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COLD COMPRESS REDUCES PAIN SCALE INSULIN INJECTION AMONG DIABETES MELLITUS CLIENTS IN A PUBLIC HEALTH CENTER

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Abstract

Diabetes Mellitus is a chronic disease that is a threat to health due to increased morbidity and mortality rates. This disease burdens sufferers, families who care for them, and the country. Problems that often arise are pain as an effect of insulin injection. One of the interventions that can be done independently is a cold compress. To analyze the effect of cold compress on the pain scale of insulin injection. The research design used a quasi-experimental with a pretest and a post-test with a control group design. The study was conducted at the Mijen I Health Center in August 2024—a sample of 15 clients for each group through purposive sampling. Inclusion criteria were diagnosed with Diabetes Mellitus, blood sugar measurement results > 120 mg/dl (fasting blood sugar) or > 140 mg/dl (random blood sugar), and received insulin injection. Exclusion criteria were respondents who withdrew and consumed analgesic drugs. This research instrument used the Numeric Rating Scale. Researchers provided cold compress intervention with a temperature of 13-16 ^{0} C once for 3 days. Data analysis using Wilcoxon and Mann-Whitney tests. Cold compresses have a significant effect on the insulin injection pain scale with a p = 0.008 (p <0.05). Cold compresses reduce the insulin injection pain scale. Health centers can develop interventions by providing cold compresses to treat pain caused by insulin injections.

I. INTRODUCTION

One chronic condition that poses a risk to public health is diabetes mellitus (DM).. This is due to the increasing trend of morbidity and mortality rates due to DM experienced by all age groups and levels of society without exception.

The International Diabetes Federation claims that (2019), the number of Diabetes mellitus clients worldwide has increased to 463 million people in 2019, and the number of deaths in this case is 4.2 million people, of which Indonesia is ranked 7th with 10.7 million clients. In addition, according to RISKESDAS (2018), the prevalence of Diabetes mellitus cases in Indonesia, according to a doctor's diagnosis in the population aged ≥ 15 years, is 2%. This figure shows an increase compared to 2013, with a prevalence of 1.5%. This means that Indonesia significantly contributes to diabetes cases in Southeast Asia (Cahyaningrum, 2023).

DM clients experience an increase in the number of clients influenced by several factors, namely rapid cultural and social changes, increasing numbers of older adults, urbanization, changes in diet, lack of physical activity, and other behaviors that indicate an unhealthy lifestyle and behavioral

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changes (Christa & Kristinae, 2021). Diabetes Mellitus is a disease that requires good self-management. There are 4 pillars of diabetes control: education, medical nutrition therapy, physical exercise, and intervention. Pharmacological. Management can be done for cases of Diabetes mellitus by adhering to 4 pillars, including regulating diet, doing physical activity, pharmacological therapy, and education. Dietary regulation can be done using the 3J principle (type, quantity, schedule).

The pancreas naturally releases the hormone insulin. Body cells need insulin to convert and use blood glucose (blood sugar). From glucose, cells create the energy needed to carry out their functions. Type I diabetes mellitus, which is dependent on insulin, is caused by a lack of insulin in the blood, which occurs due to damage to pancreatic beta cells (ADA, 2018).

Pain diagnosis is the most frequent diagnosis in this study, namely pain due to the insulin injection process. In general, pain caused by subcutaneous injections causes anxiety, fear of needles, and distrust of healthcare providers in the long term. The speed of injection, type of drug, and volume of drug injected can also affect the severity of pain.

Pharmacological and non-pharmacological methods are the two categories of pain management. Analgesics are the most common and very effective method of pain management. Although analgesics are very effective in treating pain, they can lead to drug addiction and have dangerous side effects on patients. Non-pharmacological pain management consists of distraction techniques, prayer, relaxation, music, biofeedback, and guided imagery. The intervention that will be carried out is regular education on pain management (Ministry of Health, 2020).

The results of this study are the basis for determining appropriate independent nursing interventions to treat pain during insulin injection in clients with diabetes mellitus. This can prove the professionalism of nurses as a profession on par with health professions. The role of nurses, in this case, is an educator. Nurses are responsible for educating patients about non-pharmacological therapies that can be done to overcome the pain felt, one of which is with cold compresses. Nurses act as caregivers, providing direct care to patients to overcome complaints of pain felt when receiving insulin injections by providing cold compresses. Nurses also act as researchers, where nurses analyze whether the intervention carried out in cold compresses can reduce the pain scale in DM patients who receive insulin injection therapy. This study aimed to analyze the effect of cold compresses on the pain scale of insulin injections in Diabetes Mellitus clients.

II. RESEARCH METHODS

This type of research is quasi-experimental with a pre and post with a control group design approach, namely a design that provides intervention to research subjects, and measurements are taken before and after the intervention. The study looked at the differences in changes in dependent variables between the intervention and control groups. Variable independent was cold compress and variable dependent was pain scale insulin injection.

The study's participants were diabetes mellitus clients. at a Public Health Center in August 2024, with 40 clients with Diabetes Mellitus. The research sample consisted of 30 clients, each group taken through the purposive sampling technique. The criteria for respondents were:

1. Inclusion Criteria
a. Diagnosed with Diabetes Mellitus
b. Blood sugar measurement results > 120 mg/dl (Fasting Blood Sugar) or > 140 mg/dl (Current Blood Sugar)
c. Getting an insulin injection
2. Exclusion Criteria
a. Respondent withdrew
b. The client is taking analgesic medication

The Numerical Rating Scale served as the study's tool. The researcher provided intervention in the form of cold compresses

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with a temperature of 13-16 degree once for 3 days for the intervention group and standard intervention for the control group. Mann-Whitney and Wilcoxon tests were employed in data analysis. Research ethics used respondent consent sheets, Anomie, and Autonomy. On July 21, 2024, the Universitas Muhammadiyah Kudus Health Research Ethics Committee announced that this study has passed the ethical test with the number 41/Z-7/KEPK/UMKU/VII/2024.

III. Results and Discussion

A. Characteristics of Diabetes Mellitus Clients

Table 1. Characteristics of diabetes mellitus patients based on age, gender, last education, and occupation (n=30)

Characteristics	Intervention		Control	
	f	%	f	%
Age				
41-50 Yearsold	2	13.3	4	26.7
51-60 Years old	9	60	5	33.3
61-70 Years old	3	20	5	33.3
71-80 Years old	1	6.7	1	6.7
Gender				
Man	4	26.7	6	40
Woman	11	73.3	9	60
Education				
No school	4	26.7	4	26.7
Elementary school	9	60	7	46.7
Junior high school	2	13.3	4	26.6
Occupation				
Housewife	5	33.3	3	20
Farmer	7	46.7	9	60
Laborer	3	20	3	20
Total	**15**	**100**	**15**	**100**

Table 1 describes that most of the age of Diabetes mellitus patients in the intervention group were in the age range of 51-60 years as many as 9 people (60%), most of them were female as many as 11 people (73.7%), with the majority of their last education being elementary school as many as 9 people (60%), and most of them worked as farmers as many as 7 people (46.7%). Most of the Diabetes mellitus patients in the control group were in the age range of 51-60 and 61-70 years, with each as many as nine people (50%), most of them were female as many as nine people (50%), with the majority of their last education being elementary school as many as seven people (46.7%). Most of them worked as farmers, as many as nine people (60%).

B. Insulin Injection Pain Scale

Table 2. An explanation of the insulin injection pain scale used before and after the intervention in the intervention and control groups (n=30)

Insulin Injection Pain Scale	Intervention			Control		
	Median	SD	95%CI	Min-Max	SD	95%CI
Before	4.93	0.704	4.54-5.32	4.80	0.676	4.43-5.17
After	3.67	0.816	3.21-4.12	4.47	0.640	4.11-4.82

Table 2 explains that the average insulin injection pain scale in the intervention group before the intervention was 4.93, SD 0.704, and 95% CI 4.54-5.32. After the intervention, the average changed to 3.67, SD 0.816, and 95% CI 3.21-4.12.

The mean insulin injection pain scale in the control group before the intervention was 4.80, SD 0.676, and 95% CI 4.43-5.17. After the intervention, it changed to 4.47, SD 0.640, and 95% CI 4.11-4.82.

C. Difference between S and time painful insulin injection before and after intervention

Table 4. Differences between the intervention and control groups' pre- and post-intervention insulin injection pain scales

Insulin Injection Pain Scale	Median	SD	Min-Max	p-value
Intervention				
Before	4.93	0.704	1.26	0.001
After	3.67	0.816		
Control				
Before	4.80	0.676	0.33	0.059
After	4.47	0.640		

Table 4 illustrates that there is a significant difference in the insulin injection

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pain scale before and after the intervention in the intervention group with a p-value of 0.001 (p <0.05). However, there is no significant difference in the insulin injection pain scale in the control group before and after the intervention, with a p-value of 0.059 (p>0.05).

Table 4.5. Effect of cold compresses on the pain scale of insulin injections in patients with Diabetes mellitus

Variables	Median	SD	p-value
Insulin Injection Pain Scale			
Intervention	3.67	0.816	0.008
Control	4.47	0.640	
Difference	0.8		

Based on table 5 found that there was an effect of cold compresses on the pain scale of insulin injection in diabetes mellitus patients with a p-value of 0.008 (p <0.05).

Discussion

A. Characteristics of Diabetes Mellitus Patients

The majority of diabetes mellitus patients in the intervention group were in the pre-elderly age range, according to the study's findings, whereas the control group was also in this age range.. As age increases, a person's risk of developing diabetes increases. Physiological changes in humans experience a drastic decrease at the age of over 40 years. After a person reaches a sensitive age range, namely after the age of 45, diabetes mellitus frequently manifests. (Milita et al., 2021). A person aged >45 years has an increased risk of developing DM and glucose intolerance due to degenerative factors, namely decreased body function to metabolize glucose (Gunawan & Rahmawati, 2021).

Based on the results of the study, it is known that the majority of gender in both the intervention and control groups are women. According to Arania et al. (2021), a person's gender is related to an increase in the incidence of Diabetes mellitus. The leading cause of many women getting type 2 diabetes mellitus is a decrease in the hormone estrogen, especially during menopause. Progesterone and estrogen have the ability to raise the blood's insulin response. Because estrogen and progesterone levels are low during menopause, the body's reaction to insulin declines.. In a study conducted by Arania et al. (2021), diabetes mellitus is the eighth cause of death in both sexes and the fifth cause of death in women and often occurs in the elderly. However, over time, diabetes mellitus does not only occur in the elderly due to an unhealthy lifestyle.

Based on the study's results, it is known that most of the last education of both the intervention and control groups was elementary school. People with higher education levels typically know a lot about health. (Arania et al., 2021). In various studies, the proportion of Diabetes mellitus sufferers according to education was higher in groups with low or primary education. High educated people would know a lot about health management, and education also influences each respondent's level of awareness. A person's level of education influences their thoughts and behavior when handling a situation. Poor self-care abilities are also linked to low levels of education. (Mayasari et al., 2020).

Based on the study results, it is known that most respondents in both the intervention and control groups work as farmers. Work is often associated with the family's economic level, which is also associated with a person's diet. Work that uses muscles is often very energy-draining, so the food consumed is more carbohydrates. In addition to making you feel full quickly, some assume that consuming large quantities of carbohydrate foods such as rice will restore energy to be enthusiastic about working again. Rice containing much glucose will accumulate in the fat layer and cause obesity. This is what causes someone with a job that involves quite heavy physical activity to be susceptible to diabetes mellitus (Making et al., 2023).

B. Pain Scale of Insulin Injection in Diabetes Mellitus Patients

The pain scale of insulin injection in the intervention and control groups before the intervention had almost the same average, but there was a difference in the pain scale of insulin injection between the intervention and

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control groups after the treatment. The average pain scale of insulin injection before the treatment in the intervention group was 4.93, and after the treatment, the average pain scale of insulin injection changed to 3.67. The average pain scale of insulin injection before the treatment in the control group was 4.80; after the treatment, the average pain scale of insulin injection changed to 4.47. Based on this, both the pain scales in the intervention and control groups before and after the intervention were in the moderate category.

In a study conducted by Nugroho et al. (2023), the majority of Diabetes mellitus patients who were given insulin treatment had a mild pain level of 106 people (82.8%), and the lowest was the respondent who had a severe pain level of 1 person (0.8%).

A study conducted by Magor et al. (2023) showed that the average pain scale of insulin injection before treatment in the intervention group was 8, and in the control group was 8.1. In a study conducted by Magor et al. (2023), the instrument used was the same as that used by the researcher, namely the Numeric Rating Scale (NRS). However, in the study by Magor et al. (2023), the respondents were children aged 6-15 years who suffered from type 1 diabetes and who received insulin treatment. So, the difference in pain levels in previous studies from those conducted by researchers is very different. In a Magor et al. (2023) study, most respondents showed severe pain levels. In a study conducted by researchers, most respondents showed moderate pain levels.

The most complicated human experience is pain, which is impacted by the interplay of physiological sensory elements, emotional states, and cognitive actions. Pain is a subjective, unpleasant emotional and sensory experience that is connected to real or possible tissue damage or is experienced during a damage-described event. (Lushinta & Kemenkes, 2022).

The degree of a person's suffering is referred to as their pain intensity. The assessment of pain severity is very individualized and subjective. Two distinct persons may experience the same level of pain in quite different ways. Using the body's physiological reaction to the pain itself is the most likely objective method of measuring pain. However, measurements using this method are also unable to give a clear image of the actual discomfort. (Tamsuri, 2019).

C. Differences in Insulin Injection Pain Scale Before and After Treatment in the Intervention and Control Groups

The results of this study showed a significant difference in the pain scale of insulin injection before and after treatment in the intervention group, but there was no significant difference in the pain scale of insulin injection before and after treatment in the control group.

In this study, the intervention group received cold compress treatment for three consecutive days, while in the control group, respondents received standard intervention. The difference in pain scale between before and after treatment in the intervention group indicates that the treatment is suitable if applied as an option for patients using insulin so that the pain caused by insulin injections is reduced. This study is in line with the study conducted by Estiyanti (2018), which stated that the pain response after treatment in the control research group was higher than the experimental research group ($p = 0.0001$).

Pain in the intervention group after being given the intervention, on average, was on the pain scale at the mild pain level. According to Fitriansari (2019), this is due to reduced nerve sensitivity caused by pain stimulation that is easier to penetrate the skin as an impact of giving cold compresses, which cause a numbing effect that is right for use as a local anesthetic for surface lacerations or stab wounds which are effective for relieving pain. In addition, according to researchers, the effectiveness of reducing the pain scale is supported by the patient's response, which appeared relaxed after being given a cold compress so that the pain response perceived by the respondents gradually decreased.

In the control group, the average pain level of respondents was still in the moderate

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pain range. This study also found insufficient effectiveness in the treatment given to the control group. Although there was a decrease in the average insulin injection pain scale after being given standard treatment, the average difference in the pain scale obtained was still in a range that was not much different. This shows that cold compresses are an effective and efficient method when used as pain stimulation on the skin compared to just giving standard interventions. The standard intervention given to the control group was deep breathing relaxation. Deep breathing relaxation is an effective method to reduce pain in clients who experience chronic pain. Breathing exercises and relaxation techniques reduce oxygen consumption, respiratory rate, heart rate, and muscle tension, which stops the cycle of pain, anxiety, and muscle tension (Ramandanty, 2019).

The research results show that out of 30 respondents in insulin injection pain patients, 30 stated that after being given a cold compress (ice), they felt a decrease in pain intensity with a pain scale ranging from 3 to 6. This study's results indicate a decrease in pain intensity after being given a cold compress (ice), where patients experienced a decrease in pain from very disturbing 6-7 to somewhat disturbing 3-2.

D. The Effect of Cold Compresses on the Pain Scale of Insulin Injection in Diabetes Mellitus Patients

This study's results indicate a significant effect of cold compresses on the pain scale of insulin injection patients with Diabetes mellitus with a p-value of p = 0.008 (p <0.05). This study is in line with the study conducted by Firiansari (2019), which showed a significant difference in the average pain score between the intervention group and the control group. The average pain in the intervention group was three, while the average pain for the control group was 4; it can be interpreted that the pain in the intervention group was at a mild pain level while the pain in the control group was at moderate pain level, this is also supported by the Mann Whitney test which showed a p-value of 0.011 (p <0.05).

Research conducted by Akriansyah and Surahmat (2021) also showed something similar. The difference in the average pain scale of children during IV drip installation in the control group and the intervention group after being given a cold compress was 3,467, with a standard deviation of 0.417. The results of the T-Test statistical test obtained a p-value = 0.000, meaning that at α = 0.05, there was an effect of cool packs (cold compresses) on Pain During IV Insertion in Children.

Cold compresses can relieve pain because they can reduce blood flow to a part and reduce edema bleeding, which is thought to cause an analgesic effect by slowing down the speed of nerve conduction so that fewer pain impulses reach the brain—giving cold compresses to reduce the intensity of pain transmission of pain stimuli and also stimulate nerve fibers that have a large diameter of α-Beta to reduce the transmission of pain impulses through tiny fibers α-Delta and C6 nerve fibers (Malorung, 2022).

Cold compresses can make the skin less responsive to pain because the release of endorphins can block the transmission of pain from more extensive and faster A-beta sensory nerve fibers. In addition, giving cold compresses can also reduce C and delta A fibers so that the synaptic gate closes the transmission of pain impulses, which can become cold and create a local anesthetic effect. Local anesthetics have therapeutic benefits in reducing local pain, such as injection pain (Nur et al., 2022).

A cold compress is a tool that helps reduce prostaglandins and can reduce swelling and inflammation by reducing blood flow to the painful area (adequate vasoconstriction) (Arifin, 2022). The application of cold compresses is good to do in the first 24 hours after trauma (Logaprakash & Monica, 2023).

The process of reducing pain by using cold compresses through the mechanism of reducing blood flow so that it can reduce edema; in addition, cold compresses can

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cause an analgesic effect by slowing down the speed of nerve conduction so that less pain impulses reach the brain, giving cold compresses to reduce the intensity of pain transmission of pain stimuli and also stimulate nerve fibers that have a large diameter α Beta so that it reduces the transmission of pain impulses through tiny fibers α - Delta and C6 nerve fibers (Malorung et al., 2021).

IV. CONCLUSION

The results of this study indicate that cold compresses significantly affect the pain scale of insulin injection in patients with Diabetes mellitus at the Mijen 1 Health Center. The results suggest that the Mijen 1 Health Center can prepare a cold compress procedure operational standard and apply it directly to DM clients who complain of pain during insulin injection.

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