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Comparison of the effectiveness of colloidal oatmeal 1% with petrolatum 100% to repair the skin bars in psoriasis vulgaris: A study of trans-epidermal water loss

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ABSTRACT

The purpose of this study was to compare the effectiveness of 1% colloidal oatmeal with 100% petrolatum in improving the skin barrier in patients with psoriasis vulgaris. This research method is a randomized, single-blind, pre and posttest design controlled trial involving patients with mild/moderate/severe psoriasis vulgaris at DR. Kariadi Hospital Semarang, Indonesia. The subjects of the study were divided into 2 groups, namely 1% colloidal oatmeal and 100% petrolatum. Evaluation was carried out by comparing the TEWL values between day 0 and day 28. The analysis was carried out using independent T-tests, *Mann Whitney*, and *Wilcoxon*. The results were significant if $p<0.05$ Results Topical administration of 1% colloidal oatmeal or 100% petrolatum could lower the TEWL value in each study group ($p<0.001$; $p=0.006$ respectively). ΔTEWL evaluation showed a significantly greater decrease in TEWL in the 1% colloidal oatmeal group ($p=0.003$). No complaints during use were reported in the 1% colloidal oatmeal group. Conclusion: Topical application of 1% colloidal oatmeal is more effective than 100% petrolatum as a moisturizer in improving the skin barrier in patients with psoriasis vulgaris without complaints.

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INTRODUCTION

Psoriasis is an autoimmune disease with chronic inflammation that can affect the skin, nails and joints and has a strong genetic predisposition (Armstrong & Read, 2020). The incidence and prevalence of psoriasis in Indonesia according to data from Dr. Cipto Mangunkusumo, Jakarta (2000-2002) as many as 338 cases (2.39%), while at Sanglah Central General Hospital (RSUP), Denpasar (2009) there were 156 cases (1.4%) (Alhammad et al., 2021), (Dewi & IG, 2018).

The condition psoriasis is a factor causing dry skin (Butarbutar et al., 2020). Hyperproliferation and abnormal differentiation of the epidermis cause disruption of the epidermal barrier function; which is exacerbated by decreased filaggrin expression, decreased

water and lipid binding capacity of the skin surface (Luger et al., 2014), (Montero-Vilchez et al., 2021), (Vaughn, Clark, Sivamani, & Shi, 2018). Epidermal barrier dysfunction is indicated by abnormal trans-epidermal water loss (TEWL) measurements. TEWL is a method for measuring epidermal barrier function which describes the amount of water that is condensed and diffused through a certain area of the stratum corneum to the surface of the skin per unit time (Dhabale & Nagpure, 2022). Psoriasis skin lesions show higher TEWL than healthy skin (Lodén, 1997).

Moisturizers are required in the topical management of psoriasis vulgaris as an adjunct to conventional therapy and may help reduce scaling in some patients (Maul et al., 2021). Petrolatum inhibits the oxidation of arachidonic acid by reducing prostaglandins and leukotrienes, thus causing an anti-inflammatory effect and reducing erythema (Limaye & Weightman, 1997). However, the use of petrolatum is associated with several side effects such as discomfort, stickiness, oiliness when used. Oats (Avena sativa) are a natural product from cereal grains and members of the grass family Gramineae (Michelle Garay, 2016). Oatmeal is known to have anti-inflammatory, antioxidant, antihistamine, skin barrier protection and repair, cleansing, anti-infection and immunomodulatory effects. The application of colloidal oatmeal shows a decrease in TEWL due to the skin protective effect in the form of moisturizing formation by proteins and polysaccharides (Becker et al., 2019). Comparing the effectiveness of 1% colloidal oatmeal with 100% topical petrolatum in improving the skin barrier in psoriasis vulgaris patients (Sobhan et al., 2020).

RESEARCH METHOD

Studies *randomized controlled trial, single blind, pre and posttest design* involving 32 patients with mild/moderate/severe psoriasis vulgaris at RSUP DR. Kariadi Semarang between July-September 2024. Research subjects were divided into 2 groups, namely 1% colloidal oatmeal and 100% topical petrolatum. The intervention was carried out by administering each product to both forearms at 2 FTU per administration, 2 times a day, ± 3 minutes after bathing for 28 days. Evaluation was carried out by comparing TEWL values on day 0 and day 28.

Research subjects were obtained using a consecutive sampling method until the minimum sample size was met. The study inclusion criteria were 1) patients with mild/moderate/severe psoriasis vulgaris who were clinically diagnosed and treated at the Skin and Venereology Polyclinic at RSUD Dr. Kariadi Semarang, 2) aged between 18-60 years, and 3) willing to be a research subject and sign *informed consent*. The exclusion criteria for this study were 1) patients who had a history of hypersensitivity to colloidal oatmeal and petrolatum products, 2) patients with one of the following comorbidities: erythroderma/chronic renal failure/heart failure/severe psychotic conditions obtained through history, physical examination, or medical record data, 3) had active infectious lesions in the area to be measured, and 4) consumed drugs that affect skin moisture conditions during the last 1 month (oral vitamin A and hormonal). Data were analyzed using the SPSS 29th edition statistical application. Analysis was carried out to determine differences in TEWL values between research groups and TEWL values before and after intervention in each research group. Analysis is carried out using tests *T Independen, Mann Whitney U* And *Wilcoxon*. Results are significant if $p<0.05$. The research has obtained ethical permission from the Health Research Ethics Committee of RSUP Dr. Kariadi Semarang with number 16149/EC/KEPK-RSDK/2024.

RESULTS AND DISCUSSIONS

This study involved psoriasis vulgaris patients undergoing treatment at the outpatient clinic of RSUD Dr. Kariadi Semarang. A total of 33 subjects who met the inclusion criteria were then randomly divided into 2 groups, namely 17 subjects in the treatment group (1% colloidal oatmeal) and 16 subjects in the control group (100% petrolatum). During the research process, there was 1

subject in the treatment group *drop out* because of an allergic reaction. There were 32 subjects who took part in the research until the end, with 16 subjects in the treatment group and control group each.

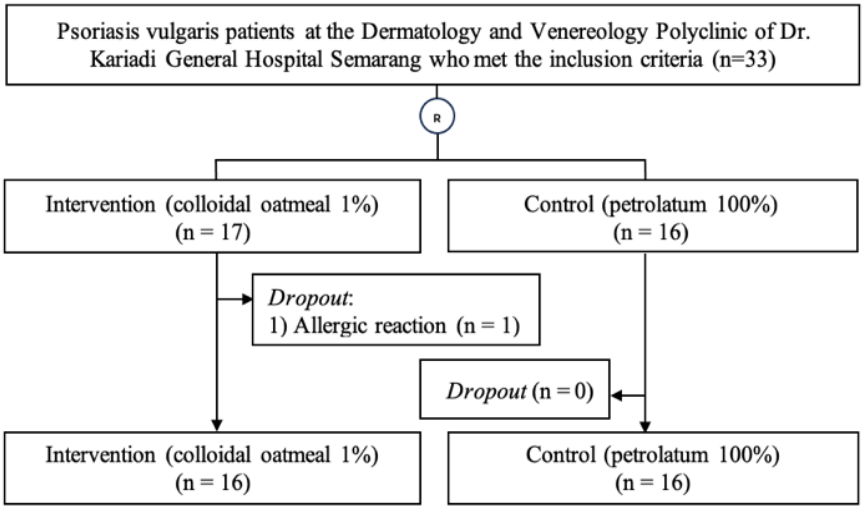

Figure 1. Diagram consolidated standards of reporting trials (CONSORT)

The age of the 1% colloid oatmeal group was found to be an average of 43.81 years with a standard deviation of 11.04 years. In the 100% petrolatum group, the average was 41.19 years with a standard deviation of 12.25 years. Age has a homogeneous data variance between research groups (p=0.403).

This is in accordance with the literature that psoriasis often occurs at the age of 20 years (early onset) or 40 years (late onset), but late onset psoriasis is slightly more common than early onset psoriasis (Goldsmith et al., 2012). Nicolescu AC et al's study assessed the prevalence and characteristics of psoriasis in Romania involving 1500 research subjects and found that the first symptoms of psoriasis appeared around the age of 50 years, where a definitive diagnosis was made at an average age of 55 years (Nicolescu et al., 2021). Profile description of psoriasis vulgaris sufferers at RSUD Dr. Soetomo Surabaya by Naufal A et al. showed that the majority of subjects had an age range of > 45 years (62.5%) (Naufal, Damayanti, & Hidayati, 2021).

The gender of the 1% colloid oatmeal group and the 100% petrolatum group was dominated by female subjects (68.8%; 75% respectively). Gender had homogeneous data variance between research groups (p=0.694). This is in accordance with the literature which states that more women suffer from psoriasis than men (Gerreth, Maciejczyk, Zalewska, Gerreth, & Hojan, 2020). Female sex hormones influence disease manifestation and severity as well as cytokine imbalance in psoriasis patients. Low estrogen levels in women are associated with a dominant Th1 cell immune response and proinflammatory cytokines, whereas high estrogen levels during pregnancy promote an increase in Th2 cell-associated cytokines. Estrogen is a negative regulator of tumor necrosis factor (TNF) which plays an important role in the pathogenesis of psoriasis (Guillet, Seeli, Nina, Maul, & Maul, 2022).

The type of soap used by the 1% colloidal oatmeal group, there were 10 subjects (62.5%) using antiseptic soap and 6 subjects (37.5%) using baby soap. In the 100% petrolatum group, there were 10 subjects (62.5%) using antiseptic soap and 6 subjects (37.5%) using baby soap. The type of soap had homogeneous data variance between research groups (p=1,000).

History of moisturizer use in the 1% colloidal oatmeal group: there were 7 subjects (43.8%) who rarely used moisturizers and 2 subjects (12.5%) used moisturizers. In the 100% petrolatum

group, there were 8 subjects (50%) who rarely used moisturizer and 5 subjects (31.3%) used moisturizer. The history of moisturizer use had homogeneous data variance between research groups (p=0.229).

Initial complaints in the 1% colloid oatmeal group were 9 subjects (56.3%) complaining of dry skin, 6 subjects (37.5%) complaining of dry and itchy skin, and 1 subject (6.3%) complaining of dry and reddish skin. In the 100% petrolatum group, 8 subjects (50%) complained of dry skin, 6 subjects (37.5%) complained of dry and itchy skin, and 2 subjects (12.5%) complained of dry, itchy and reddish skin. Initial complaints had homogeneous data variance between research groups (p=0.383).

The history of systemic treatment in the 1% colloid oatmeal group was 10 subjects (62.5%) using methotrexate and 6 subjects (37.5%) using secukinumab. In the 100% petrolatum group, 8 subjects (50%) used methotrexate and 8 subjects (50%) used secukinumab. History of systemic treatment had a homogeneous data variance between study groups (p=0.476).

Table 1. Transepidermal water loss (TEWL) with 1% colloidal oatmeal and 100% petrolatum

Variable	*Colloidal Oatmeal* 1% Mean ± SD; Median (min-max)	Petrolatum 100% Mean ± SD; Median (min-max)	*p*	Statistical Test
Initial TEWL	18.59 ± 7.21	17.24 (10.62-38.43)		
Final TEWL	11.33 (6.65-28.53)	18.28 ± 8.22		
p	<0.001[£]	0.006[£]		
Statistical Test	Wilcoxon	Wilcoxon		
ΔTEWL	-4.62 ± 1.66	-2.19 ± 2.51	0.003	Independent T-test

p<0.05 are significant

The pre-TEWL value in the 1% colloidal oatmeal group was found to be an average of 18.59 g/m2/hour with a standard deviation of 7.21 g/m2/hour. In the 100% petrolatum group, the median value was 17.24 g/m2/hour with the smallest value being 10.62 g/m2/hour and the largest value being 38.43 g/m2/hour.

The post-TEWL value in the 1% colloidal oatmeal group was obtained with a median value of 11.33 g/m2/hour with the smallest value being 6.65 g/m2/hour and the largest value being 28.53 g/m2/hour. In the 100% petrolatum group, the average was 18.28 g/m2/hour with a standard deviation of 8.22 g/m2/hour.

Evaluation of differences in TEWL pre and TEWL post in each group was carried out to determine the significance of changes in TEWL values that occurred. There was a significant decrease in TEWL in the 1% colloid oatmeal group (p<0.001) and the 100% petrolatum group (p=0.006).

According to research, the use of 1% colloidal oatmeal has a better effect than 100% petrolatum, allegedly because colloidal oatmeal not only forms a protective layer on the skin but also helps bind water and retain moisture in the stratum corneum. An important difference between colloidal oatmeal and other skin protectants such as petrolatum, dimethicone, mineral oil, cocoa butter, and glycerin is that only colloidal oatmeal plays a role in protecting the skin, as an anti-inflammatory, eliminating skin irritation and itching. Apart from being proven to act as an emollient, humectant, and occlusive (Mawazi et al., 2022), colloidal oatmeal can also function as a pH buffer that helps maintain the pH of the skin surface (Catherine Mack Correa & Nebus, 2012). The active ingredients in oatmeal consist of polysaccharides, proteins, lipids, saponins, enzymes, flavonoids, vitamins, and avenanthramides. Avenanthramides are phenolic compounds found in oats that mediate their anti-inflammatory activity. Decreased activation of the nuclear factor kappa B (NF-kB) pathway in keratinocytes and decreased secretion of proinflammatory cytokines and histamine contribute to the anti-inflammatory activity of colloidal oatmeal on inflamed, dry, and itchy skin (Lin, Zhong, & Santiago, 2018).

Research conducted by Vie et al. showed that Avena sativa colloidal extract was able to modulate skin irritation caused by sodium lauryl sulfate (SLS) through changes in skin barrier function and microvasculature. Oat extract consisting of starch, sugars, proteins, lipids, phenols, flavenoids and saponins displays several immunomodulatory activities, high emulsification and hydration properties. The phenolic substances contained in oats also function in inducing the inhibition of free radicals. The 1% colloidal oatmeal used in this study played a calming role due to the product's hydrating properties (Vie et al., 2002).

Topical use of oat extract containing β-glucan for three weeks can significantly increase water content and improve skin barrier function (Zhu et al., 2023). The decrease in TEWL values after administering cream containing oatmeal in this study showed similar results to research by Criquet et al. which stated that forearm skin hydration increased significantly (5.6–22.2%) during the period (days 1–28) of application of oatmeal-containing cream and after (day 42) compared to the baseline before application (Criquet, Roure, Dayan, Nollent, & Bertin, 2012).

The Δ TEWL assessment was carried out to determine changes in TEWL values that occurred between before and after the intervention. In the 1% colloidal oatmeal group, an average of -4.62 g/m2/hour was obtained with a standard deviation of 1.66 g/m2/hour. In the 100% petrolatum group, an average of -2.19 g/m2/hour was obtained with a standard deviation of 2.51 g/m2/hour. There was a significant difference in the distribution of ΔTEWL values between study groups (p=0.003) where a greater decrease in TEWL values was obtained in the 1% colloidal oatmeal group.

Complaints about use in the 1% colloidal oatmeal group were that all subjects (100%) did not complain about any incidents during use. In the 100% petrolatum group, 4 subjects (25%) complained of an oily feeling, 2 subjects (12.5%) complained of a sticky feeling, 2 subjects (12.5%) complained of a sticky and oily feeling, while 8 subjects (50%) did not complain of any occurrence. There was a significant difference in the distribution of usage complaints between study groups ($p = 0.002$) where more complaints were reported in the 100% petrolatum group.

This is in accordance with Matheson's research on burn patients which stated that there was a reduction in itching (assessed based on the itching assessment scale) and less antihistamine consumption in the group that received moisturizer with the addition of colloidal oatmeal compared to the group that received liquid paraffin monotherapy moisturizer ($p < 0.001$) (Matheson, Clayton, & Muller, 2001).

Research by Criquet states that personal care products such as creams, cleansers and lotions containing oatmeal have a very low potential to cause irritation and allergen sensitization in both sensitive and non-sensitive skin. Low-grade reactions were documented in 1.0% (1 of 2291 subjects) during the induction phase of repeat patch testing. No allergies were reported by 80 subjects after patch testing. The skin moisturizing effect in subjects with dry skin can last up to 2 weeks after cessation of colloidal oatmeal application.

This study has several shortcomings, including 1) the study was only conducted over a period of 28 days so it could not observe the effectiveness and risk of long-term side effects, 2) the study did not measure skin hydration status as indicated by skin capacitance (SC) measurements.

CONCLUSION

Topical application of 1% colloidal oatmeal is more effective than 100% petrolatum as a moisturizer in improving the skin barrier in psoriasis vulgaris patients without complaints.

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References

Alhammad, I. M., Aseri, A. M., Alqahtani, S. A. M., Alshaebi, M. F., Alqahtani, S. A., Alzahrani, R. A., … Jad, A. Y. (2021). A review on updates in management and treatment of psoriasis. *Archives of Pharmacy Practice*, *12*(1–2021), 74–78.

Armstrong, A. W., & Read, C. (2020). Pathophysiology, clinical presentation, and treatment of psoriasis: a review. *Jama*, *323*(19), 1945–1960.

Becker, L. C., Bergfeld, W. F., Belsito, D. V, Hill, R. A., Klaassen, C. D., Liebler, D. C., … Snyder, P. W. (2019). Safety assessment of Avena sativa (Oat)-derived ingredients as used in cosmetics. *International Journal of Toxicology*, *38*(3_suppl), 23S-47S.

Catherine Mack Correa, M., & Nebus, J. (2012). Management of patients with atopic dermatitis: the role of emollient therapy. *Dermatology Research and Practice*, *2012*(1), 836931.

Criquet, M., Roure, R., Dayan, L., Nollent, V., & Bertin, C. (2012). Safety and efficacy of personal care products containing colloidal oatmeal. *Clinical, Cosmetic and Investigational Dermatology*, 183–193.

Dewi, D., & IG, I. (2018). Insiden dan profil psoriasis di poliklinik kulit dan kelamin Rumah Sakit Umum Pusat Sanglah Denpasar periode Januari 2012 sampai Desember 2014. *E-Jurnal Medika Udayana*, *7*(9), 1–7.

Dhabale, A., & Nagpure, S. (2022). Types of psoriasis and their effects on the immune system. *Cureus*, *14*(9).

Gerreth, P., Maciejczyk, M., Zalewska, A., Gerreth, K., & Hojan, K. (2020). Comprehensive evaluation of the oral health status, salivary gland function, and oxidative stress in the saliva of patients with subacute phase of stroke: a case-control study. *Journal of Clinical Medicine*, *9*(7), 2252.

Goldsmith, L. A., Fitzpatrick, T. B., Katz, S. I., Gilchrest, B. A., Paller, A. S., Leffell, D. J., & Wolff, K. (2012). Fitzpatrick's dermatology in general medicine. *(No Title)*.

Guillet, C., Seeli, C., Nina, M., Maul, L. V., & Maul, J.-T. (2022). The impact of gender and sex in psoriasis: What to be aware of when treating women with psoriasis. *International Journal of Women's Dermatology*, *8*(2), e010.

Limaye, S., & Weightman, W. (1997). Effect of an ointment containing boric acid, zinc oxide, starch and petrolatum on psoriasis. *Australasian Journal of Dermatology*, *38*(4), 185–186.

Lin, T.-K., Zhong, L., & Santiago, J. L. (2018). Anti-inflammatory and skin barrier repair effects of topical application of some plant oils. *International Journal of Molecular Sciences*, *19*(1), 70.

Lodén, M. (1997). Barrier recovery and influence of irritant stimuli in skin treated with a moisturizing cream. *Contact Dermatitis*, *36*(5), 256–260.

Luger, T., Seite, S., Humbert, P., Krutmann, J., Triller, R., & Dréno, B. (2014). Recommendations for adjunctive basic skin care in patients with psoriasis. *European Journal of Dermatology*, *24*(2), 194–200.

Matheson, J. D., Clayton, J., & Muller, M. J. (2001). The reduction of itch during burn wound healing. *The Journal of Burn Care & Rehabilitation*, *22*(1), 76–81.

Maul, J.-T., Anzengruber, F., Conrad, C., Cozzio, A., Häusermann, P., Jalili, A., … Mainetti, C. (2021). Topical treatment of psoriasis vulgaris: the Swiss treatment pathway. *Dermatology*, *237*(2), 166–178.

Mawazi, S. M., Ann, J., Othman, N., Khan, J., Alolayan, S. O., Al thagfan, S. S., & Kaleemullah, M. (2022). A review of moisturizers; history, preparation, characterization and applications. *Cosmetics*, *9*(3), 61.

Michelle Garay, M. (2016). Colloidal oatmeal (Avena Sativa) improves skin barrier through multi-therapy activity. *J Drugs Dermatol*, *15*(6), 684–690.

Montero-Vilchez, T., Segura-Fernández-Nogueras, M.-V., Pérez-Rodríguez, I., Soler-Gongora, M., Martinez-Lopez, A., Fernández-González, A., … Arias-Santiago, S. (2021). Skin barrier function in psoriasis and atopic dermatitis: transepidermal water loss and temperature as useful tools to assess disease severity. *Journal of Clinical Medicine*, *10*(2), 359.

Naufal, A., Damayanti, K. E. H., & Hidayati, A. N. (2021). Risk factor profile and quality of life of psoriasis vulgaris. *Periodical of Dermatology and Venereology*, *33*(2), 129–134.

Nicolescu, A. C., Bucur, Ştefana, Giurcăneanu, C., Gheucă-Solovăstru, L., Constantin, T., Furtunescu, F., … Constantin, M. M. (2021). Prevalence and characteristics of psoriasis in Romania—First study in overall population. *Journal of Personalized Medicine*, *11*(6), 523.

Sobhan, M., Hojati, M., Vafaie, S.-Y., Ahmadimoghaddam, D., Mohammadi, Y., & Mehrpooya, M. (2020). The efficacy of colloidal oatmeal cream 1% as add-on therapy in the management of chronic irritant hand

eczema: A double-blind study. *Clinical, Cosmetic and Investigational Dermatology*, 241–251.

Vaughn, A. R., Clark, A. K., Sivamani, R. K., & Shi, V. Y. (2018). Natural oils for skin-barrier repair: Ancient compounds now backed by modern science. *American Journal of Clinical Dermatology*, *19*(1), 103–117.

Vie, K., Cours-Darne, S., Vienne, M. P., Boyer, F., Fabre, B., & Dupuy, P. (2002). Modulating effects of oatmeal extracts in the sodium lauryl sulfate skin irritancy model. *Skin Pharmacology and Physiology*, *15*(2), 120–124.

Zhu, J., Wang, Y.-F., Song, S.-S., Wu, L.-L., Chen, Y., Li, X.-Y., & Ju, M. (2023). Alleviating skin barrier disruption, skin inflammation, and pruritus: A moisturizing spray containing β-glucan and panthenol. *International Journal of Dermatology and Venereology*, *6*(01), 1–8.