

Effect of Cutaneous Stimulation and Virgin Coconut Oil on Skin Moisture in Patients with Chronic Renal Failure

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Abstract: Skin problem in patients with Chronic Kidney Failure that often appear that dry skin and most often appear on the forearm and lower extremities. Dry skin that appears in patients undergoing hemodialysis is usually due to atrophy of the sebaceous glands, impaired function of external secretions, and stratum corneum hydration disturbance. The aim of this study was to explain of the combination of cutaneous stimulation and VCO on skin moisture. Cutaneous stimulation and virgin coconut oil (VCO) was performed as a non-pharmacological treatment option to improve skin moisture. This study used quasy experiment pre-post test control group design, conducted between January – March 2018. A total of 52 patients undergoing hemodialysis divided randomly into two groups. The treatment group was given cutaneous stimulation and VCO for 4 weeks and the control group was not given cutaneous stimulation and VCO. The skin moisture assessment was performed five times, ie pre-test at week0, week1, week2, week3 and post-test at week4 using skin moisture analyzer. Giving cutaneous stimulation and VCO effective in improving skin moisture in patients undergoing dialysis seen from Wilcoxon test with $p < 0.05$. Based on Friedman nonparametric test results, there were significant differences in skin moisture value at five measurement times (pre-test, week1, week2, week3, and post-test) $p = 0.000$. Giving cutaneous stimulation and VCO can be used as an option to improve skin moisture in patients undergoing hemodialysis.

1 BACKGROUND

Patients with Chronic Renal Failure (CRF) have at least one change in their skin of 50-100% (Min et al., 2016). One of the skin changes that occur is pruritus where the mechanism that causes pruritus is dry skin. Dry skin is described in most patients with CRF and is thought to be a significant pathogenic factor in pruritus and may increase the intensity of itching in patients with CRF. In the study (Kolla et al., 2012) found that 52% of patients who undergo HD experience dry skin. Knowing early and performing management of rapid dermatology manifestations can reduce morbidity and improve the quality of life of patients. Dry skin that appears in patients with CRF who undergo hemodialysis is usually caused due to atrophy of the sebaceous glands, impaired function of external secretions, and stratum corneum hydration disturbance. Dry skin in patients with pruritic hemodialysis has lower hydration than hemodialysis patients without pruritus complaints (Roswati, 2013). Xerosis is a

common symptom of patients with dialysis which occurs between 50-100%. It most often appears in the lower extremities and forearms. It has been reported that CRF-related pruritus is more common and more severe in patients with xerosis. However, patients with xerosis do not always suffer from itching if they rehydrate and moisturize their skin well. Thus the possibility of xerosis increases the intensity of itch if associated with CKD-aP (Chronic Kidney Disease-associated Pruritus) (Mettang, 2016). Skin moisture is state of moisture content of the stratum corneum and a balance between the evaporation of water and the ability of the skin to retain water. Moisturizing skin can cause cracks, allowing germs that can cause infection to enter the body (Perry.A. Griffin., Potter, Patricia.A., Ostendorf, 2014). Based on the results interviews with patients, all this time that is used to reduce dry skin by using baby oil, olive oil, body lotion and traditional oil sold in pharmacies. Results obtained, moist skin only after use, a few hours later, the skin will dry again.

Kidney failure can cause changes in the sweat glands and oil glands that cause the skin to lose its natural ability to moisturize. This condition can also be caused by changes in metabolism in chronic renal failure, which are related to the volume of fluid from patients undergoing dialysis.

Cutaneous stimulation is a stimulation of the skin and underlying tissue that aims to reduce unwanted signs and symptoms such as pain, muscle spasms, inflammation, nausea and so on (Bullechek, Gloria; Butcher Howard; Dechteerman, joanne; wagner, 2013). Cutaneous stimulation may include massage, hot bath, ice packs and TENS (Transcutaneous Electrical Nerve Stimulation). In this study using cutaneous stimulation type of massage with stroking technique. Massage stroking technique is the provision of massage from proximal to distal along the tissue at depth and speed corresponding to the desired effect (Hollis, 1998). This technique is chosen because it is easy to do independently by the patient. Massage applied to dry skin certainly causes friction and pain on the skin surface. And the combination when given a massage that is by giving the VCO. VCO is a pure coconut oil has antiseptic effect and is used as an efficient skin moisturizer (DebMandal & Mandal, 2011). VCO is a processed product that contains fatty acids (especially uric acid and oleic) which has the properties of softening the skin. In addition VCO effective and used as a moisturizer on skin so that can increase skin hydration and accelerate skin healing and can eliminate itching (Sukartin, 2005). The aim of this study was to explain of the combination of cutaneous stimulation and VCO on skin moisture.

2 METHODS

2.1 Study Design and Sample

This was a quasy experimental research with pre-post test control group design. This research was conducted for 4 weeks from 22 January 2018 – 21 February 2018 at Hemodialysis Room Regional Hospital Public Buleleng, Singaraja Bali. Calculation of sample size using Lemeshow formula, where level of significant 5% = 1.96, power the test 80% = 0.84 and got 24 subjects in each group. Considering the probable loss in the sample, the number of subjects in each group was increased to 26. This study involved 52 patients: 26 patients comprised the experimental group, whereas 26 patients comprised the control group.

The population in this study were patients who underwent hemodialysis. Sampling technique in this study was done by random sampling with inclusion criteria: respondents did regular HD twice a week, experienced dry skin measured using skin moisture tool, while the exclusion criteria were patients who did HD cito, decreased consciousness, women who have menopause, patients with HD travelling, patients with Hbs Ag (+) and patients with injury or secondary infection of the skin. Random selection of samples was performed. We believed that patients undergoing dialysis in the same session could affect each other, so we chose the control and study groups according to their session times. Patients who met the criteria were grouped according to the time of their sessions. The drawing method was used to determine which group would start the study. After drawing, HD patients in the morning sessions were considered the study group, whereas those in the afternoon session were regarded as the control group. Group study: giving cutaneous stimulation for 30 minutes and VCO 5 ml, before patients undergoing standard HD treatment on the skin of a hand that is not attached to the AV Shunt. Group control: group that did not giving stimulation cutaneous and VCO.

2.2 Data Collection

2.2.1 Patient Information Form

The patients information form was developed by the researchers by screening the literature. This form consisted of 7 questions that included sociodemographic characteristic and duration of hemodialysis.

2.2.2 Skin Moisture Analyzer

Skin moisture analyzer using SK-IV Digital Moisture Monitor for Skin as especially designed precision instrument, this product utilizes the latest Bioelectric Impedance Analysis (BIA) technology. With a non-destructive measuring approach. In the skin analyzer, has an LCD screen that serves to display data measurements of skin moisture. This tool has a small design and shape and portable so it can be taken anywhere. Measurement of skin moisture is done in a very short time is within 6 seconds and appears in the form of percentage figures. Standard values of skin moisture in the arm are: 0-35% meant very dry skin, 36-45% meant normal skin and 46-100% meant moist skin.

2.3 Process

2.3.1 Study Group

In the study group, the first patient information form and measure the skin's moisture level before patients undergoing HD treatment. In practice, giving cutaneous stimulation in this case massage is given for 30 minutes with stroking technique, and when giving massage followed by giving VCO as much as 5 ml. 10 ml bottle given 5 ml VCO given each intervention. Intervention is given twice a day, ie morning before HD treatment and night before going to bed. Patients taking part in the study were patients with regular HD twice a week. At the first session of the first week, the patient was provided with 5 bottles (25 ml) of VCO to the house until the second HD session of the first week, the patient was again provided with 7 bottles (35 ml) for the house. Then when the first HD session in the second week is given back and forth for four weeks. At the beginning of administration, perform allergic tests on the back of the hand for 10 minutes, by applying a small amount of VCO, if the patient feels itchy or sore, there is a possibility that the patient is allergic, and the patient is not included as a research sample. VCO should not be given on the hands of the AV shunt and on the hands that are having an open wound.

Patients in the study group performed skin moisture measurements every week. Measurements were made five times, ie pre-test in the zero week, first week, second week, third week, and post-test in the fourth week.

2.3.2 Control Group

In the control group, the first patient information form and measure the skin's moisture level patients undergoing HD treatment. Education about the research procedure was provided to the patients. Provide VCO and cutaneous stimulation guides at the end after doing post-test. Skin moisture measurements were made twice in the first sessions of HD in the fifth week. Then the patient is given one bottle of VCO as much as 300 ml.

2.4 Virgin Coconut Oil (VCO) Practice

VCO provided by students majoring in Traditional Medicine, Airlangga University. VCO is made from selected coconut is old coconut. Oil is made without heating. VCO is packed in clear 10 ml plastic bottles (for study group) and 300 ml (for control group),

tightly sealed so that it does not spill easily. Clear colored oil, not rancid and smells typical of coconut oil.

2.5 Data Analysis

The statistical analyses were performed with SPSS. Average and percentage were used for analysis of descriptive features. Normal distribution of the data was tested by Shapiro-Wilk test. The two groups were compared via Wilcoxon test and Independent t-test. To evaluate more than two variance, the Friedman test is used.

2.6 Ethical Considerations

This study has gained approval of ethical eligibility from Ethical Commission of Health Research at Nursing Faculty of Universitas Airlangga number 609-KEPK on 4th January 2018. Written consent was obtained from all centers. The aim of the study was explained to the participants, and informed consent forms the participants were collected.

3 RESULTS

Fifty four selected for eligibility with simple random sampling, 2 patients were dropped out because passing away before post test, leaving a final study sample of 52 patients, who were assigned to intervention group ($n=26$) and control group ($n=26$).

Based on table 1 shows the characteristics of respondent by age, gender, education, occupation, and duration of hemodialysis. Most respondents were 30-45 years old (38.5%), male sex (69.2%), had level of education in high school (42.3%), did not work (19.2%), and undergoing HD less than five years (75%). Based on homogeneity test, it was found that the characteristic of age, education and occupation showed homogeneous ($p>0.05$).

Dry skin occurred in both group, all of respondents both the intervention group and control group obtained dry skin. After given intervention has increased the skin moisture level to normal as much 11 (42.3%) and 9 (34.6%) skin becomes moist. However, there are 6 patients (23%) are still at very dry skin level, but skin's moisture value has increased slightly.

Table 1: Characteristics and demographic.

Characteristic	Intervention		Control		p value
	N	%	n	%	
Age (years)					0.102
30-45	14	53.8	6	23.1	
46-55	6	23.1	11	42.3	
56-65	6	23.1	9	34.6	
Mean Age	47.73±7.68		50.85±7.58		
Gender					0.016
Male	14	53.8	22	84.6	
Female	12	46.2	4	15.4	
Education					0.392
Not schooling	1	3.8	-	-	
Primary	6	23.1	5	19.2	
Secondary	5	19.2	5	19.2	
High School	11	42.3	11	42.3	
Collage	3	11.5	5	19.2	
Occupation					0.120
Not Working	10	38.4	5	19.2	
Working	16	61.6	21	80.8	
HD Duration					0.023
0 – 5 years	16	61.5	23	88.5	
6-10 years	8	30.8	3	11.5	
>10 years	2	7.7	-	-	
Mean HD Duration	4.76±3.13		2.40±1.76		

Table 2: Incidence of skin moisture in intervention and control group (pre test-post test).

Stage of skin moisture	Intervention		Control	
	n	%	n	%
Skin moisture before intervention (pre test)				
Dry skin	26	100	26	100
Normal	0	0	0	0
Moisture	0	0	0	0
Skin moisture after intervention (post test)				
Dry skin	6	23	26	100
Normal	11	42.3	0	0
Moisture	9	34.6	0	0

Table 3: Result Wilcoxon and Independent t test.

Group	Skin Moisture		p value
	Pre test	Post test	
Intervention	20.31±4.84	41.08±5.95	0.000
Control	21.96±5.89	21.12±4.44	0.557
Independent t test p: 0.000			

Table 3 shows, that effectivity of cutaneous stimulation and vco on skin moisture, each group was tested by Wilcoxon statistic analysis, because the result of *Shapiro Wilk* data not normally test, the normal data distribution ($p < 0.05$). Based on the results of the test showed that the results obtained significant in the treatment group ($p < 0.05$), whereas

in the control group showed no significant result ($p > 0.05$).

After testing on each group, the next test is to know the difference of effectivity of cutaneous stimulation and VCO in the intervention and control group. The used Independent t-test because the distribution of the difference data between pre and post both treatments is normally distributed ($p > 0.05$).

Table 4: Result Independent t-test.

Groups	N	Mean	Standar Deviasi	p value
Intervention	26	20.77	6.641	0.000
Control	26	-0.85	4.722	

Table 5: Distribution of mean and standar deviasi of skin moisture scores of the participants in treatment group according to measurement time (Friedman Test).

Measurement time	Study griup (n=26)	p value
week 0	20.69 ± 5.98	0.000
week 1	24.88 ± 6.21	
week 2	27.92 ± 5.78	
week 3	32.35 ± 5.67	
week 4	41.46 ± 6.51	

Table 6: Result post hoc test of Friedman test.

Weeks	Week1	Week2	Week3	Week4
0	0.000	0.000	0.000	0.000
1	-	0.000	0.000	0.000
2	-	-	0.000	0.000
3	-	-	-	0.000

The results in table 4 show that there is a significant difference ($p < 0.05$) in the treatment group compared with the control group.

Giving cutaneous stimulation and VCO is given for four weeks. And the skin moisture measurement is done 5 times, that is pre test in the first week, second week, third week, fourth week and post test in the fifth week. To test the result of skin moisture measurements on a weekly basis the measurements in the group given cutaneous stimulation intervention and VCO using Anova Repeated Measure test. However, since the residual value of the data distribution group is not normally distributed, it uses the Friedman test. Table 5 shows a significant relationship between the differences in mean skin moisture score in the first week and the fifth week in the treatment group.

The groups that differed significantly on the friedman test, using the post hoc test by performing the Wilcoxon Signed Rank Test. there was a significant difference in skin moisture value between

week 0 value with first week (0.000), second week (0.000), third week (0.000) and fourth week (0.000).

4 DISCUSSION

The results of this study showed that all patients had dry skin (100%). Ankudowicz et al, in patients treated with hemodialysis because of CRF, various skin lesions were detected, the most common symptoms were skin dryness and pruritus (observed in 63% of patients) (A. Ankudowicz, Król, & Dębska-Ślizień, 2016). Giving cutaneous stimulation and VCO can improve skin moisture in patients with CRF who undergo hemodialysis tend to have dry skin. Dry skin that appears in patients dialysis is usually due to retention of vitamin A which causes decreased function of the kidneys to secrete some body substances. This vitamin A accumulates in the subcutaneous tissue of the skin. This excessive vitamin causes the atrophy of sebaceous glands and sweat glands that make skin dry and itchy (Melastuti, Erna., Setyaningrum, 2016). Xerosis is a skin disorder number two after pruritus. Skin xerosis is a frequent complication in hemodialysis patients. It can be seen in CRF before HD, but a significant rise in its frequency is found after the start of dialysis (Masmoudi, Darouiche, Salah, Hmida, & Turki, 2014). Dry skin conditions, triggering the itching of the skin. If this condition persists there will be pruritus. Before pruritus occurs, making the skin moist is very important. In addition to improving patient comfort can also improve the quality of life patients. The results showed that the combination of cutaneous stimulation and VCO significantly gave good results. Patients say more moist and less itchy skin, making patients more comfortable.

Cutaneous stimulation in the form of massage, in addition to providing a sense of relaxation in the skin, also helps the VCO more quickly absorbed into the skin. The massage is given in the type of stroking, which provides massage from the proximal to distal direction along the tissue at depth and speed corresponding to the required effect, but the direction of stroking may vary to provide greater comfort (Hollis, 1998). Massage is oriented to the superficial region, so it can stimulate the receptors that exist on the skin. One of the physiological effects of massage is its ability to increase local blood and lymphatic flow, improve nutritional status, facilitate removal of toxins released by wounded tissue and speed healing (Hollis, 1998). Increase blood flow and lymph nodes may occur as a

result of direct mechanical displacement, as well as the neural reflex response of blood and lymph channels. In addition, vasodilator release, such as histamine from mast cells, is associated with increased local blood flow. Massage that is done can provide relaxation to the muscles so that the blood vessels dilate. Under these conditions, can lower levels of cortisol, epineprin and norepineprin (Unal & Balci Akpınar, 2016). Other physiological effects, massage can increase the secretions of sweat glands and sebaceous glands. Massage mechanically has the ability to change the texture and consistency of the skin if doing repeatedly and prolonged, the skin will be more elastic (Hollis, 1998).

Most of patients had increased skin moisture (94%) after giving VCO, 6% did not increase significantly, but showed slight improvement. A total of 17 people after being given intervention have not been at the skin level to be moist. As many as 11 people who were previously at the dry skin level became normal skin, there was an increase of approximately 20 points. While as many as 6 people remain in dry skin condition although there is an increase in value in quantity. This is because the skin moisture value at pre test is at very low value (<21%), so to achieve the normal value required a considerable increase of points. The increase in the value of six people is approximately 15 points. The skin condition of each patient is certainly not always the same, some factors that cause the patient to remain in dry skin condition after four weeks of intervention due to atrophy of the sebaceous glands associated with decreased lipid surfaces that cause dehydration of the stratum corneum (Masmoudi et al., 2014). In addition to the duration of patients undergoing HD also may affect skin moisture due to the decline in the glans with abnormal functions associated with hypervitaminosis A when patients undergoing dialysis (Anna Ankudowicz, Król, Dębska Ślizień, & Czernych, 2018); (Robles-Mendez, Vazquez-Martinez, & Ocampo-Candiani, 2015). Therese et al, observed in atopic dermatitis patients, the results are an increase in stauts, whereas formerly atopic patients of severe dermatitis after being given VCO intervention, became atopic of moderate dermatitis (Evangelista, Casintahan, & Villafuerte, 2014). Noor et al study showed 24.8% increase in skin moisture for lotions with VCO-SLPs compared with 12.7% increase in skin moisture in regular lotion use for duration of use twice daily for 28 days. The use of lotions with VCO-SLPs has igher moisture retention and this could be due to the high occlusion factor of smaller particles. Moisturizing lotion containing VCO with 0.608 μm

show a better way of working that is by extending the effects of moisture on the skin. This effect can be caused by a smaller particle size that allows the particles to be maintained in the stratum corneum layer. The most important criterion for moisturizers is to prevent water loss from the skin and keep the moisture of stratum corneum skin about 20-35% or more. In addition to increasing skin hydration, VCO can also improve skin elasticity. There was an increase in skin elasticity by 2.60% from day 0 and day 28 compared to using moisturizers could be an increase of 0.76% after 28 days. This may be due to higher skin hydration and decreased transdermal water loss (Noor, Norhayati Mohamed., Aziz, Azila Abd., Sarmidi, Mohamad Roji., Aziz, 2013).

When the VCO is applied to the skin, the VCO not only coats the skin, but also penetrates the skin. VCO has saturated fat and contains 62% Medium Chain Fatty Acids (MCFAs). When applied to the skin, MCFAs react with the lipase of the skin flora and convert it into free fatty acids, which penetrate the dermis. In addition, VCO has been shown to destroy free radicals, compounds that can cause skin disorders. The antioxidant capacity of VCO can be caused by phenolic compounds such as ferulic acids and p-coumaric acids (Evangelista et al., 2014). VCO is applied to the skin, in addition to coating the skin, cover and protect by slowing transdermal water loss and increase hydration in the stratum corneum and upper layer of dermis, this makes the skin moist (Verallo-Rowell, Dillague, & Syah-Tjundawan, 2008).

The use of traditional coconut oil as a lotion has been done in many parts of the world. Coconut oil is shown to have an antiseptic effect and is used as a safe skin moisturizer (DebMandal & Mandal, 2011). In addition to cheap, coconut oil is also easy to obtain and easy to make.

4.1 Limitations

This study has some limitation. Limitations of this study are that researcher can not control well during the implementation of home interventions. Respondents only provided an observation sheet and reminded via SMS or telp. Researcher rely on the results of an observation sheet that has been filled with the patient or patient's family.

5 CONCLUSIONS

Based on the test results of the treatment, obtained significant results on the treatment of cutaneous

stimulation and VCO. That the provision of cutaneous stimulation and VCO can effectively improve skin moisture and can be used as a non-pharmacological therapy option to improve skin moisture. In addition VCO is easy to obtain, cheap and easy to make.

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