intervention, while only 3 participants experienced mild pain and 5 participants experienced from moderate pain, post intervention. As per the analysis of the results, both the intensity of pain and the levels of stress were significantly reduced after the treatment. In a study conducted in Germany enrolling 2022 patients (732 with migraine, 351 with episodic and 440 with chronic tension type headache, and 499 with other) showed that there was a significant ($P < .001$) improvement in all the outcome measures (Average pain, pain disability index [PDI], Depressive symptoms [ADS], Restricted physical health [SF-36], and Restricted mental health [SF-36]) in all diagnostic subgroups after completion of acupuncture sessions (Melchart et al., 2006).

A randomized controlled trial conducted by Vickers et al., (2004) to determine the effects of acupuncture for chronic headaches (predominantly migraine) revealed that the headache score after 12 months of acupuncture treatment was lower in the acupuncture group than in the control group who received standard care from general practitioners (Vickers et al., 2004). In yet another study done in 2020, Liao et al., reported that 21,209 patients with migraine were treated successfully with acupuncture. Further, this study reports a lower medical expenditure within year of treatment intervention, a low depression risk and a low anxiety risk when compared to the non-acupuncture cohort (Liao et al., 2020). Furthermore, a study conducted in Germany reported that after 3 months of acupuncture treatment, the number of days with headache in patients decreased from $8.4 \pm 7.2$ (estimated mean ± S.E.) to $4.7 \pm 5.6$ in the acupuncture group and from $8.1 \pm 6.8$ to $7.5 \pm 6.3$ in the control group ($P < 0.001$). It should be also noted that the improvements in the intensity

of pain and quality of life were more prominent in the acupuncture vs. control group ($P < 0.001$) (Jena et al., 2008).

Further investigation is required to determine if acupuncture should be studied as part of a multimodal headache care regimen. Studies must also be conducted to determine the best time to provide acupuncture, the best acupoints to use, and the best frequency of acupuncture therapy.

## 5. Conclusion

Perceived stress was a critical factor for chronic headaches. Acupuncture interventions were found to be useful for the management of chronic headaches due to perceived stress.

## 6. Conflict of interest

There are no conflicts of interest.

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