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Submission date: 15-Jun-2020 10:53AM (UTC+0700)

Submission ID: 1343969914

File name: ve_muscle_relaxation_to_reduces_chronic_pain_in_hemodialysis.pdf (445.28K)

Word count: 3401

Character count: 17859



Original Article

Progressive muscle relaxation to reduces chronic pain in hemodialysis patient

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ARTICLE INFORMATION

Received: November 02, 2019
Revised: November 05, 2019
Available online: January 17, 2020

KEYWORDS

Progressive muscle relaxation; Chronic pain; Hemodialysis; Autogenic training

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ABSTRACT

Background: Hemodialysis is a kidney replacement therapy, but it has many implications identified, one of them is pain. Thus, we need non-pharmacological interventions that can be done by nurses, among them is progressive muscle relaxation (PMR), which is economically-efficient and no side effects.

Objective: To determine the effect of progressive muscle relaxation on pain in hemodialysis patients.

Methods: This is a quasi experimental design of time series design. The number samples was 100 patients taken by simple random sampling. Progressive muscle relaxation (PMR) was given every day for 4 weeks. Research instrument applied was Brief Pain Inventory. The data analysis employed independent t-test.

Results: There was a decrease in pain level from week to week after the intervention, from the scale of 6 (moderate pain) to scale 3 (mild pain). There was a difference in the level of pain between the intervention group and the control group $p < 0.001$.

Conclusion: The therapy of non-pharmacological using a progressive muscle relaxation is proven to reduce pain in hemodialysis patients.

INTRODUCTION

Chronic Kidney Disease (CKD) or chronic renal failure is a nonvenereal disease which currently becomes a public health problem, in Indonesia and in the world. Its prevalence throughout the world is increasing; it has been a global challenge to overcome. The number of its sufferers worldwide reaches 11-13%¹.

The high incidence of CKD demands urgent measures to overcome the inflicted problems such as fluid retention, pain and sleep disorders^{2,3}. Hemodialysis is an alternative therapy at the final stasium of the disease⁴. This therapy is safe and beneficial for the patients but it has side effects that can result in physiological changes in the form of excessive thirst, dry throat, no appetite, gastritis, constipation, difficult-breathing, weakness, pain and sleep disorders².

A preliminary study at PKU Muhammadiyah Gamping Yogyakarta, by interviewing 12 patients with the Brief Pain Inventory (BPI) showed that four of them complaining about their pain. For such a pain, nursing interventions are needed to overcome, by providing pharmacological and non-pharmacological therapy. Pharmacological therapy for mild pain usually involves the use of non-opioid analgesics, including acetaminophen and non-steroidal anti-inflammatory drugs (NSAID).

Moderate pain allows the addition of opioids with low potential like codeine, oxycodone, tramadol and dihydrocodein or hydrocodone. Meanwhile for severe pain, it may need the addition of stronger opioids, including morphine, hydromotor, methadone, and fentanyl citrate⁵. Pharmacological therapy incures high costs, and in a long period, the medication by strong opioids, including morphine, hydromotor, methadone and fentanyl can cause some complication. One of the contents in opioids will inflict in constipation 16%, nausea 15%, dizziness or

<https://doi.org/10.30595/medisains.v17i3.5823>

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1 vertigo 8%, somnolence 9%, vomiting 5%, dry and itchy skin or pruritus 4%^{6,7}.

Non-pharmacological therapy or better known as Complementary and Alternative Medicine (CAM) is very popular and important in terms of health, economy, medical therapy companions and low side effects^{8,9}. Types of non-pharmacological therapies include diet, lifestyle modification, herbal treatments, massage, exercise, acupuncture and cognitive behavioral therapy (CBT)^{5,10}. CAM therapy can reduce pain with CBT interventions, like mind-body (relaxation techniques (progressive muscle relaxation), imagery, spiritual healing / prayer, biofeedback, hypnosis, meditation, yoga)¹¹.

Progressive Muscle Relaxation (PMR) is the cheapest CAM relaxation technique available in a non-invasive Nursing Intervention Classification (NIC), which is easy-to-learn. Its function is to reduce pain, sleep problems, anxiety and so on, without any complication. This therapy can be done independently by the patient¹²⁻¹⁴.

PMR therapy can reduce adrenergic activity by always making movements for tensing and relaxing muscles throughout the body, as well as stimulating the release of natural chemicals in the body namely beta endorphin and enkephaline which function as natural painkiller¹⁵, by inhibiting pain impulses through blocking transmission in the brain and the spinal cord². These actions will maintain the balance of pressure between the adrenergic nerve and the parasympathetic nerve, and stimulate the brain signals that cause muscles to relax and to increase blood flow to the brain. The effects of these will distract the patient's focus from the pain¹⁶.

Several previous studies indicate that non-pharmacological therapy is very important to be applied. PMR is a complementary therapy in nursing requiring professional nurses. They have key positions that can provide primary care activities, health improvement and also a prevention of diseases that are cost-effective; they should be the efficient and competent sources for the patients' care¹⁷.

Studies on the use of PMR to reduce pain in patients undergoing hemodialysis have not been found, especially in Indonesia. PMR has been often used for studies in patients with anxiety¹⁸⁻²². Thus, a study needs to conduct on the effect of PMR therapy for pain among hemodialysis clients. This study aims to test the effectiveness of PMR on pain in hemodialysis patients.

METHOD

Study Design

This is a quasi-experimental research with time series design²³.

Settings and Respondents

The population in this study are the patients in the hemodialysis clinics of PKU Muhammadiyah Gamping Hospital and Sleman District Hospital. The total sample of 100 respondents were divided into intervention and control groups, taken by simple random sampling²⁴ with inclusion criteria; (a) have been diagnosed with CKD more than 3 months, (b) have routine hemodialysis twice a week, (c) experience pain for more than 1 month. While the exclusion criteria are those who (a) refused as respondents (b) resigned during the study (c) died during the study.

Experimental Procedure

The intervention was carried out by training the subjects on the PMR techniques; the team had seen all of them can do the movements. Then, they were given a PMR book as a guide. PMR movements are actually tensing and relaxing the muscles in the body, starting from the wrist muscles, forearm muscles, upper arm muscles, shoulder muscles, head and neck muscles, facial muscles, back muscles, chest muscles, abdominal muscles and thigh muscles. Each movement is only 10 seconds, accompanied by regular breathing. After the respondents understood and are able to do all the movements, they then practiced the PMR for 4 weeks independently at their homes. The researchers always sent reminder to them about doing PMR by SMS/Phone, and *WhatsApp*. Whereas the control group only got standard therapy from the hospital.

The Instrument and Measurement

To examine the severity of chronic pain in this study the study employed the Brief Pain Inventory (BPI)^{25,26}. This instrument assesses pain severity using a numerical rating scale of 0-10. Pain classification is divided into three categories, namely mild (1.00-3.99), moderate (4.00-6.99) and severe (7.00-10.00)^{27,28}. The pain variables were measured at the beginning of the intervention, 2 weeks, and 4 weeks after it.

Data Analysis

Statistical tests in the study used the Independent t-test to assess the differences in the mean before and after the intervention was given. The data were normally distributed²⁹.

Ethical Consideration

This study has passed the ethics test by the committee of the Muhammadiyah University of Yogyakarta, with registration number: 279/EP-FKIK-UMY/VI/2018.

RESULTS

Most respondents were male (51%), aged 46-55 years (60%), the level of pain was mostly in the moderate category (73%), and respondents had undergone

1 hemodialysis between 1-5 years (93%) (Table 1). At the pretest, the level of pain among the two groups was the same; the independent t-test showed a significance value more than 0.05 ($p > 0.05$). It means before the intervention the level of pain among the both is homogeneous. In the post-test I, it was obtained a difference in the average score of pain levels in the two groups, although the pain in both group similarly decreased. The difference is statistically significant with a $p < 0.05$. From the post-test II, the $p < 0.001$, which means that there is significant differences between the intervention and control groups (Table 2).

Table 1. Characteristics of the Subjects of Hemodialysis (n=100)

Characteristics	Frequency	Percentage
Sex		
Male	51	51%
Female	49	49%
Age		
< 35 yrs	8	8%
36-45 yrs	31	31%
46-55 yrs	60	60%
>56 yrs	1	1%
Pain level		
Mild	14	14%
Moderate	73	73%
Severe	8	8%
The period of Hemodialysis		
< 1 yrs	7	7%
1-5 yrs	93	93%

DISCUSSION

In this study, the male patients undergoing male hemodialysis therapy is more than the female, but another study shows otherwise ¹. The fact from the present study can be explained by some risk factors among the male, like their higher creatinine levels in the mass muscle, their lifestyle of smoking and drinking, all of these are related to CKD ^{30,31}.

The subjects are mostly above 40 years old. This is in line with previous studies in which patients undergoing hemodialysis therapy are more prevalent at the age of 40-55 years ³². The aging causes the lubricating fluid in the

joints to decrease slowly, so that the cartilage that supports the joint movement becomes drier. As a result the joints get thinner, losing its elasticity, then as they rub, the pain will be there ^{33,34}.

The pain in hemodialysis patients received less attention by the medical staff. In fact, it can interfere with the daily life of the patients ³⁵. Hemodialysis patients suffer the pain most in the range between the hemodialysis schedules. The age, sex and the period of hemodialysis therapy also influence the differences in pain perception between hemodialysis patients ³⁶.

Patients must undergo hemodialysis therapy to replace kidney function. In the period, they get standard therapy from the hospital in the form of drugs. To avoid the bias in this study, the study also made checks on the types of the drugs consumed. The routine drug therapy from the hospital includes anti-hypertension, folic acid, vitamin B complex, and the hormone erythropoetin. It is clear that there no opioid content that can have an effect on reducing the pain. Thus, the decrease in the pain level in the patients is not due to the effect of any routine drug consumption from the hospital ³⁷.

PMR is done by tensing the muscles for 10 seconds and then relaxing them for the same length, starting from the wrist, shoulder, face, chest, abdomen and leg muscle groups. By the muscle contraction and relaxation, the body will produce physiologically endogenous to inhibit the pain impulses and the body becomes relaxed. The endogenous consists of endorphins and enkephalins, which are like morphine, functioning to inhibit the transmission of pain impulses. If the body releases endorphins and enkephalins, they will have some effects of pain relief ².

The result of this study can be seen in Table 2. It shows the mean difference between the intervention group and the control group, with the p-value of 0.001, after 4 weeks of PMR. This means there are significant differences. The result of the study has proved that the administration of PMR therapy can reduce pain. This finding is in line previous study ¹², stating that PMR training is significant in reducing pain with result of $p < 0.05$. This study supports the results of other studies which indicate that PMR relaxation techniques can reduce pain after the PMR was practiced every day in a month ³⁸.

Table 2. The difference of pain level between the intervention and the control groups (n= 100)

Time of the test	Group	n	Mean±SD	t	p-value
Pretest (0 week)	Intervention	50	6.15±1.3	-0.737	0.465
	control	50	6.38±1.3		
1 Postest I (2 weeks after PMR)	Intervention	50	5.16±1.2	-2.515	0.014
	control	50	5.93±1.2		
1 Postest II (4 weeks after PMR)	Intervention	50	3.80±1.1	-3.423	0.001
	Kontrol	50	4.83±1.4		

1 CONCLUSIONS AND RECOMMENDATION

The finding of this study has shown that there is a significant difference on pain level between the intervention and the control groups. PMR therapy can be adopted by the nurse as an independent intervention for hemodialysis patients who experience mild or moderate pain. It is expected that the problems of pain often experienced by them can be treated well.

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