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Article

The Effect of Electroacupuncture and Gua Sha on Reducing Pain Scale and Neck Disability in Neck Pain Cases at Siligita Husada Independent Acupuncture Practice

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ABSTRACT

Neck pain is one of the musculoskeletal disorders due to several causative factors, one of which is ergonomic factors at work. Electroacupuncture and gua sha therapy have been widely used as alternative treatment methods to help reduce pain and improve functional ability in neck pain. This study aims to determine the effect of electroacupuncture and gua sha on reducing pain scale and neck disability. This study employed a double-blind randomized controlled trial (RCT) with a true experimental design. A total of 34 subjects were selected using simple random sampling from a population of 40, with 6 additional participants prepared as reserves. The intervention group received electroacupuncture at points GB 20 (Fengchi), GB 21 (Jianjing), and Gua Sha, while the control group received only electroacupuncture at GB 20 and GB 21. Pain intensity and neck disability were measured using the Numeric Rating Scale (NRS) and Neck Disability Index (NDI) before and after 10 sessions of therapy. Data were analyzed using univariate and bivariate tests, including tests of normality, homogeneity, and hypothesis testing, to assess the effectiveness of the interventions. Both the intervention group (electroacupuncture combined with Gua Sha) and the control group (electroacupuncture only) showed a significant reduction in pain intensity and neck disability, as measured by the NRS and NDI scores ($p < 0.05$). However, the reduction was greater in the intervention group, indicating a more pronounced effect when Gua Sha was added to electroacupuncture therapy. combination of electroacupuncture with Gua Sha provides greater clinical benefits compared to electroacupuncture alone.

I. INTRODUCTION

Good physical and functional ability is the dream of every individual, if there is physical disturbance in the form of pain it can cause interference with several daily activities. In this digital era, individuals often spend all day sitting in front of a computer screen or other devices, a less ergonomic

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position while working can also cause skeletal muscle disorders. A common skeletal muscle disorder in every individual is neck pain, which often causes limitations in activities. About ten percent of the human population experiences neck pain disorders, and as many as two out of twenty people feel that neck pain greatly interferes with their daily activities. Damage to bones, muscles, ligaments, facet joints, and intervertebral discs can be a source of neck pain [1][2].

The neck has a function as the main support for the head and protects the spinal cord[3]. Neck pain occurs due to several contributing factors, one of which is ergonomic factors at work[4]. Static working and sitting positions and efforts to maintain a nonphysiological posture of the neck muscles for a long time[5]. Neck pain is also caused by musculoskeletal disorders including cervical uncharthrosis, facet joint syndrome, disc degeneration, spinal canal stenosis, and myofascial syndrome [6]. Impacts that can be caused by neck pain disorders include decreased range of motion of the neck, decreased sitting endurance, so that it is unable to sit for long durations, sleep disturbances, to decreased quality of life[7].

Neck pain can also be caused by multifactors, both modifiable and non-modifiable. Non-modifiable factors include age, gender, and history of pain experienced by each individual[4]. While modifiable factors are those that are closely related to body posture at work and the environment, such as sitting duration, workplace design, monotonous work behavior, work stress levels and workload[8]. Neck pain that is not properly addressed will cause danger signs of complications, such as weakness in the extremities or limbs to paralysis, limitations on activities stiff neck to the point of not being able to move the head, muscle atrophy, and deformity [2].

Acupuncture is a supporting therapeutic modality for musculoskeletal pain, including neck pain. Acupuncture in musculoskeletal pain disorders can regulate local blood flow, blood flow in the brain, tissue oxidation, metabolic exchange and induce motor control effects through α and γ motor neurons (inhibiting pain-tension-pain)[9]. Acupuncture is significantly influential in the management of musculoskeletal cases both in terms of pain scale, quality of life improvement, and general health status.

Acupuncture at localized points causes a relaxing effect, improves circulation, and repairs damaged tissue. The mechanism of acupuncture is explained in the endorphin theory. Needling stimulates the activity of spinal and supraspinal chemicals such as opioids, serotonin, and norepinephrine[10]. Some acupuncture points that can be used for neck pain management include SJ17 Yifeng, GB20 Fengchi, SJ3 Zhongzhu, GB39 Xuanzhong, BL10 Tianzhu, Du14 Dazhui, SI3 Houxi, and BL60 Kunlun[11]. GB21 Jianjing point can relieve complaints of neck, shoulder, and back pain[12]. GB20 Fengchi is beneficial for relieving tension in the neck and can help relieve neck and head pain[13].

Gua sha is defined as a therapy that uses several tools or modalities by scraping or rubbing the surface of the body to overcome blood stagnation, treat flu, respiratory problems, and musculoskeletal disorders[19]. The mechanism of gua sha in overcoming musculoskeletal pain includes gua sha can increase microcirculation in the local area which can reduce distal myalgia; musculoskeletal pain is reduced through stimulation of serotonergic, noradrenergic, opioid systems; gua sha can also reduce pain directly in nociceptors, surrounding areas, and directly related to the spinal cord [14]. Gua sha therapy is associated with upregulation of proinflammatory cytokines, increased immune cell activity, dilation of blood vessels, and improved blood circulation. All these factors play a role in the reduction of pain intensity in patients with chronic pain[15]. Some recent studies have shown symptomatic improvement in patients with chronic low

back pain conditions as well as chronic neck pain[14].

Globally, the recorded prevalence of neck pain was 288.7 million in 2017 and the number of disabilities caused by neck pain globally was 28.6 million[15]. Neck pain is the second most common musculoskeletal disorder by prevalence and is the third largest cause of disability-adjusted life-years (DALYs) in both sexes (87 million)(19-21). Neck pain is a common complaint in society, especially in middle age, with the highest burden in men aged 45-49 years and women aged 45-54 years[16]. Global burden of disease data in 2016 estimated that there are 333 causes of DALYs, 68 of which are sources of disability but not causes of death, one of which is neck pain[3].

The percentage incidence of neck pain reported in Indonesia reached 46.5%. Although some episodes of neck pain will resolve without treatment, about 50% of pain episodes experienced by individuals will continue to increase to cause pain and recurrent pain[17]. The prevalence of neck pain in a study conducted in Mengwi, Badung Regency, Bali Province was 52.17% of people experiencing upper neck pain and as many as 13.04% lower neck pain[18].

Based on the results of preliminary studies conducted by researchers on November 1, 2024, using patient medical record data at Siligita Husada Acupuncture Independent Practice, it was found that there were 40 patients with an age range of 20-60 years who had complaints of neck pain in the range of August - October 2024. Most of the efforts made by patients at Siligita Husada Acupuncture Independent Practice in overcoming neck pain complaints by massage, taking pain relievers, or using warming creams. Meanwhile, the utilization of acupuncture therapy as one of the therapies to relieve these complaints is still rarely done. If this is not given good treatment, it will have a negative impact on health conditions and affect productivity. So the combination of electroacupuncture and gua sha is expected to reduce pain intensity and improve blood circulation.

Based on the above background, the researcher is interested in examining the effect of electroacupuncture and gua sha on reducing the pain scale and neck disability in neck pain cases at Siligita Husada Acupuncture Independent Practice.

II. METHODS

This study uses a type of quantitative research with a double-blind True Experiment research design, where both parties do not know what treatment is given, either from the researcher or the research subject [64]. This study was conducted by measuring the Numeric Rating Scale (NRS) and Neck Disability Index (NDI) values first before being given an intervention as pre-test data, then the NRS and NDI values were measured again after the intervention as post-test data[25].

The sample in this study used Simple Random Sampling with the Randomized Controlled Trials (RCTs) approach by applying the Rule of Thumb theory. Based on this theory, 10-20% of the population is allocated as a reserve to anticipate subjects who do not meet the criteria during the research process. From a population of 40 people, it was determined that the main sample consisted of 34 people, with 6 other people as reserve subjects[29].

The use of this method aims to maintain the objectivity of group division, minimize potential selection bias, and increase the validity and reliability of the research results. In addition, the dice rolling method provides a simple yet effective randomization mechanism in the context of small-scale research. This research will be conducted at Siligita Husada Acupuncture Independent Practice, which will begin in January 2025 until April 2025.

Research variables are attributes/ properties/values of people/objects/ activities that have certain variations, then determined by researchers to study and draw conclusions [26]. Research variables

are divided into three. The independent variable is the variable whose position influences the dependent variable[27]. The independent variables in this study are Electroacupuncture GB 20 Fengchi, GB 21 Jianjing, and Gua Sha. Control variables are variables that are always included in the research process[28]. This variable also affects the dependent variable in addition to the independent variable. The control variables in this study are Electroacupuncture GB 20 Fengchi, GB 21 Jianjing. The dependent variable is the variable that is the result of the influence of the independent variable[27]. The dependent variable in the study is a decrease in the scale of neck pain and neck disability.

In this study using the Numeric Rating Scale (NRS) to measure the level of pain felt by research subjects, and the Neck Disability Index (NDI) was used to measure the level of disability or limitation of neck function in research subjects. The data distributed in this study are the NRS and NDI values of each research subject calculated before and after being given the intervention as a treatment group (electroacupuncture GB 20 Fengchi and GB 21 Jianjing and gua sha) and control group (electroacupuncture GB 20 Fengchi and GB 21 Jianjing).

The results that have been obtained will be continued by analyzing using several methods including univariate analysis tests to explain the characteristics of the variables, then continued with bivariate tests to find out the differences between before treatment and after both treatments are given through data normality tests, homogeneity tests, and hypothesis tests to find out the best treatment that can reduce neck pain.

III. RESULT

The research stages that have been carried out by researchers are conducting preliminary studies at Siligita Husada Acupuncture Independent Practice to find out the number of patients who experience neck pain. The data obtained are 40 patients who experience neck pain based on patient medical records.

The research subjects were divided into two groups, with as many as 17 research subjects in the intervention group who were given electroacupuncture and gua sha treatment, and 17 other research subjects in the control group who were only given electroacupuncture treatment. The electroacupuncture and gua sha treatment interventions were carried out six times, with three interventions in one week. Before being given the intervention, the research subject signed an informed consent and the measurement of pain scale and neck disability measurement was carried out first (pre test) and after the intervention was carried out six times the measurement of pain scale and neck disability again (post-test).

The results of research conducted on 34 research subjects include univariate analysis and bivariate analysis. Data on the characteristics of research subjects include gender, age, and occupation, which will be presented in tabular form.

Table 1. Characteristics of Respondents

Characteristics	Group 1		Group 2	
	N	%	N	%
Gender				
Man	7	41.2	8	47.1
Woman	10	58.8	9	52.9
Age (years)				
20-30	4	23.5	1	5.9
30-40	7	41.2	9	52.9
40-50	4	23.5	4	23.5
50-60	2	11.8	3	17.6
Syndromes				
Bi Zheng	12	70.6	8	47.1
Cold wind pathogen and Jing Diffusion	4	23.5	7	41.2
Xue on Kidney and Liver	1	5.9	2	11.8

Based on Table 1. above, it is known from the total number of 34 research subjects, in group I electroacupuncture and gua sha shows that the number of female research subjects is higher with 10 people (58.8%) and group II electroacupuncture with 9 people (52.8%) compared to male

research subjects. Based on Table 1, it is also known that the total number of 34 research subjects of the study obtained data on the syndrome of research subjects in group I, electroacupuncture and gua sha the most is Bi Zheng totaling 12 people (70.6%) and group II electroacupuncture totaling 8 people (47.1%).

Table 2. Normality Test

Research Data	N	p
***Pre-test* of NRS**	34	<0.001
***Post-test* of NRS**	34	0.029
***Pre-test* of NDI**	34	<0.001
***Post-test* of NDI**	34	<0.001

Based on Table 2, the results of the data normality test obtained a pre-test scale significance of <0.001 and a significance after acupuncture therapy of 0.029. From the results of the normality test significance using Shapiro-Wilk, the data is not normally distributed because the significance is <0.050. The results show that neck disability data is not normally distributed because the significance is <0.050.

Table 3. Levene Test

Research Data	N	p
NRS	34	0.961
NDI	34	0.999

Based on Table 3, the results of the homogeneity test, 0.961 and 0.999 that more than 0.050, then the data can be declared homogeneous.

Table 4. Mann-Whitney Test

Blood Pressure	Group	Mean Rank	p
***Pre-test* of NRS**	**Group I**	17.50	1.000
	Group II	17.50	
***Pre-test* of NRS**	**Group I**	10.41	<0.001
	Group II	24.59	
***Pre-test* of NDI**	**Group I**	17.50	1.000
	Group II	17.50	
***Pre-test* of NDI**	**Group I**	10.41	0.003
	Group II	24.59	

Based on Table 4, the Mann-Whitney test results obtained significant results, p<0.001, which means Electroacupuncture and Gua Sha therapy are effective on changes in the neck pain scale. the Mann-Whitney test results obtained the significance p=0.003, which means Electroacupuncture and Gua Sha therapy are effective on changes in neck disability scores.

Table 5. Wilcoxon Test

Blood Pressure	Group	Mean	p
***Pre-test* of NRS**	**Group I**	7.41	<0.001
	Group II	1.59	
***Pre-test* of NRS**	**Group I**	7.41	0.001
	Group II	4.59	
***Pre-test* of NDI**	**Group I**	56.0	<0.001
	Group II	8.0	
***Pre-test* of NDI**	**Group I**	50.0	0.001
	Group II	7.41	

Based on Table 5, the Wilcoxon test obtained significance results p<0.001 in group I electroacupuncture and gua sha, and p=0.001 in group II Electroacupuncture. This shows that the two treatments show significant results in reducing the neck pain scale. The Wilcoxon test obtained significance results, p<0.001 in group I electroacupuncture and gua sha, and p=0.001in group II Electroacupuncture. This shows that the two treatments show significant results on changes in neck disability in cases of neck pain.

IV. DISCUSSION

Group I Electroacupuncture and Gua Sha found that the most research subjects experiencing neck pain were research subjects with female gender, as many as 10 people (58.8%), and in electroacupuncture therapy group II, as many as 9 people (52.8%). These results are in accordance with research by [24], which states that female gender shows a higher prevalence of chronic neck pain complaints with (OR

= 2.08; 95% CI: 1.92 to 2.23). Women have a higher sensitivity to pain and a lower threshold for pain tolerance. Genotype, endogenous opioid function, and sex hormones also play a role as factors that influence pain sensitivity[31].

Electroacupuncture group I and Gua Sha, it was found that most research subjects experiencing neck pain were research subjects with Bi Zheng syndrome, as many as 12 people (70.6%), and in the electroacupuncture therapy group II, as many as 8 people (47.1%). Neck pain or commonly called Jing Bi or blockade of the neck in TCM.

Neck pain based on syndrome according to TCM is generally caused by Bi Zheng, which is discomfort localized in muscles, joints, and tendons due to exogenous pathogens (wind, cold, humidity, heat). Neck pain due to Bi Zheng has specific characteristics such as pain, soreness or numbness due to obstruction in the flow of Qi and Xue[32].

In group I (Electroacupuncture and Gua Sha) the NRS pain scale after treatment was mostly pain scale 1 (mild pain) as many as 6 people (35.3%), in group II Electroacupuncture the NRS pain scale after treatment was mostly pain scale 5 (moderate pain) as many as 6 people (35.3%). The average NRS before intervention in group I was 7.41 and in group II 7.41, while after intervention in group I 1.59 and in group II 4.59. In group I (Electroacupuncture and Gua Sha) NDI after treatment was mostly 0-20% (minimal) as many as 15 people (88.2%), in group II (Electroacupuncture), NDI after treatment was mostly 20-40% (moderate) as many as 9 people (52.9%). The average NDI before intervention in group I was 50.7% and group II 45.5%, while after intervention in group I 10.3% and group II 25.5%.

The group data above shows a change in pain scale and a decrease in the level of neck disability in neck pain patients. This study is in line with research conducted by Chen et al., electroacupuncture is effective in reducing the scale of neck pain. Electroacupuncture through a certain intensity and frequency of micropulse current to strengthen the stimulation of acupuncture points, to enhance the healing effect.

This study is also in line with Lee et al., who showed a significant decrease in pain scale after being given Gua Sha treatment[14]. In the intervention, the most neck disability became 0-20%, namely minimal disability (mild), with a total of 15 research subjects. Group II Electroacupuncture obtained the most neck disability before the intervention was 40-60% which is severe disability (severe) with a total of 11 research subjects, after being given the intervention the most neck disability became 20-40% which is moderate disability (moderate) with a total of 9 research subjects. The normality test of the data obtained in the pre-test neck pain scale (NRS) is <0.001, and in the post-test neck pain scale (NRS) is 0.029. The normality test on the neck disability scale (NDI) in the pre-test was <0.001, and the neck disability scale (NDI) in the post-test was <0.001. It can be concluded that changes in the pain scale and neck disability on these measures are not normally distributed because the significance value is less than 0.050.

Mann-Whitney test obtained a significance value on changes in the neck pain scale (NRS), <0.001 smaller than 0.050 and changes in the neck disability scale (NDI), 0.003, smaller than 0.05, then Ho is rejected and Ha is accepted. So it can be concluded that Electroacupuncture and Gua Sha therapy are effective in reducing the shoulder pain scale and the neck disability scale.

Electroacupuncture is effective in reducing the neck pain scale. Electroacupuncture through a certain intensity and frequency of micropulse current to strengthen the stimulation of acupuncture points, to enhance the healing effect. Studies have found that electroacupuncture acts on acupuncture points and continuously stimulates acupuncture points to increase

the release of endogenous opioid peptides in the body. Endogenous opioid peptides can combine with opioid peptide receptors to produce analgesic effects.

Electroacupuncture aims to activate peripheral sympathetic nerve fibers and the cannabinoid system to increase the opioid concentration at the site of inflamemation for pain relief and can inhibit COX-2, thereby increasing opioids at the site of inflammation, which shows similar effects to anti-inflammatory drugs[33].

The use of acupuncture point GB 20 Fengchi is an acupuncture point that can help open the flow of meridians to help remove pathogens, regulate Qi flow, vasodilate blood vessels to increase blood flow in the area around the neck, and is a local analgesia point for neck and shoulder complaints. GB 21 Jianjing can help reduce tension in the muscles in the neck and shoulder area, which aims to reduce pain in the neck and shoulders [20].

Gua Sha is considered effective for acute or chronic pain and can treat musculoskeletal problems and is indicated for all cases of persistent recurrent pain[19]. The immediate and direct effects of rubbing on the surface of the skin area will increase local blood flow and lymphatic flow which will serve to address the pain in the area [23]. Gua sha in particular showed a significant increase in surface microperfusion, as well as an increase in hemo-oxygenase-1 (HO-1) gene expression after Gua sha [22]. Gua sha therapy is associated with upregulation of proinflammatory cytokines, increased immune cell activity, dilation of blood vessels, and improved blood circulation[21].

V. CONCLUSION

Based on the results of the research and discussion described in the previous chapter, it can be concluded that the intervention group (electroacupuncture and gua sha) and the control group (electroacupuncture) both experienced a significant decrease in pain scale and neck disability with a p value <0.050. This shows that both treatments are effective, but a greater reduction occurs in the electroacupuncture and gua sha groups.

REFERENCES

1. Husmarika NMH, Muliani M, Yuliana Y. Prevalensi kejadian nyeri leher pada siswa SD Negeri 3 Mas, Desa Mas, Kecamatan Ubud yang menggunakan tas punggung. Bali Anat J. 2019;2(1):8–11.
2. Then Z, Triko Biakto K. Tinjauan pustaka pendekatan diagnostik nyeri leher. Cermin Dunia Kedokteran. 2020;47(7):487–93.
3. Hay SI, Abajobir AA, Abate KH, Abbafati C, Abbas KM, Abd-Allah F, et al. Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2017;390(10100):1260–344.
4. Kazeminasab S, Nejadghaderi SA, Amiri P, Pourfathi H, Araj-Khodaei M, Sullman MJM, et al. Neck pain: global epidemiology, trends and risk factors. BMC Musculoskelet Disord [Internet]. 2022;23(1):1–13. https://doi.org/10.1186/s12891-021-04957-4.
5. Popescu A, Lee H. Neck pain and lower back pain. Med Clin North Am. 2020; 104(2):279–92.
6. Menchetti PPM. Cervical spine: Minimally invasive and open surgery. 2015;1–251.

7. Temesgen MH, Belay GJ, Gelaw AY, Janakiraman B, Animut Y. Burden of shoulder and/or neck pain among school teachers in Ethiopia. BMC Musculoskelet Disord. 2019;20(1):1–9.
8. Aegerter AM, Deforth M, Volken T, Johnston V, Luomajoki H, Dressel H, et al. A multi-component intervention (NEXpro) reduces neck pain-related work productivity loss: A randomized controlled trial among Swiss office workers. J Occup Rehabil [Internet]. 2023;33(2):288–300. https://doi.org/10.1007/s10926-022-10069-0.
9. Calamita SA, Biasotto-Gonzalez D, De Melo N, Fumagalli M, Amorim C, Paula DG. Immediate effect of acupuncture on electromyographic activity of the upper trapezius muscle and pain in patients with nonspecific neck pain: A randomized, single-blinded, sham-controlled, crossover study. J Manipulative Physiol Ther. 2018;41(3):208–17.
10. Zhang Y, Wang C. Acupuncture and chronic musculoskeletal pain. Complement Altern Med. 2020;22(80).
11. Sim KJ. Ilmu terapi akupunktur. Jilid 1. Singapore: TCM Publication; 2015.
12. Tidak P, Dan M. Design of acupressure tutorial video. J Med Sci. 2024;8(1):83–9.
13. Kumar S. A singular case study: Acupuncture treatment with GB20, GB21, UB11, LI4, LI16 for acute pain management in cervical spondylosis. Int J Sci Res. 2024;13(4):1040–3.
14. Lee MS, Choi T, Kim JI, Choi SM. Using guasha to treat musculoskeletal pain: A systematic review of controlled clinical trials. Chin Med J. 2017;5(5).
15. Chen T, Liu N, Liu J, Zhang X, Huang Z, Zang Y, et al. Gua sha, a press-stroke treatment of the skin, boosts the immune response to intradermal vaccination. PeerJ. 2016;2016(9):1–16.
16. Safiri S, Kolahi AA, Hoy D, Buchbinder R, Mansournia MA, Bettampadi D, et al. Global, regional, and national burden of neck pain in the general population, 1990–2017: Systematic analysis of the Global Burden of Disease Study 2017. BMJ. 2020;368.
17. Deviandri R, Ismiarto YD. The prevalence of musculoskeletal disorders among orthopaedic and traumatology residents in Indonesia. J Ilmu Kedokteran. 2021; 15(2):87.
18. Sekaaram V, Ani LS. Prevalensi musculoskeletal disorders (MSDs) pada pengemudi angkutan umum di Terminal Mengwi, Kabupaten Badung-Bali. Intisari Sains Medis. 2017;8(2):118–24.
19. Braun M, Schwickert M, Nielsen A, Brunnhuber S, Dobos G, Musial F, et al. Effectiveness of traditional Chinese “gua sha” therapy in patients with chronic neck pain: A randomized controlled trial. Pain Med. 2011;12(3):362–9.
20. Jie SK. Ilmu titik akupuntur. Singapore: TCM Publication; 2010.
21. Tang K. Gua sha: An ancient therapy for contemporary illnesses. New Jersey: World Scientific Publishing; 2020.
22. Zhongchao W. Gua sha scraping massage technique. Hong Kong: Tuttle Publishing; 2020.
23. Nielsen A. Gua sha: A traditional technique for modern practice. 2nd ed. London: Churchill Livingstone Elsevier; 2013.
24. Sugiyono. Metode penelitian kuantitatif, kualitatif, dan R&D. Bandung: Alfabeta; 2017.
25. Swarjana IK. Metodologi penelitian kesehatan. Edisi Revisi. Yogyakarta: ANDI; 2016.
26. Setiawan A. Pengantar teori probabilitas. Salatiga: Tisara Grafika; 2015.

27. Yusuf M. Metode penelitian kuantitatif, kualitatif dan penelitian gabungan. Jakarta: Kencana; 2014.
28. Haryanto I, Batmomolin A, Olii N, Alow G, Nurhaiti, Tangka J, et al. Metodologi penelitian. Cilacap: Media Pustaka Indo; 2024.
29. Murti B. Desain dan ukuran sampel untuk penelitian kuantitatif dan kualitatif di bidang kesehatan. 3rd ed. Yogyakarta: Gadjah Mada University Press; 2013.
30. Palacios-Ceña D, Albaladejo-Vicente R, Hernández-Barrera V, Lima-Florencio L, Fernández-De-Las-Peñas C, Jimenez-Garcia R, et al. Female gender is associated with a higher prevalence of chronic neck pain, chronic low back pain, and migraine: Results of the Spanish National Health Survey, 2017. Pain Med. 2021;22(2):382–95.
31. Mills SEE, Nicolson KP, Smith BH. Chronic pain: A review of its epidemiology and associated factors in population-based studies. Br J Anaesth [Internet]. 2019; 123 (2):e273–83. https://doi.org/10.1016/j.bja.2019.03.023
32. Japaries W, Wen B, Zhang H. Pestle needle (Chu Zhen) treatment for neck pain. Med Acupunct. 2022;34(6):400–4.
33. Chen L, Li D, Xu J, Liang H, Zhang Y, Ren Y, et al. The CX-DZ-II intelligent electronic stimulator for neck pain caused by cervical spondylosis: A two-center, randomized, controlled, and non-inferiority trial. Front Neurosci. 2022;16(July):1–10.