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Combination of Transcutaneous Electrical Nerve Stimulation (TENS) at Acupoints in Controlling Blood Pressure at The Public Health Center in Jember

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ABSTRACT

Hypertension or high blood pressure is a major risk factor for stroke, heart failure, and other vascular diseases. Transcutaneous Electrical Nerve Stimulation (TENS) is a non-pharmacological modality therapy that has very minimal side effects. This Study aims to determine the effect of TENS combination on acupoints in controlling blood pressure. The research design used was a quasy experiment with a pre-test and post-test approach with control group design. This study divided the respondents into 2 groups, namely the intervention group and the control group. Based on the results of the Friedman test, it showed a significant decrease in systolic blood pressure with a p value of 0.000 in the intervention and control groups. As for the diastolic pressure in the intervention group, a significant decrease in blood pressure was found with a p value of 0.033. In the diastolic control group, there was no significant decrease in diastolic blood pressure. The use of TENS at point PC5 PC6 LI4 LI10 showed that it could significantly reduce systolic and diastolic blood pressure in hypertensive patients, while deep breathing therapy showed that only systolic blood pressure decreased significantly. TENS is an alternative intervention that patients can use safely, comfortably, peacefully and can be done independently

Keyword: Complementary therapy, Hypertension, relaxation therapy, Blood pressure

ABSTRAK

Hipertensi atau tekanan darah tinggi merupakan faktor risiko utama stroke, gagal jantung, dan penyakit pembuluh darah lainnya. Transcutaneous Electrical Nerve Stimulation (TENS) merupakan modalitas terapi non farmakologi yang memiliki efek samping yang sangat minimal. Tujuan: Penelitian ini bertujuan untuk mengetahui pengaruh kombinasi TENS pada titik akupuntur dalam mengontrol tekanan darah. Metode: Desain penelitian yang digunakan adalah quasy eksperimen dengan pendekatan pre-test and post-test with control group design. Penelitian ini membagi responden menjadi 2 kelompok, yaitu kelompok intervensi dan kelompok kontrol. Hasil: Berdasarkan hasil uji Friedman menunjukkan penurunan tekanan darah sistolik yang signifikan dengan nilai p 0,000 pada kelompok intervensi dan kontrol. Sedangkan untuk tekanan diastolik pada kelompok intervensi didapatkan penurunan tekanan darah yang signifikan dengan nilai p sebesar 0,033. Pada kelompok kontrol diastolik, tidak ada penurunan tekanan darah diastolik yang signifikan. Penggunaan TENS pada titik PC5 PC6 LI4 LI10 menunjukkan dapat menurunkan tekanan darah sistolik dan diastolik secara signifikan pada pasien hipertensi, sedangkan terapi nafas dalam menunjukkan hanya tekanan darah sistolik yang menurun secara signifikan. Kesimpulan: TENS merupakan intervensi alternatif yang dapat digunakan pasien dengan aman, nyaman, damai dan dapat dilakukan secara mandiri.

Kata Kunci: *Terapi komplementer, Hipertensi, Terapi relaksasi, Tekanan darah*

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Introduction:

Hypertension or high blood pressure is a major risk factor for stroke, heart failure, and other vascular diseases (Carey et al., 2018). Globally, until 2021 there are 1.13 billion people suffering from hypertension and this number will continue to grow over time (World Health Organization (WHO), 2021). Meanwhile, the prevalence of hypertension in Indonesia according to Riskesdas 2018 shows an increase in the number of cases of people with hypertension from 25.8% in 2013 to 34.11% in 2018 (Riskesdas, 2018). The number of people with hypertension in East Java Province is around 36.3% and Jember Regency is the region with the first rank in East Java with the highest prevalence of hypertension as many as 741,735 residents(Dinas Kesehatan Provinsi Jawa Timur., 2020).

One of the main indicators of the success of hypertension treatment is that the patient is able to control blood pressure. Various approaches have been taken to reduce blood pressure in hypertensive patients, ranging from pharmacological therapy, DASH diet, modification of activity and rest, and maintaining ideal body weight (Qin et al., 2021). The difference between this research and the previous one is that this technique is based on tool technology with a combination of acupoints. However, in its implementation, many patients do not comply with the given therapy program. This is reflected in the Riskesdas data in 2018 which shows that only 54.4% of the total hypertensive patients in Indonesia regularly take medication. WHO also states that 1 in 5 hypertensive patients cannot control their blood pressure (World Health Organization (WHO), 2021)

Blood pressure instability is a major problem faced by hypertensive patients. Carey's research (2018) states that an increase of 20 mmHg in systolic pressure and 10 mmHg in diastolic can double the risk of cardiovascular disease. Therefore, a new alternative treatment is needed with a combination of pharmacological and non-pharmacological therapy approaches to control blood pressure. Acupuncture is a non-pharmacological therapy that has been shown to have a positive effect on cardiovascular disease, especially hypertension (Zheng et al., 2019).

The acupuncture points that are often used to insert acupuncture needles to lower blood pressure are PC6, PC5, LI4 and LI10 (Moreira et al., 2019). However, in its implementation, it encountered many obstacles and limitations, among others, many patients did not want to because they had to be pricked with needles, their use was complicated and inflexible. Meanwhile, Transcutaneous Electrical Nerve Stimulation (TENS) is a non-pharmacological and non-invasive therapeutic modality that uses electrodes to deliver low-frequency electricity to the patient's skin (Öncü & Zincir, 2017). Previous studies have shown the effect of using TENS, among others, by stimulating relaxing endothelial factor, inhibitory sympathetic by decreasing the sensitivity of nicotinic receptors, and stimulating endogenous vasodilators (Campos et al., 2016).

The pathophysiology of the process of increasing blood pressure is caused by a dysfunction of the Autonomic Nervous System which is characterized by hyperactivation of the sympathetic system (de Jesus et al., 2021) The use of TENS at acupuncture points is expected to reduce the patient's blood pressure by improving the balance of the Autonomic Nervous System, inhibitory sympathetic, and stimulating the parasympathetic system (Moreira et al., 2019). The implementation of TENS in patients uses electrodes and does not require needle insertion, so that TENS is much easier and does not cause psychological trauma in hypertensive patients. The convenience obtained by the patient is expected to increase the patient's motivation to do it regularly. The use of TENS to lower blood pressure in hypertensive patients is very rarely done, especially at PC6, LI4, LI10 and PC5 acupuncture points which have never been done. Therefore, researchers are interested in conducting a study entitled "The Effect of Combination of Transcutaneous Electrical Nerve Stimulation (TENS) and Acupuncture in Controlling Blood Pressure of Hypertensive Patients".

The research focuses on acupoints which will later be intervened using TENS where this technique has minimal trauma at all because it

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doesn't use needles at all so that clients feel more comfortable. The aims of this study were 1) Creating alternative complementary therapies in controlling blood pressure in hypertensive patients 2) Analyzing the effect of Combination Transcutaneous Electrical Nerve Stimulation (TENS) on Acupuncture Points in controlling Blood Pressure in Hypertensive Patients. The urgency of this study is to maintain the stability of blood pressure in hypertensive patients is the main goal of treatment of hypertensive patients. Therefore, the administration of TENS at acupuncture points is expected to be a new alternative treatment that can be combined with pharmacological therapy. The use of TENS which is easy, safe and without side effects can be one of the patient's choices to help control blood pressure.

Methods:

The research design used was a quasy experiment with a pre-test and post-test approach with control group design. This study divided the respondents into 2 groups, namely the intervention group and the control group. The intervention group received TENS therapy at acupuncture points PC5, PC6, LI4, LI10 and the control group was given deep breathing relaxation techniques. The intervention was given once per day for six times for the intervention group and the control group. Measurement of systolic and diastolic blood pressure was carried out pre and post intervention at the first, third, and sixth meetings. This study used non-probability sampling, consecutive sampling. Researchers have several inclusion and exclusion criteria in determining research respondents, the inclusion criteria: patients diagnosed with hypertension, stage 1 and 2 hypertension, receiving captopril antihypertensive pharmacological therapy and living with family. While the exclusion criteria; rejecct to participate in a series of research implementation activities to completion, there are complications of heart failure, kidney failure and stroke. The samples used were patients at the Puskesmas Patrang Jember with a total of 60 patients who were divided into 2 groups. The allocation of respondents into the intervention group and the control group was carried out alternately according to the arrival of the patient. This research was conducted at the Puskesmas Patrang from July - September 2022. The instrument in this study was to measure systolic and diastolic blood pressure using a digital Tensimeter with the brand Beurer BM 218. Measurements were carried out every before and after giving intervention to respondents. Giving TENS at acupuncture points is done once a day for 6 meetings. The patient's blood pressure was measured before and after giving TENS therapy to the patient. In this study, the TENS device used was the Beurer BM 80, Stimulator using a frequency of 30 Hz and was given for 15 minutes.

Data collected to the respondent directly after the respondent filled out the provided informed consent. Data were analyzed using a frequency distribution. This research has also received ethical approval from the Health Research Ethics Commission of FKG UNEJ NO.1558/UN25.8/KEPK/DL/2022.

Results:

There are several tests carried out in the data analysis process, firstly the normality test of the data with a standardized residual value then followed by a *repeated annova*

Table 1. Normality Test Data standardized residual value

Variable	Normality Test Data	Interpretation
Sistolic 1 (intervention group)	0.00	normal
Sistolic 2 (intervention group)	0.834	abnormal
Sistolic 3 (intervention group)	0.29	abnormal
Sistolic 1 (control group)	0.005	normal
Sistolic 2 (control group)	0.601	abnormal
Sistolic 3 (control group)	0.44	abnormal
Diastolic 1 (intervention group)	0.659	abnormal

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Variable	Normality Test Data	Interpretation
Diastolic 2 (intervention group)	0.008	normal
Diastolic 3 (intervention group)	0.45	abnormal
Diastolic 1 (control group)	0.646	abnormal
Diastolic 2 (control group)	0.074	abnormal
Diastolic 3 (control group)	0.051	abnormal

Data source: Primary, 2022

Table 1 Based on the results of normality of data with standardized residual values in the table above, it shows that almost all variables indicate normality of data that does not meet the requirements for parametric tests with Repeated Annova. Therefore, the researchers used the Friedman test to analyze data that was repeated more than 2 times.

Table 2. Friedman Test

Intervention group			
Variable	Mean rank	Mean ± SD	*p value*
Sistolik 1	2.87	161.100 ± 16.79	0.000
Sistolik 2	1.97	150.067 ± 19.34	
Sistolik 3	1.17	140.633 ± 21.85	
Diastolik 1	2.35	89.867 ± 11.41	0.033
Diastolik 2	1.95	88.133 ± 9.16	
DIastolik 3	1.70	86.067 ± 11.34	
Control group			
Variable	Mean rank	Mean ± SD	*p value*
Sistolik 1	2.75	167.433 ± 22.41	0.000
Sistolic 2	2.22	160.700 ± 21.56	
Sistolic 3	1.03	149.900 ± 23.46	
Diastolic 1	2.32	94.067 ± 15.89	0.080
Diastolic 2	1.82	90.633 ± 13.37	
DIastolic 3	1.87	90.267 ± 13.57	

Data source: Primary, 2022

Table 2 Based on the results of the Friedman test above, it showed a significant decrease in systolic blood pressure with a p value of 0.000 in the intervention and control groups. As for the diastolic pressure in the intervention group, a significant decrease in blood pressure was found with a p value of 0.033. In the diastolic control group, there was no significant decrease in diastolic blood pressure.

Discussion :

Transcutaneous Electrical Nerve Stimulation (TENS) is a non-pharmacological modality therapy that has very minimal side effects. So far, TENS has been one of the therapeutic options to treat pain. This is evidenced in the results of the Systematic Review study conducted by Cardinali 2021 using 8 studies of the effect of TENS on pain reduction. The results of these studies indicate that the use of TENS in patients can significantly reduce pain, reduce the use of analgesics, and improve lung function in postoperative patients (Cardinali et al., 2021)In addition, in the 2017 Oncu study, TENS administered for 45 minutes / day in patients with acute exacerbations of chronic obstructive pulmonary disease (COPD) showed clinical improvement in forced expiratory volume and increased exercise capacity that the patient could do ((Öncü & Zincir, 2017)

The administration of TENS at acupuncture points PC5, PC6, LI4, LI10 was one of the first studies conducted. Based on the results of research, giving acupuncture at that point can modulate the stimulus in the Autonomic Nerve System / ANS so that sympathetic nerve inhibition and parasympathetic stimulation occur (de Jesus et al., 2021; Moreira et al., 2019). This will result in a decrease in heart contraction, and vasodilation of systemic blood vessels so that it will have an impact on decreasing the patient's

blood pressure. in addition to a decrease in blood pressure that occurred in patients, in this study also almost all respondents experienced a decrease in blood pressure. Most of the respondents also said that their bodies were more relaxed and relaxed after receiving TENS therapy.

The use of TENS as one of the complementary therapeutic modalities in lowering blood pressure shows positive things both in terms of the benefits obtained and in its implementation which is very easy, safe, and has almost no side effects on patients. (Öncü & Zincir, 2017). This is in line with research conducted by Zheng (2016) using acupuncture therapy to reduce SBP (Systolic Blood Pressure) of patients showing acupuncture therapy can significantly reduce SBP by 8 mmHg (Zheng et al., 2019). The study was conducted on patients with stage 1 hypertension for 18 treatments, and the results showed that the longer acupuncture therapy was given to patients, the greater the therapeutic effect. In another study conducted by Huang (2020) showed a positive impact on patients, namely a gradual decrease in blood pressure carried out for 3 times after the patient was given acupuncture therapy for 3 months (Huang et al., 2020). In this study, the results showed that the combination of using TENS at acupoints can reduce SBP. The administration of TENS at acupuncture points PC5, PC6, LI4, LI10 at that point can modulate the stimulus in the Autonomic Nerve System / ANS so that sympathetic nerve inhibition and parasympathetic stimulation occur. This will result in a decrease in heart contractions and vasodilation of systemic blood vessels so that it will have an impact on decreasing the patient's blood pressure. in addition to a decrease in blood pressure that occurred in patients, in this study also almost all respondents experienced a decrease in blood pressure.

One of the advantages of TENS when compared to other therapies is that it is easy and flexible to use, does not cause pain, is non-invasive and has almost no side effects. Many patients choose to use TENS because it is easy and practical to use, as well as increasing the patient's sense of safety and comfort compared to using acupuncture needles, even many patients can perform TENS independently at home. Therefore, TENS can be an alternative therapy that can be done by patients to maintain blood pressure stability in hypertensive patients(Campos et al., 2016).

Conclusions:

The use of TENS at point PC5 PC6 LI4 LI10 showed that it could significantly reduce systolic and diastolic blood pressure in hypertensive patients, while deep breathing therapy showed that only systolic blood pressure decreased significantly. TENS is an alternative intervention that patients can use safely, comfortably, peacefully and can be done independently

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