



## THE SKIN BARRIER IN SENSITIVE SKIN SYNDROME

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### ABSTRACT

**Background:** Sensitive Skin Syndrome (SSS) is predominantly a self-defined condition without objective pathological findings. The syndrome presents with sudden and easily provoked flushes accompanied by unpleasant sensations like itching, pain or numbness in response to stimuli that usually do not cause such sensations.

The intact skin is a barrier to uncontrolled water loss, plasma components and proteins from the organism. It is therefore assumed that one of the possible explanations of itching and other unpleasant sensations in SSS should be resulting in a dysfunctional skin barrier.

**Purpose:** was to establish is there a dysfunction of the skin barrier in SSS patients.

**Objective and Methods:** The presented study includes 64 females self-diagnosed with SSS and 45 females self-diagnosed with NSS (non-sensitive skin). Demographic data were collected from registers of Medico-Aesthetic Center “Medea” Varna from April 2017 till April 2019. Trans epidermal Water Loss (TEWL) and Hydration (H) of the epidermis in three different areas of the body were measured as an indicator of normal skin barrier functioning.

**Results:** No significant differences in skin barrier indicators in SS compare to NSS were found. No visible pathological changes were found in patients according to the duration of SSS. A slight correlation between abnormal levels of TEWL and H and the severity of disease was obtained.

**Conclusion:** All the reported and analyzed results indicate that disorders of the skin barrier are slightly connected with the severity and duration of SSS. This could be one of the explanations why adding topical treatment worsen rather than improve SSS. This is the first study in our country, which aims to measure the impact of changes in skin barrier on clinical characteristics of SSS.

**Keywords:** Sensitive Skin Syndrome, Skin Barrier Evaluation, TEWL,

### INTRODUCTION

In 1987 Maibach used the term Cosmetic Intolerance Syndrome, describing the condition of increased skin sensitivity without any visible changes [1]. Later the International Forum for the Study of Itch (IFSI) accepted the official definition of sensitive skin. Thus the syndrome is determined by the appearance of irritating sensations (sting-

ing, burning, pain, pruritus, and tingling sensations) in response to stimuli that usually do not cause such sensations [2]. Although an increase in the incidence of SSS, its pathogenesis is still not well distinguished.

Disorders of the skin barrier are suspected as a trigger or enhance pathological symptoms of SSS [3]. In most cases, the emphasis is on the increased permeability of the stratum corneum [4]. Other possible reasons, pointed by the authors, are sensory hyperreactivity [5], inflammatory or vascular response [6], and allergic predisposition [7].

This study explores the possible correlation or predominance of changes in skin barrier function as an underline mechanism of SSS.

### MATERIAL AND METHODS:

Epidemiological data were collected from registers of Medico-Aesthetical Centre “Medea” Varna from April 2017 till April 2019. The inclusion criteria for the study were age between 18 and 65 years and II to IV skin phototype. All examined patients were females.

Patients were asked to record their current skin sensitivity using the 10-item version of the Sensitive Scale. The Sensitive Scale-10 was the dermatology-specific instrument developed by a group of 4 experts. It comprises 10 items, giving a sum score ranging between 0 and 100. The skin irritability was measured from 0 to 10 by a visual analog scale. This validated self-assessment questionnaire has been used in many epidemiological studies of SSS in different countries and is available in English, Chinese, Portuguese, Spanish and Italian languages [8-9].

For the purpose of our study, the 10 items Sensitive Scale was translated to Bulgarian.

Patients gave written informed consent for data collection and analysis.

We used instrumental methods, including measuring H and TEWL in three body sites (left cheek, nuchal area and left palm) to evaluate the functioning of the Stratum Corneum (SC). The degree of H was measured with a capacitance meter (Corneometer CM 825), and the TEWL was determined using a measurement instrument Tewameter® TM 300.

The statistical analysis was performed with SPSS v.21.0 for Windows. Hypotheses were tested using  $\chi^2$ -criteria (for the descriptive profile data). Results with  $p < 0.001$  were interpreted as statistically significant.

## RESULTS

Socio-demographic characteristics are shown in table 1. The questionnaire score for both groups is visualized in table 2. In the SSS group, those with very sensitive skin were 17.51%, 56.27% were with mild sensitive skin and 26.22% with moderate SS. The distribution according to the duration of SSS is shown in table 3.

**Table 1.** Socio-demographic characteristics

	SSS	NSS
Self-assessed skin	64 (100%)	45 (100%)
Gender		
Female	64 (100%)	45 (100%)
Age	Mean age 43.17±14.45 years (range 22-65 years)	
Skin type(Fitzpatrick)		
Type II	12 (18.75%)	7 (15.55%)
Type III	38 (59.38%)	29 (64.45%)
Type IV	14 (21.87%)	9 (20.0%)
Employment		
Employed	38 (58.46%)	32 (71.11%)
Unemployed	4 (6.15%)	2 (4.44%)
Student	7 (10.76%)	3 (6.66%)
Retiree	15 (24.63%)	8 (17.70%)
Education		
Primary	4 (6.16%)	2 (4.44%)
Secondary	12 (18.46%)	9 (20.0%)
High	48 (75.38%)	34 (75.56%)
Facial skin dryness		
Normal	21 (32.81%)	17 (37.77%)
Dry	14 (21.53%)	8 (17.77%)
Oily	9(13.87%)	7 (15.55%)
Combined	20 (30.79%)	13 (28.91%)
Body skin dryness		
Normal	19 (30.77%)	21 (46.67%)
Dry	34 (52.31%)	17 (37.78%)
Oily	11 (16.92%)	7 (15.55%)

**Table 2.** Questionnaire score

SS 10	SSS (%)	NSS (%)
0-10	12.15	70.89
10-20	14.07	17.09
20-30	15.2	6.57
30-40	15.09	3.11
40-50	14.07	2.01
50-60	11.91	0.24
60-70	9.92	0
70-80	4.09	0
80-90	2.71	0
90-100	0.79	0

**Table 3.** The distribution according to the duration

Disease duration in months	Frequency (%)
6	10 (15.62%)
6-12	24 (37.6%)
13-24	11 (17.18%)
25-36	7 (10.93%)
Long time	4 (6.25%)
Don't know	8 (12.5%)
Total	64 (100%)

The results obtained from measuring TEWL in SSS and NSS show that the levels of TEWL in NSS skin are normal (14 g.m2.h/ range from 7.35 g.m2.h to 16.8 g.m2.h.) The levels of TEWL in SSS were a little higher (16.23 g.m2.h/ range from 8.35 g.m2.h to 31.22 g.m2.h.).The most distinct trend for correlation was accounted by comparing TEWL in SSS skin and severity of the disease. In a group of patients with very sensitive skin, TEWL was mean range 18-31(mean 27.22 g.m2.h), while in group with moderately sensitive skin TEWL was range 9- 19 (mean 12.23 g.m2.h). (p=0.004) (Fig.1). We compare the TEWL in dividing SSS patients according to the duration of the disease. The pathological changes were more visible in patients with a duration of SSS 13-24 months- mean 25.30

g.m2.h and more than 36 months from 20 g. m2.h to 29g.m2.h-mean 26.34 g.m2.h.(p=0.001) (Fig.2).

The results obtained from measuring H in NSS skin are normal (26.09/ range from 19 to 30.) The levels of H in SSS skin were lower (23.32/ range from 10 to 30.). Also, we compare the H dividing SSS patients according to the duration of the disease. (Fig.2). The pathological changes were more visible in patients with a duration of SSS 13-24 months- mean 22.17 and more than 36 months 17.75(p=0.008). The most distinct trend for correlation was accounted by comparing H in SSS skin and severity of the disease. In a group of patients with severe SSS H was a mean of 21.25, while in a group with moderate SSS H was a mean of 27.44(p=0.002) (Fig.1).

Fig. 1. TEWL and H according to the severity of disease

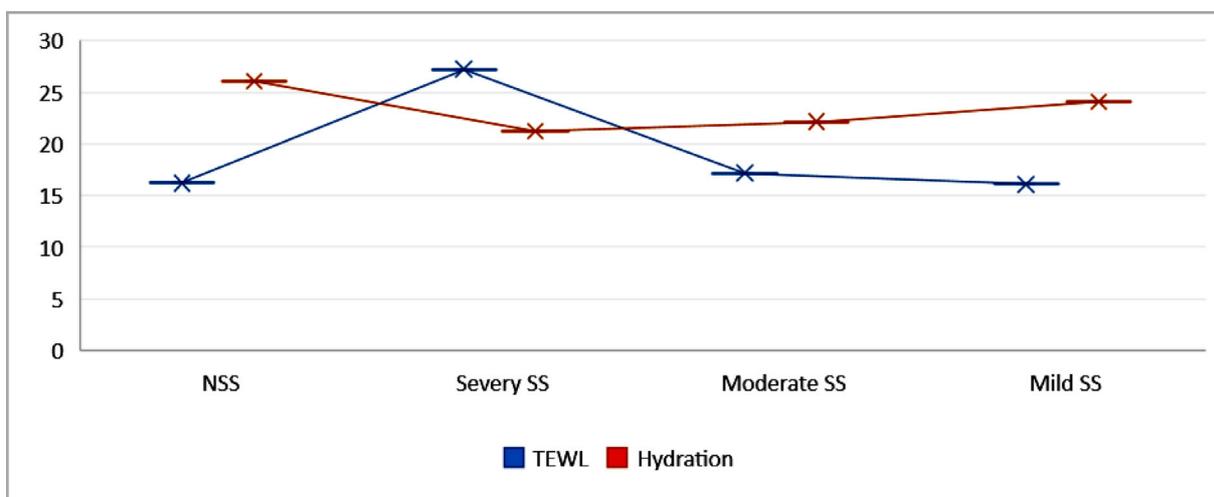
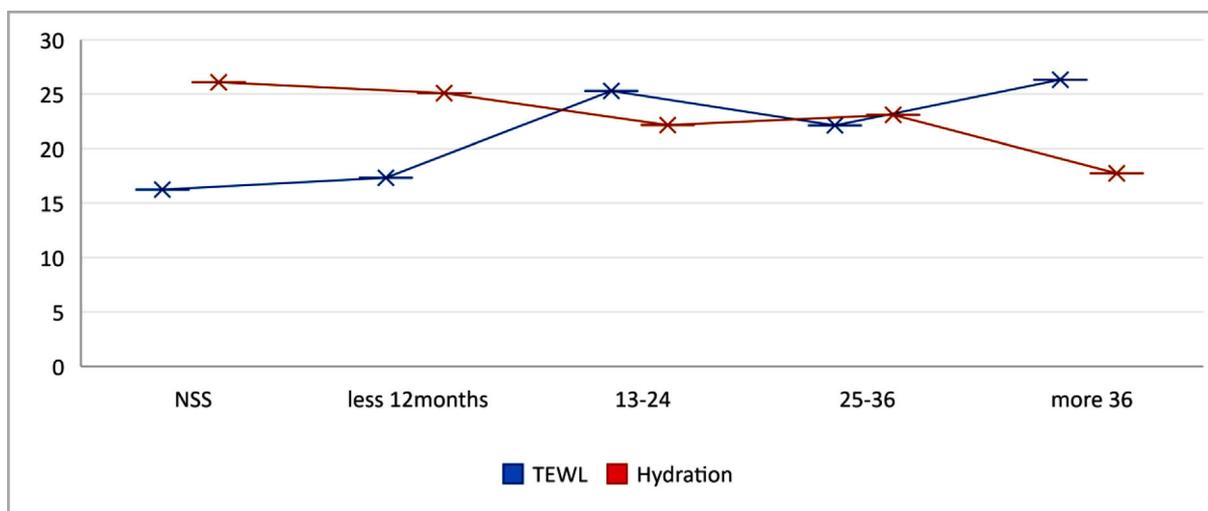


Fig. 2. TEWL and H according to the duration of disease



**DISCUSSION**

The SSS as a stand-alone condition is relatively new, although, in recent years, there has been a significant increase in the prevalence of self-reported SSS. In the literature, there are few studies on its epidemiology [9]. The different authors pointed out prevalence between 54, 47% to 25, 80% [10, 11]. Kim YR, reported the distribution of SSS

in the range of 56.8% and in some studies, the prevalence among women self-reported SS reaches 50-61% [6, 12, 13]. It should be noted that its rapid spread grows the interest of investigators. In the literature review made by Richters and coauthors, more than 1,700 articles and studies on the topic have been analyzed [8]. The authors emphasized the importance and complexity of the syndrome and pointed

out that the question of the complex pathogenetic mechanism is still unclear. In the context of this, the role of all factors associated with the change in skin reactivity, hydration and fluctuations in skin barrier function should be assumed as a possible explanation of SSS. Boulter E. et al. published data on the relationship between the homeostasis of the skin barrier (corneal layer) and the age and season [14]. Fan and coauthors analyzed the lipid function in SSS and NSS and suggested that that possible reason for SSS might be an unpaired skin barrier as a result of apoptosis and lack water [15]. Other researchers also pointed out the dysfunction of the skin barrier as a main underlying mechanism in SS [16]. On the other hand, there are few reports that no significant violations have been found in the barrier function of the SSS. Cho HL, et al. measured TEWL and performed a Lactic acid sting test in 50 volunteers (20 with SSS and 30 with non-SS) and concluded that there were no differences in TEWL and erythema index values between the two groups [17]. In another study conducted by Diogo and Papoila, insignificant differences in the functioning of the skin barrier in SSS and NSS were reported [18]. Other studies also noted that there was no statistically significant difference in skin compatibility in SSS and NSS

[19, 20]. The results obtained in our study show statistically insignificant differences both in terms of TEWL and skin hydration, which correlate with the results pointed out by Cho HL, et al. [17] and Diogo and Papoila [18]. The explanation for this could be the subjectivity in the diagnosis of SSS, on the other hand, this would explain why topical therapy aimed at stabilizing the skin barrier does not lead to a significant improvement in the condition.

## CONCLUSION

According to the reported and analyzed results, disorders of the skin barrier measured through the levels of TEWL and H are slightly connected with severity and duration of SSS. This is the first study in our country, which aims to measure the impact of changes in skin barrier on clinical characteristics of SSS.

## Limitations

The main problem in conducting the study was the subjectivity of the diagnostic criteria. This, despite the instrumental measurement of the factors connected closely to skin function, gives us reason to conduct the study in the future, including a larger group of patients.

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