

# THE EFFECT OF PROGRESSIVE MUSCLE RELAXATION ON BLOOD GLUCOSE LEVELS AND FATIGUE SYMPTOM OF PEOPLE WITH TYPE 2 DIABETES MELLITUS

Adi Antoni

e-mail: adiantoni100@gmail.com

## ABSTRACT

Progressive Muscle Relaxation (PMR) is a relaxation technique for muscle by tensing or tightening one certain group of muscles and releasing the tense followed by focusing the mind to feel the sensation of relaxing. This research was aimed at observing the effect of PMR on blood glucose levels and fatigue symptom of people with Diabetes Mellitus. Quasi experimental Pretest-Posttest Design with control group was used as the design of this research. The samples were collected by employing consecutive sampling technique with 66 respondents consisting of 33 people in intervention group and the other 33 people in control group. Blood glucose levels observed by random blood glucose and The fatigue symptoms observed in this research were measured by using Piper Fatigue Scale. It was found from the results that there were some significant differences on blood glucose levels and fatigue symptoms before and after giving PMR to both the intervention group with  $t=19.335$ ,  $p<0.001$ ;  $t=43.57$ ,  $p<0.001$ ; and the control group with  $t=10.053$ ,  $p<0.001$ ;  $t=1.73$ ,  $p=0.093$ . Furthermore, another significant difference was also found between the intervention and control group which was  $t=-7.505$ , and  $p<0.001$ ;  $t=-30.453$ , and  $p<0.001$ . Finally, it was concluded that PMR was effective to reduce blood glucose levels and fatigue symptoms of people with T2DM.

**Keywords:** *progressive muscle relaxation, fatigue, type 2 diabetes mellitus*

## PRELIMINARY

Diabetes mellitus (DM) is one of noncommunicable diseases (NCDs). Globally deaths caused by noncommunicable diseases (NCDs) are still very high and increasing (World Health Organization [WHO], 2014).

Diabetes mellitus is a global health problem that threatens the health of mankind in the 21st century (Sudoyo et al., 2009). Every year the prevalences of people with diabetes mellitus have increased (Diabetes UK, 2011).

World Health Organization (2012) said that the people of diabetics over 20 years amounted to 150 million people, and within a period of 25 years ie by 2025 that number will increase to 350 million people. The number of people with diabetes in 2013 amounted to 382 million people (WHO, 2014). If no meaningful action is done, this number is expected to increase to 592 million by 2035 (International Diabetes Federation [IDF], 2013). In Indonesia the number of clients with diabetes mellitus is expected to occupy the fifth position in 2030 with a total of 12.4 million people (Sudoyo et al., 2009).

Type 2 diabetes mellitus (type 2 diabetes) is characterized by the presence of hyperglycemia,

insulin resistance, and their excessive liver glucose release causing symptoms for sufferers (Sudoyo et al., 2009). One of the symptoms experienced by clients with type 2 diabetes are fatigue (tiredness) (Morsch, Gocalves, & Barros, 2006; Weijman et al., 2004). Fatigue is a very subjective experience on the client with diabetes mellitus (Singh, 2013). Fatigue is a tremendous sense of fatigue and decrease physical and mental work capacity at the regular rate (NANDA, 2012).

The study by Warren, Deary, and Frier (2003) states that fatigue on the client with type 2 diabetes was ranked fifth in the UK from the symptoms that often appear (after polydipsia, dry mouth, did not feel fit, and polyuria) and 85% of respondents reported complaints of fatigue. Epidemiological Studies Drivsholm et al. (2005) conducted in Denmark found that of the 1,137 subjects with type 2 diabetes, the prevalence of fatigue was found at 61% and is the fourth complaint that emerged after polydipsia, polyuria, and weight loss is undesirable.

Research Wenzel et al. (2005), obstacles of self-management in type 2 diabetes found the body a feeling of discomfort due to fatigue. Mixed method study by Singh (2013) found that fatigue can degrade the quality of life and functional status on the client with type 2 diabetes.

The role of nurses is very important in overcoming fatigue experienced by clients with type 2 diabetes. Past research has shown that non-pharmacological approaches are interventions that can be done on the client with type 2 diabetes (Smeltzer et al., 2010). One strategy that can be used in reducing the fatigue that is relaxation (Mitchell et al., 2007).

Progressive Muscle Relaxation (PMR) is an independent act of nursing (McCloskey et al., 2013). PMR is one of the relaxation techniques such as motion tightens and relaxes certain muscles to give a feeling of relaxation physically (Snyder & Lindquist, 2010).

Ghazavi, Talakoob, Abdeyazdan, Attari, and Joazi (2007) conducted a study of 75 clients with type 2 diabetes found that PMR exercise can lower HbA1c levels by lowering cortisol secretion. Mashudi (2011) found that PMR can lower blood sugar levels in clients with type 2 diabetes.

Some research suggests that PMR is able to overcome the symptoms of fatigue in multiple chronic diseases with different causes fatigue symptoms. Dayapoglu and Tan (2012) mentions PMR can reduce symptoms of fatigue in multiple sclerosis 32 clients. Demiralp, Oflaz and Komurcu (2009) mentions PMR can reduce symptoms of fatigue on the client breast cancer undergoing chemotherapy.

## RESEARCH METHODS

Quantitative research design used in this study is a quasi-experimental design with pretest-posttest design with control group.

The sampling method used by consecutive sampling method. The sample size is calculated using power analysis tables to obtain the 33 votes intervention group and 33 control group.

Data were collected using a questionnaire Piper Fatigue Scale. Analysis of data using univariate, bivariate analysis using paired t-test and independent t-test.

## RESULTS AND DISCUSSION

### RESEARCH RESULT

**Tabel 1.** Blood Glucose levels in Poly Endocrine Hospital Dr. Pirngadi Medan (n = 33)

No	Group	Blood glucose levels	Mean	T	Sig.
1	Intervention	Pretest	218,27	19.335	<0.001
		Posttest	171,61		
2	Control	Pretest	217,48	10.053	<0.001
		Posttest	202,58		

Based on the table above, the average difference blood glucose levels before and after the intervention group at 46.66. While the average blood glucose levels difference before and after the control group amounted to 14.90. Although in each group showed a relationship signification.

**Table 2.** Differences blood Glucose Levels difference in intervention group and the control group in the Client with type 2 diabetes in Poli Endocrine Hospital Dr. Pirngadi Medan (n = 33)

Blood Glucose Levels	Mean	T	Sig
Intervention group	218,27	-7.505	<0,001
Control group	202,58		

PMR influence on blood glucose levels in this study were identified by comparing the value end of the circulation between the intervention and control by using statistical analysis independent t-test. Based on the analysis, it was found that there are significant differences in symptoms of fatigue between intervention and control groups ( $t = -7.505$ ;  $p < 0.001$ ).

**Tabel 3.** Results of Analysis on Fatigue Symptoms of type 2 diabetes Clients Before and After Intervention PMR in Poly Endocrine Hospital Dr. Pirngadi Medan (n = 33)

Fatigue	Group	Mean	SD
Pretest	Intervention	7,32	0,17
	Control	7,27	0,13
Posttest	Intervention	5,47	0,28
	Control	7,22	0,18

The results showed that symptoms of fatigue prior to PMR on respondents intervention group showed an average of 7.32 (SD = 0.17). While in the control group, the average symptoms of fatigue early (before the PMR in the control group) showed 7.27

Symptoms of fatigue after the PMR respondents intervention group showed an average of 5.47 (SD = 0.28). While in the control group, the average

symptoms of fatigue late (after a period of PMR in the control group) showed 7.22 (SD = 0.18).

**Table 4.** Differences Fatigue Symptoms Before and After Intervention PMR on Intervention and Control Client Group with type 2 diabetes in Poli Endocrine Hospital Dr. Pirngadi Medan (n = 33)

Group	Fatigue	Mean	T	Sig
Intervention	Pretest	7,32	43,57	<0,001
	Posttest	5,47		
Control	Pretest	7,27	1,73	0,093
	Posttest	7,22		

The results showed that there are different symptoms of fatigue on the client with type 2 diabetes before and after the intervention. The intervention group there is a decrease in fatigue symptoms an average of 1.85, while the control group average of 0.05.

Statistical test results paired t-test showed that the intervention group subjects there is significant difference between before and after the PMR against fatigue symptoms ( $t = 43.57$ ;  $p < 0.001$ ). While in the control group there was no significant difference between before and after the PMR against fatigue symptoms ( $t = 1.73$ ;  $p = 0.093$ ).

**Table 3.** Fatigue Symptoms difference in intervention group and the control group in the Client with type 2 diabetes in Poli Endocrine Hospital Dr. Pirngadi Medan (n = 33)

Fatigue	Mea n	T	Sig
Intervention group	5,47	- 30,45	<0,00 1
Control group	7,22	3	

PMR influence on fatigue symptoms in this study were identified by comparing the value end of the circulation between the intervention and control by using statistical analysis independent t-test. Based on the analysis, it was found that there are significant differences in symptoms of fatigue between intervention and control groups ( $t = -30.453$ ;  $p < 0.001$ ).

## DISCUSSION

Based on preliminary data, the symptoms of fatigue prior to PMR on respondents intervention group showed an average of 7.32 (SD = 0.17). While in the control group, the average initial symptoms of fatigue showed 7.27 (SD = 0.13). Fritschi (2008) suggests that fatigue is influenced by several factors such as body mass index and blood glucose levels. Sheo et al. (2013) also added that fatigue is influenced by age and gender.

Valentine et al. (2008) conducted a study of 127 elderly clients conducted in China stated that women are more likely to experience fatigue than men by 63% ( $p = 0.04$ ). Koch et al. (1999) in a qualitative study suggests that women are more easily fatigued because women have a work plan that is too much and often expend all his energy to meet social obligations.

Increased fatigue symptoms are also associated with age (Sheo et al., 2013). The increasing age will be more susceptible to fatigue (Singh, 2013). Results of research Sheo et al. (2013) to 180 clients in Korea with type 2 diabetes who do mention that there is a correlation between age and symptoms of fatigue. Fatigue will increasingly be felt with age. This is because the decline in muscle strength and endurance, so fatigue will increase (Williams & Hopper, 2007).

The body mass index is also associated with increased symptoms of fatigue (Fritschi, 2008). Elevated levels of pro-inflammatory cytokines (such as that seen in obese individuals) is a significant factor in the increased fatigue (Pickup, DPhil, and Ercpath, 2004). Research Adeniyi et al. (2014) conducted in Nigeria to 122 clients with type 2 diabetes found that the value of the ratio of clients who have more weight (overweight) was 2.41 times greater than the fatigue complaints clients who have a normal BMI.

Drivsholm et al. (2005) suggested that improvement of the symptoms of fatigue are also closely linked to improved blood glucose levels. Blood glucose levels over 200gr / dl increase complaints of fatigue experienced by clients with type 2 diabetes (Warren et al., 2003).

PMR is one of the relaxation techniques that are designed to help relieve muscle tension that occurs when the conscious (National Safety Council, 2003). Research Demiralp et al. (2009), of 27 clients PMR cancer conducted with a time of 15

minutes (before and after chemotherapy) for one week obtained a decrease in fatigue symptom scores by an average of 4.03. It is also supported by research Mashudi (2011) which PMR exercises done 2 times a day for 3 days can lower blood glucose levels clients with type 2 diabetes.

Mechanism of action of PMR in overcoming fatigue in clients with type 2 diabetes is associated with physiological factors that hyperglycemia. PMR will activate the parasympathetic nervous system which is then forwarded to the hypothalamus. Furthermore, the hypothalamus would decrease the stimulation of neuron-neurosekretori to release the hormone CRH (Corticotropin Releasing Hormone) to the anterior pituitary, thus inhibiting the release of anterior pituitary hormone ACTH (Adrenocorticotrophic Hormone) into circulation. Barriers will inhibit release of ACTH stimulation of the adrenal cortex to secrete glucocorticoids (cortisol) and the hormone-producing adrenal medulla catecholamines mainly epinephrine and norepineprin (Greenberg, 2002).

The decline in the pancreas epineprin work will improve the functioning of the pancreas in the production of insulin, so insulin work will increase. While cortisol secretion obstacles will have metabolic effects of increased uptake and utilization of glucose by most networks (Timby & Smith, 2010).

Barriers cortisol also decreases the metabolism of glucose via gluconeogenesis that amino acid, lactate, and pyruvate tidah converted into blood glucose which ultimately lowers blood glucose levels (Tortora and Derrickson, 2009). The decrease gluconeogenesis anaerobic metabolism will decrease resulting in decreased accumulation of lactic acid builds up in the muscles and blood vessels due to a decrease in the concentration of H<sup>+</sup> ions in the intracellular. This condition will also reduce symptoms of fatigue experienced (Timby & Smith, 2010).

## CONCLUSIONS AND SUGGESTIONS

### CONCLUSION

PMR affects significantly to the decrease blood glucose levels and symptoms of fatigue client with type 2 diabetes,  $p < 0.001$ .

## SUGGESTION

PMR can be done on a particular instructional practice of complementary therapies in lectures, so increasing the membership of nursing students in applying independent nursing interventions in the form of PMR.

PMR can be done in nursing practice in hospitals and in nursing practice independently to help reduce blood glucose levels and symptoms of fatigue client with type 2 diabetes.

Researchers expect for nursing research in order to become the basis for developing further research with more time and space to consider setting up of interventions for PMR and to consider objectively measuring fatigue and relationship between blood glucose levels and symptoms of fatigue client with type 2 diabetes.

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