



THE RELATIONSHIP BETWEEN TOPICAL HERBAL PRODUCT USAGE AND DERMATOLOGICAL DISORDERS, SKIN PH LEVEL, AND SKIN MOISTURE: A COMMUNITY-BASED STUDY

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Abstract

Objective: Individuals with dermatological problems may turn to herbal products in addition to medical treatment or without treatment. These products are usually applied topically in the form of cream, lotion, oil, ointment or gel and can be used to support skin health. The aim of this study was to examine the relationship between topical use of herbal products and dermatologic problems, skin pH level and moisturization.

Methods: This study is a descriptive cross-sectional study. The study sample consisted of 507 people who agreed to participate in the study and met the inclusion criteria. An Individual Identification Form consisting of four sections including sociodemographic characteristics, information on health and disease, information on dermatologic problems and information on herbal product use was used as a data collection tool.

Results: 29.4% of the participants stated that they used herbal products topically and 47.7% stated that they had dermatologic disorders. The mean skin pH level of the participants was 4.97 ± 0.44 and the mean skin moisture level was 18.59 ± 5.23 . A positive correlation was found between dermatologic disorders and herbal product use. There was a significant difference between the skin pH levels and skin moisture levels of individuals who used topical herbal products and those who did not.

Conclusion: Our research findings show that topical herbal products may affect skin pH and moisture levels and require careful use in individuals with dermatological disorders. In conclusion, safe use of these products is important for public health and health professionals play a critical role in this process.

Keywords: Herbal, pH, skin, skin disorders.

Introduction

Skin health is associated with physical and psychological health by individuals, and skin appearance can affect self-confidence and social relationships. Especially diseases such as acne, psoriasis, eczema and skin problems such as itching, redness, sweating can negatively affect individuals psychosociologically. Studies show that individuals with dermatologic problems have high anxiety and stress levels and low quality of life.¹⁻⁴ For this reason, many people today resort to integrative and complementary methods as well as medical treatment to protect, maintain and support skin health. One of the most commonly used complementary methods for dermatologic problems is topically applied herbal products. These products are usually applied in cream, lotion, oil, ointment or gel forms and are known for their antioxidant, anti-inflammatory, antimicrobial and moisturizing properties.⁵⁻⁷ Evening primrose essential oil has anti-inflammatory properties and can be used to prevent epidermal keratinization.⁸ Aloe vera gel is used in wound and burn treatment, vegetable oils such as sesame, jojoba, argan are used for skin moisturizing, and lavender oil is used for its relaxing effect.⁹⁻¹¹ In many studies, it has been determined that tea tree oil has antibacterial and antimicrobial effects and can be used in acne treatment.¹²⁻¹⁴

While herbal products used topically can improve skin problems, they can also have effects on skin hydration and skin pH levels. The effect of herbal products on skin hydration and skin pH level may vary depending on the content, form and frequency of use. For this reason, the product used may vary depending on factors such as age, gender, skin type, dermatological condition. Ingredients such as argan oil, jojoba oil and aloe vera may be preferred more frequently in individuals with dermatological problems because they increase the moisture retention capacity of the skin, strengthen the moisture barrier and accelerate wound healing.^{10,15-17} However, it is important to seek expert advice when using these products, taking into account skin type and the risk of allergic reactions.^{6,18} While carefully selected and correctly used herbal products can support the health of the skin, overuse or frequent use can negatively affect the pH balance and moisturization of the skin. Therefore, there is a need for more scientific studies in this field.¹⁹⁻²¹ In this study, it was aimed to determine the effect of topical use of herbal products on dermatologic problems, skin pH level and moisturization.

Methods

Type of Research

This research is a descriptive study.

Place and Time of Research

The study was conducted in the dermatology polyclinics and other adult polyclinics of a state hospital, two family health centers and at a booth set up on the university campus in a province in the Eastern Black Sea region between February 20, 2024 and February 01, 2025.

Population and Sample

No sample selection was made in the study and everyone who agreed to participate in the study in accordance with the inclusion criteria was included in the study. At the end of the research, a total of 507 participants were reached. Individuals who volunteered to participate in the study, who were 18 years of age or older, who had not used a product such as lotion, cream, cologne, soap, disinfectant in the last hour and who did not have any communication problems were

included in the study. Individuals with open wounds in the area to be measured and individuals who had used a product that could affect the measurement results in the last hour were excluded from the study.

Data Collection Process

Participants were informed about the purpose and process of the study. It was explained to the participants that participation was completely voluntary, that the questionnaires were filled out anonymously, that they would not be subjected to any pressure if they chose not to complete or incompletely complete the questionnaire, and that they could withdraw from the study at any time. Research data were collected using the Individual Identification Form. Data collection forms were administered by the researcher using face-to-face interview method. In addition, skin pH level and skin moisture level of the participants were measured. During the measurement, individuals sat in a comfortable chair and extended the hand to be measured. An additional backrest was used to ensure that the measurement was performed in a standard manner for each individual. The skin pH measurement device was placed in contact with the skin. After the device indicated that the measurement was complete, the measurement was finalized and the result was recorded. After the measurement was completed, the device's probe was wiped with a damp cotton swab to prepare it for the next measurement. The device's probe only came into contact with the skin, and no invasive procedures were performed on the individual. Skin moisture measurement was also performed in accordance with these steps. Both devices were chosen because they can measure through the skin and have high measurement reliability. The calibration of the skin pH measurement device was performed according to the frequency of use, once a day for frequent use and once a week for infrequent use.

Individual Identification Form

The Individual Identification Form consists of four sections: sociodemographic characteristics, information on health and disease, information on dermatologic problems and information on herbal product use. This form was developed by reviewing the relevant literature.^{7,22,24,27}

Sociodemographic Characteristics: It consists of questions about age, gender, marital status, educational status, place of residence for the longest time, employment status, occupation, income status, social security and family type.

Health and Disease Related Characteristics: It consists of questions such as duration of diagnosis of chronic diseases, smoking/alcohol use, regular medication use, and regular check-ups.

Information on Herbal Product Use: It consists of questions such as herbal product use status, how long she has been using it, and its effect.

Information on Dermatologic Problems: It consists of questions such as the presence of dermatologic problems, how long they have been seen, and the level of impact on daily life activities.

Statistical Analysis

The research data were analyzed using the IBM Statistical Package for the Social Sciences (SPSS) for Windows 26.0 package program. Data on the descriptive characteristics of the participants were given as number, percentage, mean and standard deviation values. Chi-square test and Mann Whitney U test were also used in the study.

Results

The mean age of the participants was 37.83 ± 16.35 and 54.4% were female. 29.4% of the participants stated that they used herbal products topically (Table 1). Of the individuals who used herbal products topically, 52.3% reported that they applied this product in the form of oil, 43.0% reported that they had been using this product for 2-4 years, and 92.6% reported that they were still using this product. According to the research analysis, 61.1% of individuals who use herbal products topically started to use this product by seeing it on the internet. Most of the participants (93.3%) were not aware of the use of topical herbal products by their physicians or nurses and almost all of them (96.6%) did not develop side effects (Table 2).

It was determined that 47.7% of the participants had dermatologic disorders. The three most common diseases were hair loss (32.2%), eczema (29.8%) and acne (19.4%). The mean skin pH level of the participants was 4.97 ± 0.44 and the mean skin moisture level was 18.59 ± 5.23 (Table 3).

While 49.2% of individuals with dermatologic disorders used herbal products topically, 11.3% of individuals without dermatologic disorders used herbal products topically. According to the chi-square analysis, it was determined that individuals with dermatologic disorders used herbal products at a significantly higher rate than individuals without dermatologic disorders ($p=0.000$) (Table 4).

The skin pH level of individuals who used herbal products topically was 4.90 ± 0.40 (Min=4.09-Max=5.98), while the skin pH level of individuals who did not use herbal products topically was 5.00 ± 0.46 (Min=4.12-Max=6.60). There was a significant difference between the skin pH levels of individuals who used herbal products and those who did not ($p=0.037$, $Z=-2.084$) (Table 5).

The skin moisture level of individuals who used herbal products topically was 20.77 ± 4.90 (Min=11.50-Max=34.10), and the skin moisture level of individuals who did not use herbal products topically was 17.69 ± 5.10 (Min=10.40-Max=38.40). There was a significant difference between the skin moisturization levels of individuals who used herbal products and those who did not ($p<0.000$, $Z=-6.935$) (Table 5).

Table 1. Sociodemographic characteristics of participants

Demographic Variables	n	%
Gender		
Female	276	54.4
Male	231	45.6
Marital status		
Married	236	46.5
Single	271	53.5
Place of residence		
Village	53	10.5
City center	454	89.5
Education status		
Literate	13	2.6
Primary education	73	14.4
High School	158	31.2
University and above	263	51.9
Employment status		
Working	205	40.4
Not working	302	59.6
Profession		
Student	172	33.9
Officer	111	21.9
Worker	87	17.2
Retired	59	11.6
Housewife	78	15.4

Table 2. Characteristics of participants regarding topical use of herbal products

Variables	n	%
Topical Use of Herbal Products		
Yes	149	29.4
No	358	70.6
Form of herbal products		
Lotion/cream	39	26.2
Cologne	10	6.7
Oil	78	52.3
Shampoo	12	8.1
Other (gel, soap)	10	6.7
Duration of use (year)		
0-2	50	33.5
2-4	64	43.0
4 and ↑	35	23.5
Currently in use		
Yes	138	92.6
No	11	7.4
Who recommends the herbal product*		
Doctor/nurse	9	6.0
Family/relatives/neighbors	60	40.3
TV/radio	18	12.1
Internet	91	61.1
How the use of herbal products affects the skin		
Moisturized	125	83.9
Dried	9	6.0
Did not change	15	10.1
Whether the doctor/nurse is aware of the use of herbal products		
Yes	10	6.7
No	139	93.3
Development of side effects due to herbal product use		
Yes	5	3.4
No	144	96.6

*Participants marked more than one option in these question

Table 3. Characteristics of participants regarding dermatologic disorders

Variables	n	%
Dermatologic disorders		
Yes	242	47.7
No	265	52.3
Complaints of individuals		
Wound	25	10.3
Itching	63	26.0
Skin rash	40	16.5
Sweating	40	16.5
Redness	36	14.9
Diseases of individuals		
Psoriasis	7	2.9
Eczema	72	29.8
Dermatitis	9	3.7
Acne	47	19.4
Urticaria	15	6.2
Fungus	39	16.1
Hair loss	78	32.2

*Participants marked more than one option in these questions.

Table 4. The relationship between dermatologic disease and herbal product use

		The herbal product use		<i>p</i>
		Yes	No	
Dermatological disorder	Yes	119	123	<i>p</i> =0.000
	No	30	135	

Table 5. The relationship between herbal product use and skin pH and skin moisture

	The herbal product use	$\bar{x} \pm SD$	Test	<i>p</i>
Skin pH	Yes	4.90 $\pm$ 0.40	Z=-2.084	<i>p</i> =0.37
	No	5.00 $\pm$ 0.46		
Skin moisture	Yes	20.77 $\pm$ 4.90	Z=-6.935	<i>p</i> =0.000
	No	17.83 $\pm$ 5.70		

Discussion

In this study, the level of topical herbal product use of individuals with and without dermatologic disorders was determined and skin moisturization and skin pH levels were determined. This is one of the limited number of studies in the literature evaluating topical herbal product use in the community.

Nearly half of the participants reported using herbal products topically, which suggests a strong personal interest in natural products applied directly to the skin. Again, the fact that 52.3% of those who use herbal products externally use this product in oil form may be due to the high moisturizing properties of oils and their antioxidant, anti-inflammatory and antimicrobial effects.^{11,13,17}

The widespread use of herbal products by participants after seeing them online demonstrates how powerful the internet has become as a platform for marketing and information sharing. Similar to our study, in a study by Uçan and colleagues, patients reported that they generally obtained information about non-pharmacologic methods from family and friends, the internet, television and herbalists.²² However, it is not clear whether the information on the internet is reliable and based on evidence-based information. Therefore, it is very important for individuals to have access to accurate and reliable information about herbal products that can directly affect their health. At this point, individuals' health literacy levels come into play. Individuals with high levels of health literacy have the ability to obtain information from accurate and reliable sources, to question whether the information is based on scientific foundations, and to understand medical terms.^{23, 24} Therefore, it is of great importance to increase the health literacy levels of individuals in order for them to access accurate information on the use of herbal products and to expand awareness-raising and educational activities.

The fact that most of the participants were not aware that their physicians or nurses were using these products suggests that there is a lack of communication between health professionals and patients. In their study on the use of complementary therapies such as herbal products, Araz *et al.* reported that the majority of patients did not inform their nurses and physicians, and the reason for this was the different attitudes of health professionals towards this issue.²⁵ This may pose a risk for potential side effects of herbal products or interactions with

drugs. It is important that healthcare professionals inform patients about the use of herbal products and establish a more open communication on this issue.^{26,27}

Almost all participants (96.6%) reported no side effects indicates. However, this finding should not be taken to mean that herbal products are completely risk-free. The possibility of side effects occurring in the long term or rare effects should not be ignored.^{26,28}

The fact that almost half of the participants have a dermatological condition shows that skin problems are an important health problem in the society. The fact that 49.2% of individuals with dermatologic conditions use herbal products topically shows that this group is more likely to use herbal products in search of solutions to skin problems. On the other hand, only 11.3% of individuals without dermatologic conditions used herbal products, suggesting that these products are more popular especially among individuals with skin problems. Although there were no studies on topical use of herbal products in individuals with dermatologic disorders, studies conducted in different groups in the literature show that the use of herbal products may be common. In a study conducted with diabetes patients, it was found that 35.7% of patients used herbal products.²⁶ In a study conducted with families of pediatric patients, it was found that 74.4% of the participants let their children use herbal products.²⁹ Among the reasons for the use of herbal products by individuals, trust in traditional treatment methods, the effect of the internet and social media, and the search for psychological relief can be counted.^{22,28}

A healthy skin pH is generally considered to be in the range of 4.5-5.5. Although the average pH values of both groups were in this range, the pH values of individuals using herbal products were lower, indicating that these products may support the acidic barrier of the skin. However, the ingredients and formulation of herbal products may have different effects on skin pH. Therefore, the effect of each herbal product on skin pH should be evaluated separately.^{30,31} The skin moisturization level of individuals using herbal products was significantly higher than non-users. Considering that topical use of herbal products in the study was mostly in oil form, this is an expected finding. In addition, natural oils, moisturizing ingredients and antioxidants contained in herbal products can increase the moisture retention capacity of the skin.^{21,32}

Limitations

In our study, detailed data such as herbal product use rates, duration of use, forms and reasons for use were presented. The determination of skin moisturization and pH levels allowed for a scientific assessment that was not based solely on subjective statements. Despite such strengths, several limitations should be recognized. First of all, since the results of this study are only for the region, it is important to conduct further research with variables that can be planned for more comprehensive studies. Secondly, the fact that the participants' dermatologic conditions and herbal product use were only assessed based on their own statements is also a limitation of the study.

Conclusion

This study is one of the limited number of studies examining the relationship between dermatological disorders and the topical use of herbal products. Our findings highlight that the topical use of herbal products may affect skin pH levels and skin moisture levels, emphasizing the importance of careful

use in individuals with dermatological conditions. However, public awareness should be raised regarding the conscious and controlled use of herbal products, and more scientific research is needed on their efficacy and safety. It should not be forgotten that the composition and formulation of herbal products may have different effects on skin pH and moisture. Additionally, the long-term effects of herbal product use and its role in skin microbiota should be investigated. It is crucial to create educational content on the safe use of topical herbal products through platforms such as the internet, television, and radio, and to raise public awareness about health literacy. The knowledge and awareness of healthcare professionals on these issues will contribute to the controlled and safe use of topical herbal products, especially in individuals with dermatological conditions.

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Conflict of Interest

The authors declare no conflicts of interest.

Compliance of Ethical Statement

Permission was obtained from Artvin Çoruh University Scientific Research and Publication Ethics Committee (Number: E-18457941-050.99-113094 Date: 10.11.2023). Participants were informed before the study and data collection started after verbal informed consent was obtained from all participants.

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Author Contributions

A.T., S.D.S., H.K., Y.Y.: Study idea/Hypothesis; A.T., S.D.S., H.K.: Design; A.T., S.D.S.: Data Collection A.T., H.K.: Analysis; A.T., H.K.: literature review, visualization and writing; A.T., Y.Y.: Critical review and supervision

References

- Barankin B, DeKoven J. Psychosocial effect of common skin diseases. *Canadian Family Physician*. 2002;48(4):712-716.
- Demirci OO, Ates B, Sagaltici E, Ocak ZG, Altunay IK. Association of the attachment styles with depression, anxiety, and quality of life in patients with psoriasis. *Dermatologica Sinica*. 2020;38(2):81-87. doi:10.4103/ds.ds_35_19
- Solgaiová A, Sollár T, Vörösová G, Zrubcová D. The incidence of anxiety, depression, and quality of life in patients with dermatological diseases. *Cent Eur J Nurs Midw*. 2016;7(3):476-483. doi: 10.15452/CEJNM.2016.07.0018
- Storer B, Kershaw KA, Braund TA, et al. The prevalence of anxiety disorders in dermatology outpatients: a systematic review and meta-analysis. *J Eur Acad of Dermatol Venereol*. 2023;37(8):1576-1586. doi: 10.1111/jdv.19151
- Ahuja A, Gupta J, Gupta R. Miracles of Herbal Phytomedicines in Treatment of Skin Disorders: Natural Healthcare Perspective. *Infect Disord Drug Targets*. 2021;21(3):328-338. doi:10.2174/1871526520666200622142710
- Dattner AM. Herbal and complementary medicine in dermatology. *Dermatol Clin*. 2004;22(3):325-vii. doi:10.1016/j.det.2004.03.005
- Gül Ü. Dermatolojik Hastalıklarda Fitoterapi Uygulamaları. *Türkiye Klinikleri J Dermatol*. 2021;31(1):36-44. doi:10.5336/dermato.2020-73866
- Kaźmierska A, Bolesławska I, Polańska A, et al. Effect of Evening Primrose Oil Supplementation on Selected Parameters of Skin Condition in a Group of Patients Treated with Isotretinoin-A Randomized Double-Blind Trial. *Nutrients*. 2022;14(14):2980. doi:10.3390/nu14142980
- Abelan US, de Oliveira AC, Cacoci ÉSP, et al. Potential use of essential oils in cosmetic and dermatological hair products: A review. *J Cosmet Dermatol*. 2022;21(4):1407-1418. doi:10.1111/jocd.14286
- Vitale S, Colanero S, Placidi M, et al. Phytochemistry and Biological Activity of Medicinal Plants in Wound Healing: An Overview of Current Research. *Molecules*. 2022;27(11):3566. doi:10.3390/molecules27113566
- Mori HM, Kawanami H, Kawahata H, Aoki M. Wound healing potential of lavender oil by acceleration of granulation and wound contraction through induction of TGF-β in a rat model. *BMC Complement Altern Med*. 2016;16:144. doi:10.1186/s12906-016-1128-7
- Ardiana D. The role of Tea tree oil as a skin antimicrobial: A literature study. *Medical and Health Science Journal*. 2021;5(1):26-33. doi:10.33086/mhsj.v5i1.1921
- Thomas J, Carson CF, Peterson GM, et al. Therapeutic Potential of Tea Tree Oil for Scabies. *Am J Trop Med Hyg*. 2016;94(2):258-266. doi:10.4269/ajtmh.14-0515
- Pisseri F, Bertoli A, Nardoni S, et al. Antifungal activity of tea tree oil from *Melaleuca alternifolia* against *Trichophyton equinum*: an in vivo assay. *Phytomedicine*. 2009;16(11):1056-1058. doi:10.1016/j.phymed.2009.03.013
- Saraf S, Sahu S, Kaur CD, Saraf S. Comparative measurement of hydration effects of herbal moisturizers. *Pharmacognosy Res*. 2010;2(3):146-151. doi:10.4103/0974-8490.65508
- Sumit K, Vivek S, Sujata S, Ashish B. Herbal cosmetics: used for skin and hair. *Inven. J*. 2012;4:1-7.
- Dal'Belo SE, Gaspar LR, Maia Campos PM. Moisturizing effect of cosmetic formulations containing Aloe vera extract in different concentrations assessed by skin bioengineering techniques. *Skin Res Technol*. 2006;12(4):241-246. doi:10.1111/j.0909-752X.2006.00155.x
- Souilah N, Amina B, Hamdi B, et al. Ethnobotanical investigation of *Pistacia lentiscus* L. grown in El Kala (Algeria), and phytochemical study and antioxidant activity of its essential oil and extracts. *Nat Prod Res*. 2023;37(9):1583-1588. doi:10.1080/14786419.2021.2024825
- Gediya SK, Mistry RB, Patel UK, Blessy M, Jain HN. Herbal plants: used as a cosmetics. *J Nat Prod Plant Resour*. 2011;1(1):24-32.
- Flynn TC, Petros J, Clark RE, Viehman GE. Dry skin and moisturizers. *Clin Dermatol*. 2001;19(4):387-392. doi:10.1016/s0738-081x(01)00199-7
- Draeos ZD. The science behind skin care: Moisturizers. *J Cosmet Dermatol*. 2018;17(2):138-144. doi:10.1111/jocd.12490
- Uçan Ö, Owayolu N, Pehlivan S. Hemodiyaliz hastalarının alternatif yöntem kullanımına ilişkin bilgi ve uygulamaları. *Sağlık ve Toplum Dergisi*. 2007;17:56-60.
- Ekinci Y, Tutgun Ünal A, Tarhan N. Dijital sağlık okuryazarlığı üzerine bir alanyazın incelemesi. *Bayterek Uluslararası Akademik Araştırmalar Dergisi*. 2021;4(2), 148-165. doi:10.48174/buaad.42.1
- Kerkez N, Şahin T. Sağlık okuryazarlığı ile sağlık algısı ilişkisinin incelenmesi üzerine bir araştırma. *Balıkesir Sağlık Bilimleri Dergisi*. 2023;12(2), 336-346. doi:10.53424/balikesirsbd.1177899
- Araz A, Harlak H, Meşe G. Sağlık davranışları ve alternatif tedavi kullanımı. *Koruyucu Hekimlik*. 2007;6(2):112-122.
- Ergün U, Ürk A, Kırık A, Uysal A, Eroğlu M. Diyabetik hastalarda ilaç dışı bitkisel ürün veya diğer yöntemlerin kullanımı. *Kocatepe Tıp Dergisi*. 2021;22(2):119-124. doi:10.18229/kocatepetip.704261
- Kahraman H, Ceyhan Ö, Taşcı S. Cerrahi yara iyileşmesinde bitkisel ürünlerin kullanımı. *Yaşam Boyu Hemşirelik Dergisi*. 2024;2(2):74-86.

28. Başaran N, Paslı D, Başaran AA. Unpredictable adverse effects of herbal products. *Food Chem Toxicol.* 2022;159:112762. doi:10.1016/j.fct.2021.112762
29. Bulut S, Karakaş N, Orhan DD. Pediatri hastalarında bitki ve bitkisel içerikli ürün kullanım alışkanlıklarının değerlendirilmesi. *Sağlık ve Toplum.* 2021;31(2):172-180.
30. Ali SM, Yosipovitch G. Skin pH: from basic science to basic skin care. *Acta Derm Venereol.* 2013;93(3):261-267. doi:10.2340/00015555-1531
31. Schmid-Wendtner MH, Korting HC. The pH of the skin surface and its impact on the barrier function. *Skin Pharmacol Physiol.* 2006;19(6):296-302. doi:10.1159/000094670
32. Michalak M. Plant Extracts as Skin Care and Therapeutic Agents. *Int J Mol Sci.* 2023;24(20):15444. doi:10.3390/ijms242015444