

Wood's Lamp: A Valuable Tool for Diagnosing Dermatological Diseases and Assessing Facial Skin Hydration Levels [†]

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Abstract

The skin, as the body's largest organ, reflects overall health and is shaped by factors such as diet, habits, work environment, and lifestyle. A Wood's lamp offers significant advantages for assessing skin health. Our study leveraged Wood's lamp to evaluate facial skin hydration and the impact of a diet rich in water, fruits, and vegetables. Conducted with 14 women, the study included the assessment of skin hydration levels. Remarkable improvements were observed in 13 participants, including enhanced skin hydration, reduced surface lesions, and better-regulated sebum levels.

Keywords: light; water intake; antiaging

1. Introduction

Water is the major component of bodily fluids such as blood, synovial fluid (the fluid in joints), saliva, and urine, which perform vital functions in the body. At the molecular level, water plays a role in the formation, diffusion, transport, transformation, activation, and recombination of atoms, ions, and molecules within the body [1]. Some of the most important bio-chemical reactions, such as oxidation, hydration, hydrolysis, pressure, and solubilization, occur only in the presence of water and with its assistance. According to the World Health Organization, the recommended adequate water intake for an individual is 1.5 to 2 L per day, depending on body size and weight. Another method for calculating water needs is based on the fact that the requirement is 1 mL for every Kcal consumed by a healthy adult, which translates to approximately 35 mL/kg of body weight, and 1.5 mL per Kcal for children, which amounts to about 50–100 mL/kg of body weight. Newborns need approximately 150 mL/kg of body weight. For pregnant women, the necessary water intake is 600–700 mL higher, while individuals engaging in intense physical activity will have increased daily water needs that vary depending on the duration, type, and intensity of the physical effort [2].

The skin is the largest multifunctional organ of the human body, composed of mineral salts, water, proteins, fat cells, collagen, elastin fibers, and glucose. It is colonized by a



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diverse array of microorganisms, many of which are harmless or even beneficial to the host. The skin acts as an impermeable, insulating barrier, protecting the body from extreme temperatures and harmful chemicals. Additionally, it secretes antibacterial substances that prevent infection and produces vitamin D, which is essential for transforming calcium into healthy bones. Furthermore, the skin serves as a giant sensor containing neural networks that keep the brain connected to the outside world. At the same time, the skin facilitates free movement, proving to be an astonishingly adaptive organ [1]. The innate and adaptive immune responses of the skin can modulate the skin microbiota. The skin also serves as a reservoir for nutrients and water and contributes to important metabolic activities. Based on the appearance of the skin, elasticity, dryness, peeling, roughness, sebum level, and skin pH, the levels of hydration and dehydration can be analyzed and evaluated [3]. The skin performs, among other functions, the role of protecting the human body against dehydration, acting as a strong barrier against harmful and damaging factors, and controlling trans-epidermal water loss [4]. This protective capacity is essential for maintaining the body's water balance and preventing complications that may arise from dehydration. By analyzing these characteristics of the skin, appropriate measures can be taken to ensure proper hydration and overall skin health. Measuring the pH of the skin's surface is an indicator for determining its acidity. Healthy skin is slightly acidic. The acid mantle in the stratum corneum is important for both forming the permeability barrier and providing microbial defense for the skin. The pH of the skin is influenced by a number of endogenous factors, such as skin moisture, sweating, sebum production, anatomical location, genetic predisposition, and age. Additionally, exogenous factors such as the use of hygiene products, cleansing agents, cosmetics, creams, and various pharmaceuticals like antibiotics can affect skin pH. When the pH is altered, various skin dysfunctions can occur, such as atopic dermatitis, skin lesions, acne, bacterial infections, or irritations [5]. The mechanisms by which skin aging or damage can be slowed down or delayed include nutritional interventions. Skin aging is characterized by the formation of wrinkles due to the loss of elasticity and firmness, leading to sagging skin. Skin aging is an internal as well as an external process. Among external factors, photoaging caused by UV radiation, smoking, and poor nutrition have the most significant impact on the skin, even leading to skin cancer [5].

2. Materials and Methods

The present study aimed to follow up the importance and effect of good hydration on the skin and whole-body health. The studied series included 10 women aged between 35 and 45 years old, and tested during 4 weeks with special equipment developed with this aim. During this period, other treatments were not administered, so as not to interfere with the final results. Before inclusion in the study, the subjects signed an informed consent form for participation and use of images and personal data. A Wood's lamp, a piece of equipment used in the dermatology office and body care salons, detected the hydration and regeneration levels of the skin. In skin dehydration, this lamp can aid in the detection of specific characteristics, such as (i) skin appearance—darker than normal skin, because dehydrated skin reflects light differently; (ii) corneum layer (superior skin layer), which can appear whitish or pale under a Wood's lamp if dehydrated because transparency and cell cohesion are lost; (iii) desquamation and microcracks, which become more visible under examination with a Wood's lamp, because they reflect the UV light. Among its most important advantages in its usage are the noninvasiveness and quick evaluation for a diagnosis, but sensitivity is limited and interpretation subjective. For testing, the patient is introduced into a dark room, in order to reduce interferences caused by external light, and the lamp is applied on different skin regions. The parameters followed are color changes,

density changes, microcracks, and desquamation. After examination with a Wood's lamp, pigmentation, black spots, oily skin, dehydrated skin, thin corneum layer and acne can be evaluated.

3. Results

For the evaluation of the degree of skin dehydration in 14 subjects included in this study, we checked their skin characteristics with a Wood's lamp, and the results are shown in Figure 1.

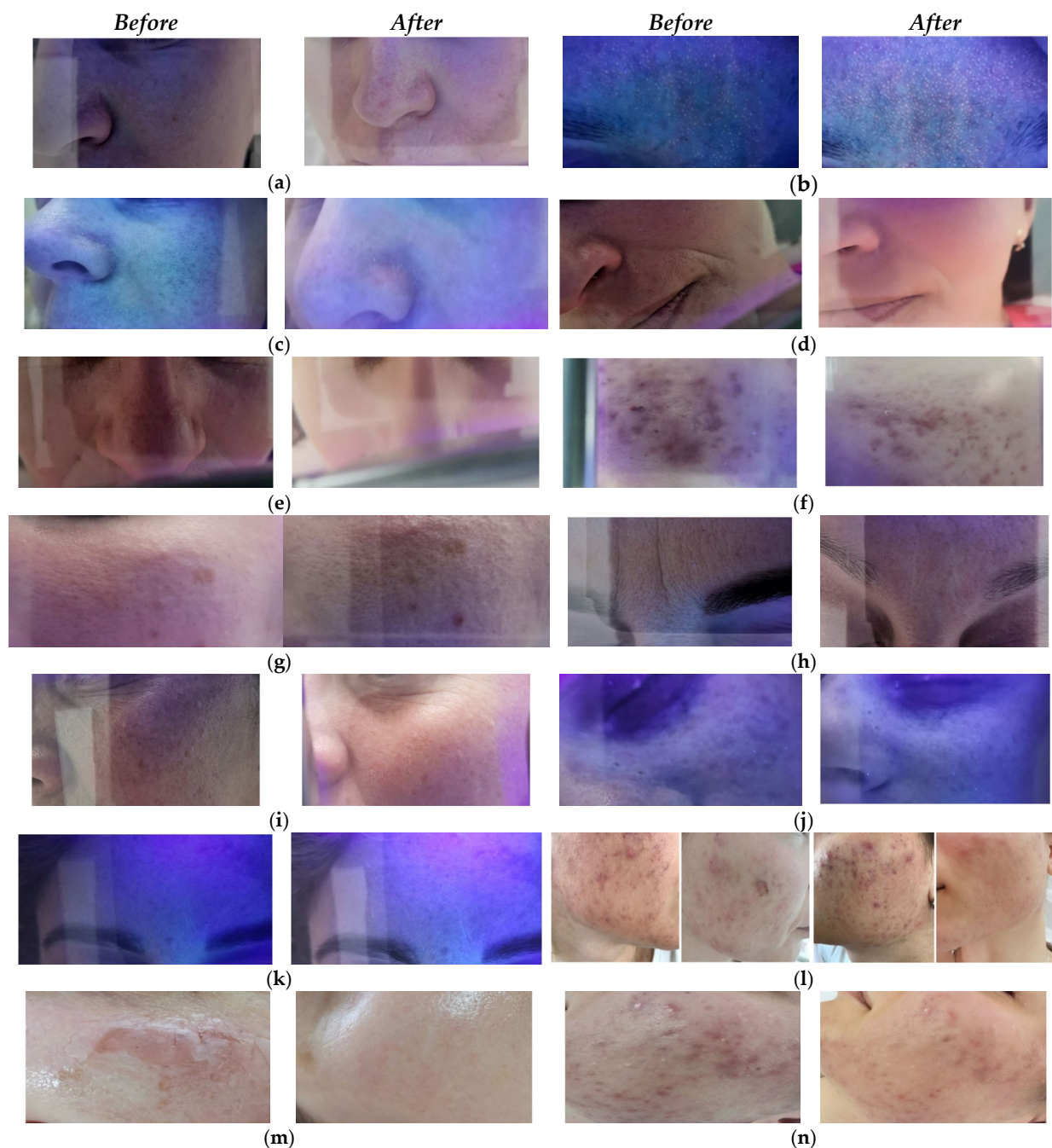


Figure 1. Images of the skin of the individuals included in the study, captured with a Wood's lamp before and after the four-week testing period. PC, 45 years old (a), mixed skin with enlarged pores and dull appearance, opaque and dried in the nose area. After 4 weeks, the skin was enlightened and internally hydrated, and became more elastic. CC, 38 years old (b), dehydrated skin, hyperpigmentation, dark skin appearance. After 4 weeks, the appearance was a little better. PA, 41 years old (c), fatigued,

loose skin. After 4 weeks, the skin became more hydrated. TR, 46 years old (d), deep wrinkles, dehydrated, dull appearance. After 4 weeks, appearance improved; the skin was luminous and better hydrated. The size of pores and wrinkles was smaller, and skin appearance was healthy. HI, 40 years old (e), dried skin, pores in the T area. After 4 weeks, reduced pores and shiny aspect were observed. The skin regained a more radiant and hydrated appearance. RM, 39 years old (f). The skin, affected by acne vulgaris, with inflamed pimples and an oily appearance, showed improvement after four weeks. The inflammation of the pimples was reduced, the amount of sebum decreased, and the pores began to heal. There were noticeable areas of slightly healed skin. The skin's hydration level improved, and the complexion regained its optimal level of hydration. HO, 35 years old (g), oily skin with dehydrated and sagging appearance. After the testing period, a slight tendency towards improved hydration was observed. DA, 35 years old (h), dry skin with enlarged pores and expression lines. After four weeks, an improvement in the appearance of wrinkles was observed. The skin appeared more radiant. AC, 40 years old (i), sensitive skin due to sun exposure and the use of inappropriate skincare products. After four weeks, the skin appeared slightly soothed, with no recent signs of irritation. BM, 39 years old (j), oily skin with pores clogged by sebum and acne lesions. The skin lacked vitality due to dehydration and external factors such as pollution, smoking, and improper use of cosmetic products. After improvement, the skin regained its firmness, the pores became smaller, and sebum secretion was reduced due to better hydration. HT, 37 years old (k), dry skin with slight exfoliation, dull appearance, and lack of radiance. After four weeks, a slight improvement in the skin's elasticity and luminosity was observed. CM, 35 years old (l), acne-prone skin displaying blackheads, pimples, and cysts, along with redness and inflammation. The skin showed improvement, with reduced pores and decreased sebum production. It appeared more hydrated and radiant. ML, 45 years old (m), skin with a high level of dehydration, showing shiny pores and sebum. There was skin sensitivity present. After the testing period, the skin appeared more hydrated, with an improved appearance of the pores. DI, 35 years old (n), oily skin with pustules and sebaceous comedones. The pores were clogged and enlarged. The skin was dehydrated, sensitive, with a tendency for irritation, redness, and flaking. After four weeks, a slight improvement in the pores and sebum levels was observed. The skin regained some of its hydration, appearing more radiant, with reduced sebum production. Elasticity returned to normal levels.

In recent years, the general population very often address specialists for the identification and evaluation of their health status, especially because of the increased concern for promoting and improving health status at every segment of the population. In order to overcome subjective interpretations, research progress has enabled the development of cutting-edge equipment that can identify problems in very early stages.

The skin represents the most extensive part of the human body and represents a mirror reflecting the quality of life of the tested person, irrespective of the subject's nutrition, habits, workplace, or lifestyle. A Wood's lamp is a piece of equipment developed for increasing the living standards of the population and is very often part of the basic equipment in the dermatocosmetic laboratory. Different studies have examined its usage in the identification of skin problems like dark circles, wrinkles or dehydration [6]. A Wood's lamp is the preferred instrument for the detection of skin problems using UV light. The lesions seen with this lamp were significantly better described, leading to the identification of new lesions that could not be observed clinically or those that are in the early stages and cannot be seen in normal light conditions [7]. This lamp type was successfully used in the identification of skin dehydration degree by German specialists who also treated these lesions [8]. Besides external factors like life conditions or pollution, nutrition has a crucial role in keeping the skin hydrated. Several studies proved that increased water input led to increased profound skin hydration, skin elasticity and capacity to restore the initial form, which can be explained by the capacity of skin to store water [9]. The same feature was found by Palma et al., who proved that increasing the liquid input, either water or other liquids, determines hydration in the superficial skin layers but also in the deeper parts because there is more water available for normal physiologic processes [10]. The same

results can be observed in our study where, together with increasing the water volume, surface skin lesions lost intensity, and the hydration degree and general aspect of the skin was improved (Figure 1). Similarly, when we evaluated the influence of liquid input on hydration status and skin barrier characteristics, we found that the skin pH and face hydration were associated with liquid input [11].

Williams et al. showed that, with the healthy habit of drinking at least 2 L of water per day, skin status is considerably improved, and dehydration-associated problems are eliminated. With a correct and equilibrated liquid input, good effects on skin were observed after 2 weeks, and after 4 weeks, skin density and hydration level improved significantly [12]. According to several studies, when nutrition is equilibrated by the consumption of fruits and vegetables and constant physical activity, rehydration skin level increases in the order face > décolletage > neck > arms, with the best results observed in the cheeks [13]. According to the degree of hydration, Cortes et al. identified 23 different skin regions, even if the face region is the best studied because of the high interest of the cosmetic industry and dermatology [14]. Water is vital not only for keeping skin healthy but also for good functioning of the whole body. For people with dehydration problems, the first signs of recovery are seen at the skin level [15]. This is clear for our study, where in 4 weeks only the degree of skin hydration of the face increased significantly. Of the 14 women included, all but one showed significant changes (Figure 1j). Japanese women, well known for their skin aspect, eat food with high water content. In a study on 1086 women from Japan, which investigated the correlations of a diet containing lipids, fruits, and vegetables with skin aging, it was proved that when green and yellow fruits and vegetables were eaten, hydration and elasticity increased exponentially. In the same study, it was shown that the skin is highly sensitive to external factors—its degree of hydration being greatly influenced by humidity [16].

4. Conclusions

The skin is a reflection of the body's overall health. Unhealthy eating habits are one of the most significant contributing factors to the onset of various pathologies, regardless of their nature. On the other hand, healthy foods have a beneficial effect, especially for the optimal development and functioning of epithelial cells. The evaluation of skin dehydration using a Wood's lamp showed that, over the three-week testing period, 13 out of the 14 individuals in this study experienced improvements in their skin's overall appearance, largely due to increased hydration. Skin hydration varies across different areas of the body; however, future research is needed to develop a comprehensive skin hydration map that takes this into account. The importance of physical activity in maintaining skin hydration levels is another topic that could be explored in future research, as significant gaps still persist in this area.

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all subjects involved in the study. Written informed consent has been obtained from the patient(s) to publish this paper.

Informed Consent Statement: Informed consent form for participation and use of images and personal data was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on reasonable request from the corresponding author. The data are not publicly available due to privacy and ethical restrictions related to patient confidentiality.

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