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SENSITIVE SKIN IN THE POPULATION OF HERZEGOVINA-NERETVA COUNTY: PREVALENCEAND CLINICAL DATA

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SUMMARY

Introduction: *Sensitive skin has been described as a syndrome defined by the occurrence of unpleasant sensations (stinging, burning, pain, pruritus, and tingling sensations) in response to stimuli that normally should not provoke such sensations. Although often transient, and in many cases unaccompanied by visual dermatological responses, sensitive skin affects the quality of life. The aim of this survey was to assess the prevalence of sensitive skin and collect clinical data on sensitive skin in the population of Herzegovina-Neretva County.*

Subjects and methods: *The survey included a total of 73 participants, 45 female and 28 male, aged 20 years and above, with a diagnosis of sensitive skin syndrome (SSS) confirmed by physicians. A dermatological exam assessing skin type, phototype and skin sensitivity was performed. The survey collected an assortment of information including demographics and included customized standardized questionnaires that closely examine skin sensitivity and the burden of sensitive skin.*

Results: *Findings concurred with existing evidence that individuals with sensitive skin represent almost half the examined population. The prevalence of perceived sensitive skin was significantly higher in females than in males. The main skin symptom was itching, followed by prickling, warmth and numbness. Our results clearly show that there is a burden of sensitive skin.*

Conclusion: *This study investigated the prevalence of sensitive skin and the burden of sensitive skin in the population of Herzegovina-Neretva County. It is the first to focus on sensitive skin among Herzegovina-Neretva County population. Further studies are needed to bolster epidemiological data and physiological pathways of sensitive skin syndrome.*

Key words: *sensitive skin, sensitive skin syndrome, prevalence, clinical data*

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INTRODUCTION

Sensitive skin syndrome (SSS) is a widely reported complaint and a diagnostic challenge because of its subjective symptoms and lack of clearly visible manifestations. Sensitive skin has been described as a syndrome defined by the occurrence of unpleasant sensations (stinging, burning, pain, pruritus, and tingling) in response to stimuli that normally should not provoke such sensations. It can affect all body locations, especially the face (Misery 2017*).* Although often transient, and in many cases unaccompanied by visual dermatological responses, sensitive skin affects the quality of life (Farage 2010). SSS can manifest itself in two forms: objective and subjective (Richters 2015). The objective form is favored by a basic dermatitis that alters the protective skin barrier such as atopic dermatitis and acne. In these cases, clinical lesions may be visible, such as erythema, papules and vesicles (Farage 2014, Draelos 1997). In the subjective form, the patient refers only to the symptoms, without visible dermatitis, and is thus usually self-diagnosed (Duarte 2017). The prevalence in Europe is relatively high with approximately 39% of the population affected by sensitive skin, women more often than men (Misery 2009). Since it's prevalence increases during the summer, it has been suggested that exposure to UV radiation might play a role in the appearance of sensitive skin (Misery 2013, 2016). In support of this, fair-skinned individuals prone to sunburn reported increased discomfort when compared to those with darker skin (Farage 2010), whereas other studies could not confirm an association with skin phototype (Misery 2011). Besides UV radiation, other environmental factors, including air pollution, heat, cold and wind, as well as lifestyle factors such as cosmetic usage, diet and alcohol consumption, and physiological factors, such as stress, or endogenous hormones, have been reported to induce or worsen the symptoms of sensitive skin (Ständer 2009, Misery, 2007, 2013). Pathophysiology

of sensitive skin is not completely elucidated, however it is recognized that this condition has no immunological or allergic origin (Taieb 2014). The main hypothesis attributed to the occurrence of sensitive skin is the increase in the permeability of the stratum corneum, leading to greater penetration of substances and also to water loss. There is an inverse relation between corneal layer thickness and skin permeability (Farage 2014, Lev-Tov 2012). Other evidence reported in the literature suggested that the dysfunction of the sensorineural activity of the cutaneous nerves to play a role. Current studies have demonstrated a thermal receptor of transient potential V1 (TRPV1) that would act as a facilitator of neurogenic inflammation (Rodrigues-Barata 2013, Richters 2015). The diagnosis and assessment of sensitive skin can be assisted by many sensory testing methods, from stinging tests with lactic acid (or capsaicin and dimethylsulfoxide), occlusion tests, behind the knee tests, washing and exaggerated immersion tests, to the evaluation of itching and quantitative sensory testing (QST) (Berardesca 2013). However, there is still a lack of international consensus on the preferred method (Misery 2016). In all cases, there is a need to assess the subjective opinions of the patients. Because sensitive skin is defined as being a subjective symptom with abnormal sensations in response to a variety of factors, the best method to diagnose sensitive skin is utilizing patient reported scales (Misery 2013). It is essential to ask the patient about personal, family and occupational history, as well as habits and use of cosmetic products. Complete physical examination should exclude signs of inflammation and the presence of other forms of dermatitis, such as contact and atopic dermatitis (Rodrigues-Barata 2013). The treatment of sensitive skin remains challenging and is based on a continuous and thorough topical therapy using mild, non-irritating ingredients (Kerscher 2011, Berardesca 2006). In addition, individual trigger factors should be avoided (Misery 2016). The use of topical steroids should be avoided under all circumstances. Alternatively, substances utilizing the properties of TRPV1 could also be applied, as TRPV1 is thought to be involved in the pathophysiology of sensitive skin (Kueper 2010). The calcineurin inhibitor pimecrolimus is also believed to target TRPV1 (Isoda 2015). Other treatment options that demonstrated the beneficial effect on decreased skin sensitivity and an increased rate of barrier function recovery are low-level laser/light therapy (Choi 2013) and oral supplementation containing the probiotic Lactobacillus paracasei NCC 2461 (ST11) (Gueniche 2014).

The aim of this survey was to assess the prevalence of sensitive skin and collect clinical data on sensitive skin in the population of Herzegovina-Neretva County using a customized standardized questionnaire that closely examine skin sensitivity and to assess the burden of sensitive skin using the specific sensitive skin burden questionnaire. An additional aim was to determine the prevalence of sensitive skin syndrome by sex, age, skin type and phototype. A large number of unrecognized patients with sensitive skin syndrome in the Herzegovina-Neretva County was hypothesized.

SUBJECTS AND METHODS

The study was conducted at the Department of Dermatology and Venerelogy of the University Clinical Hospital Mostar, in Bosnia and Herzegovina, during the period September 1 - December 1, 2019. Patients, aged 20 years and above, with a diagnosis of sensitive skin syndrome (SSS) confirmed by physicians, who voluntarily agreed to participate in the study and gave written consent, were included. Participants who were unable or not willing to give their consent or who presented with dry skin due to other conditions than SSS and younger than 20 years were excluded.

The study included a total of 73 participants: 45 female and 28 male. A dermatological exam assessing skin type, phototype and skin sensitivity was performed. The survey collected an assortment of information including demographics, customized standardized questionnaires that closely examine skin sensitivity and the burden of sensitive skin (modified Sensitive Scale and the Burden of Sensitive Skin (BoSS) questionnaire). Questions from the modified 14-item version of the Sensitive Scale (Appendix 1) which is designed to measure the severity of skin sensitivity were given by physicians for each symptom as follows: "did you notice skin irritation, prickling, burning, warmth, numbness, itching, soreness, general discomfort, a sudden feeling of heat, redness, peeling skin, swelling, moistening, crust? Could you score it from 0 to 4?"

The modified Burden of Sensitive Skin questionnaire (Appendix 2), designedto assess the burden of sensitive skin, is composed of 14 questions regarding self-care (uncomfortable wool, impacted clothing purchase, travelling with own toaletries, choice of everyday clothes, choice of cosmetics and jewellery), daily life (forbidden food, choice of leisure activities, air conditioning and pollution) and appearance (blushing for no reason while with other people, blushing after sport activities and avoiding photography). The total score is calculated by summing the scores obtained for each of the 14 items that composed the questionnaire, which were rated as follows: 0 for never, 1 for rarely, 2 for sometimes, 3 for often and 4 for constantly.

Ethical review and approval was obtained from the University Clinical Hospital Ethics Committee. All the participants were given an explaination about the purpose of the study and emphasized the voluntary and confidential nature of the study, with a possibility to withdraw at any time during the survey. Written consent was obtained prior to participation. All respon-

dents were previously informed about the purpose and manner of research. After agreeing to participate in the survey, participants were asked to fill out a questionnaires. The participants anonymity was preserved.

Statistical analysis

Continuous variables are presented as mean ± standard deviation (SD) or median with interquartile range (IQR) and compared by using Student's t-test or Mann-Whitney U test, as appropriate, unless otherwise stated. Chi-square test was used to compare categorical data. Kendall's tau (τ) test and Pearson test were performed to assess correlation between variables.

All tests were two-sided and $P<0.05$ was considered statistically significant. Statistical analyses were performed using Graph Pad Prism version 6 for Windows (Graph Pad Software Inc., La Jolla, CA).

RESULTS

Out of 73 respondents, females (n=45; 61.64%) outnumbered males.

In this population, 42.5% (n=31) of individuals reported having some degree of sensitive skin syndrome (SSS) symptoms (Figure 1).

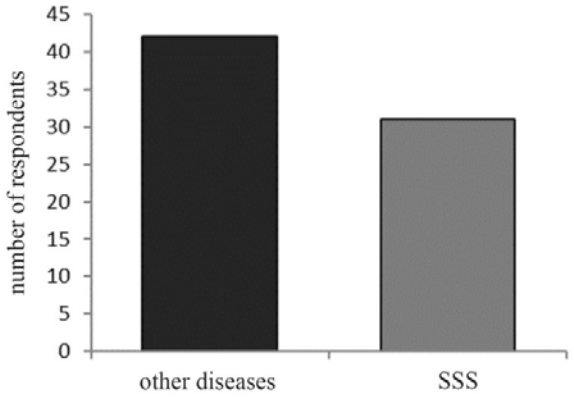

Figure 1. Respondents distribution to those with SSS and other dermatologic conditions

Females (n=22; 71.0%) were significantly more concerned about sensitive skin than men (n=9; 29.0%) (χ^2=5.542, d.f. 1, p=0.019) (Figure 2).

Participants were aged between 20 and 64, with a mean age of 42.6±13.8.

The majority of respondents (n=14; 45.2%) were in the age group 50-64, while 6 (19.3%) individuals were in the age group 35-49 and 11 (35.5 %) in the age group 20-34 (χ^2=3.160; d.f. 2; p=0.205) (Figure 3).

When comparing mean age among sex, a significant difference between male (54.12±6.6) and female (37.8±8.5) participants with SSS was obtained (Student's t-test, p=0.74) (Figure 4).

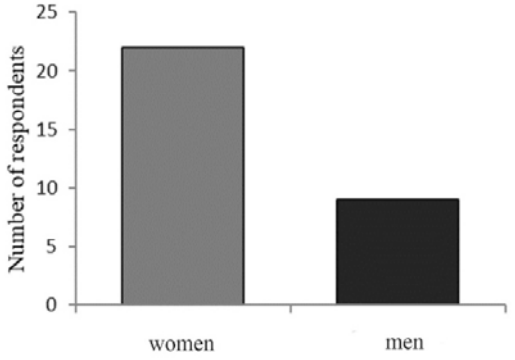

Figure 2. Sex distribution of SSS

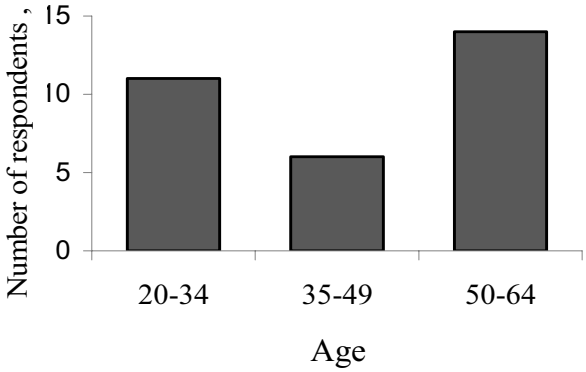

Figure 3. Age distribution of SSS

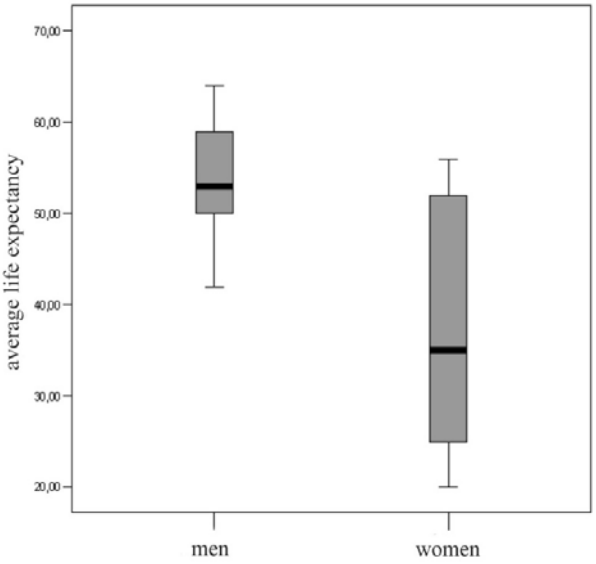

Figure 4. Age and sex comparison among respondents with SSS

The most frequent skin type (n=18; 58.1%) was dry, followed by combination (n=7; 22.5%) and oily skin type (n=6; 19.4 %) (χ^2=8.581 d.f. 2; p=0.013) (Figure 5).

The most frequent phototype (n=25; 80.6%) was 3, followed by phototype 2 (n=6; 19.4%), while other phototypes have not been registered among respondents (χ^2=11.645 d.f. 1; p<0.001) (Figure 6).

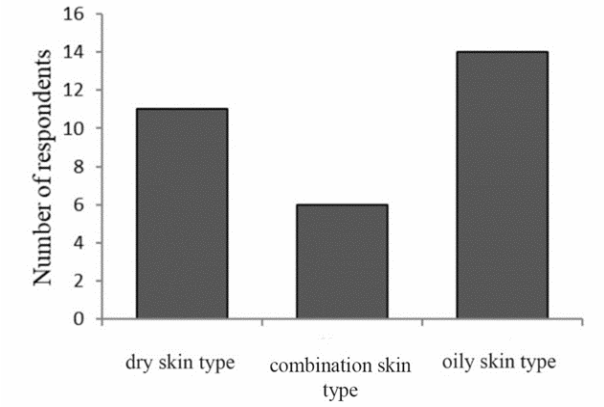

Figure 5. Skin type distribution of SSS

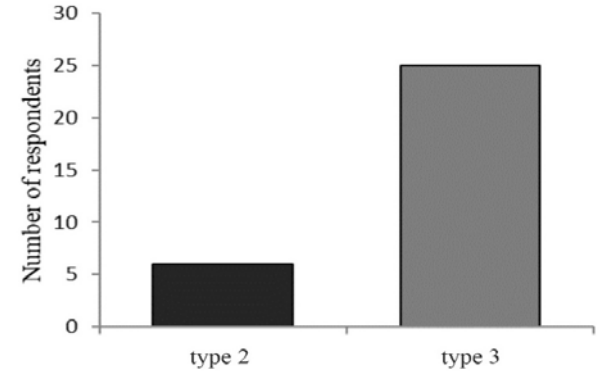

Figure 6. Phototype distribution of SSS

The modified Sensitive Scale survey results showed that on a scale from 0 to 4 participants with SSS rated itching sensation with the highest average score (2.9±0.9), followed by prickling (2.8±0.4), warmth (2.7±1.0), numbness (2.7±1.3) and swelling (2.7±0.7; Table 1).

The overall median score achieved on the modified Sensitive scale of all the participants was 36.9±5.0. When comparing the results among sex, there was no significant difference between male and female subjects. The average score achieved by male subjects was 38.2±2.2 and female 36.0±5.6 (t-test=1.627; d.f. 29; p=0.11; Figure 7).

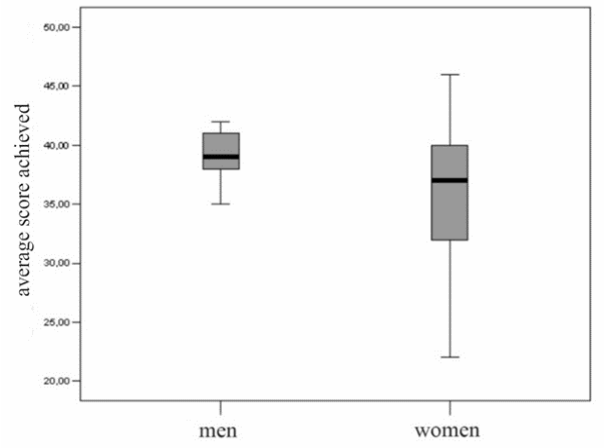

Figure 7. Comparison of the average score achieved on the modified Sensitive scale among sexes

No significant correlation between age of respondents and average score achieved on the modified Sensitive scale was detected. The average score in the age group 20-39 was 34.6±6.2, in the age group 40-54 was 37.6±5.3, while in the group 50-64 was 36.0±5.6 (F=1.981; d.f. 29; p=0.157; (Figure 8).

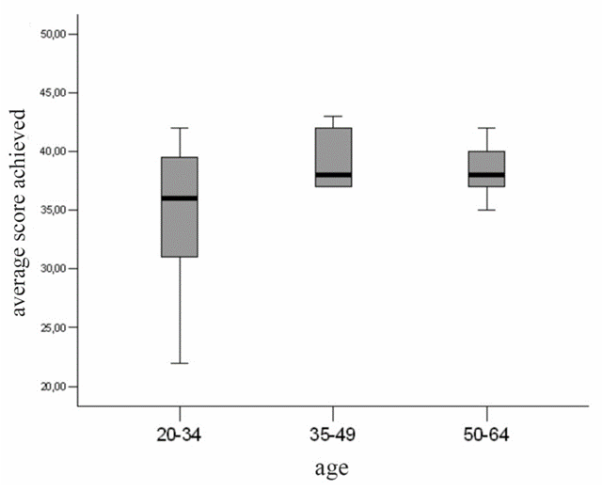

Figure 8. Comparison of the average score achieved on the modified Sensitive scale and age of respondents

There was no significant difference when comparing the results achieved on the modified Sensitive scale and skin type. The average score among dry skin type respondents was 37.8±5.3, combination skin type was 37.0±3.5 while in oily skin type was 36.0±5.6 (F=1.078; d.f. 29; p=0.354) (Figure 9).

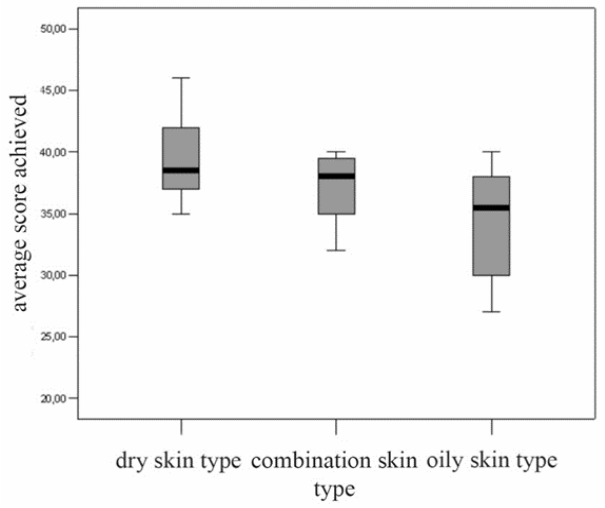

Figure 9. Comparison of the average score achieved on the modified Sensitive scale and skin type

At the modified Burden of Sensitive Skin (BoSS) questionnaire on the 0-4 point scale the question regarding soap usage was answered with the highest average score 2.8±1.0, followed by the question about tolerating air conditioning 2.7±1.2 and the question about buying cosmetics 2.7±1.1 (Table 2).

Table 1. Mean and standard deviation of the average results on the modified Sensitive Scale

Skin condition felt/ Visible skin conditions	Min	Max	MD*	SD**
Irritation	0	4	1.6	0.3
Prickling	0	4	2.8	0.4
Burning sensation	0	4	2.6	0.8
Warmth	0	4	2.7	1.0
Numbness	0	4	2.7	1.3
Itching sensation	0	4	2.9	0.9
Soreness	0	4	2.5	0.8
General discomfort	0	4	2.7	0.7
Sudden feeling of heat	0	4	1.9	0.5
Skin redness	0	4	2.2	0.8
Peeling skin	0	4	2.5	0.8
Swelling	0	4	2.7	0.7
Moistening	0	4	2.4	1.3
Crust	0	4	2.0	1.4

* MD – mean deviation; ** SD –standard deviation

Table 2. Mean and standard deviation of the average results on the modified Burden of Sensitive Skin (BoSS) questionnaire

For each of the following statements, choose from one of the 5 answers given. Reply as spontaneously as possible by thinking of your own situation in the last week. There are no right or wrong answers	Min	Max	MD*	SD**
When buying clothes I have to think about my sensitive skin.	0	4	2.5	1.0
When buying cosmetics I have to think about my sensitive skin.	0	4	2.7	1.1
Due to my sensitive skin I have to avoid certain food.	0	4	2.6	1.1
Due to my sensitive skin I find it difficult to stay in air conditioned areas.	0	4	2.7	1.2
I have given up hobbies and holidays because of my sensitive skin.	0	4	2.1	1.1
Urban pollution increases the sensitivity of my skin.	0	4	2.4	1.0
Blushing for no reason while with other people causes me discomfort.	0	4	2.2	0.9
Due to redness of my face I refrain from appearing in pictures.	0	4	2.3	1.2
It is unimaginable for me to wear jewelry not made of gold.	0	4	2.1	0.8
Sport activities make my face turn red.	0	4	2.6	1.0
Woollen clothes make my skin very uncomfortable.	0	4	2.4	1.0
When choosing everyday clothes I have to think about my sensitive skin.	0	4	2.5	0.9
When choosing a washing powder I have to think about my sensitive skin.	0	4	2.6	0.9
I always have to take my own soap and toiletries when away from home, because I cannot use someone else's.	0	4	2.8	1.0

* MD – mean deviation; ** SD – standard deviation

DISCUSSION

This study investigated the prevalence of sensitive skin syndrome (SSS) and the burden of sensitive skin in the population of Herzegovina-Neretva County. Findings concurred with existing evidence that individuals with sensitive skin represent almost half the examined population. The prevalence of perceived sensitive skin was significantly higher in females than in males. The main skin symptom was itching, followed by prickling, warmth and numbness. Our results clearly show that there is a burden of sensitive skin. This study is the first to focus on sensitive skin among Herzegovina-Neretva County population.

Out of 73 respondents, female gender was more commonly represented (61.64%) than male. Participants were aged between 20 and 64, with the mean age of 42. Similar ratio of respondents was shown in the study by Misery et al. on a sample of 4506 participants (Misery 2009). In our study sensitive skin was declared by 42.5% participants. This is in correlation with the survey carried out in eight European countries (France, Belgium, Greece, Germany, Italy, Portugal, Spain, and Switzerland) reported a high prevalence of sensitive skin, with about 40% of the subjects interviewed considering their skin to be sensitive or very sensitive (Misery 2009, 2005). In a 2016 publication, Misery et al. cited a prevalence rate of about 40% worldwide, comparing responders having “sensitive” or “very sensitive” skin to those having “not very sensitive” or “not sensitive at all” (Misery 2016).

Females in our study were significantly more concerned about sensitive skin than men. Most publications also suggest that women complain of sensitive skin more often than men (Misery 2011). A survey conducted in the UK reported the incidence of skin sensitivity to be 51.4% and 38.2% for women and men, respectively (Willis 2001). These figures are consistent with our results, showing that 71.0% of women declared having "sensitive" skin vs. 29% of men. In addition, Loffler et al. (2001) reported significant differences in the frequency of self-estimated skin susceptibility between men and women. This result was not explained by differences in objective parameters such as transepidermal water loss, cutaneous blood flow, or hydration level as bioengineering measurements failed to show any significant difference between men and women (Loffler 2001). However, skin reactivity seems to be influenced by hormonal fluctuations during the menstrual cycle, and has been shown to be positively correlated with high concentrations of estradiol or luteinizing hormone (Kirmaz 2004). This might help to explain the differences in skin sensitivity between women and men (Misery 2011).

When comparing mean age among sex, a significant difference between male (54.12±6.6) and female (37.8±8.5) participants with sensitive skin syndrome was obtained. In a Chinese study it was observed that the total prevalence of sensitive skin gradually decreased with age. Older Chinese subjects may have been less clear on the meaning of sensitive skin and, therefore, less likely to categorized themselves as such. In men, about 11% of age 25 or less classified themselves as having "very sensitive" or "sensitive" skin, compared to about 7% of men ≥50 years. For women of age 25 or less these percentages were about 19%, compared to about 12% of women ≥50 years (Xu 2013).

Furthermore, our results showed that skin sensitivity is also dependent on skin type as the prevalence of sensitive skin was increased in subjects with dry skin. This findings are consistent with the study on the sample of 1000 individuals of the American population (Misery 2011).

In addition, our results suggest that fair skin phototype was more commonly associated with self-reported sensitive skin. The most frequent phototype (80.6%) was III, followed by a phototype II. It has long been recognized that fair skin phototype is more commonly associated with self-reported sensitive skin compared to darker skin phototype (Misery 2011, Guinot 2006). This was confirmed in a mexican study where 22 of 37 (over 59%) of subjects with phototypes II and III claimed sensitive skin, compared to 67 of 209 (32%) of subjects with phototypes IV and V (Farage 2019). Differences in the self-diagnosis of sensitive skin also may be related to cultural differences, such as lower interest in using cosmetic products or reporting adverse reactions to them (Hernández-Blanco 2013). Another study conducted in China in 2009 among 9154 subjects from large urban areas showed that the majority of their study population were phototype IV (over 86%). This darker skin type would be expected to lower the prevalence of sensitive skin to some degree (Xu 2013).

The modified Sensitive Scale survey results showed that participants with SSS rated itching sensation with the highest average score, followed by prickling, warmth, numbness and swelling. This is in correlation with the survey that tested The Sensitive Scale as a new scale with a 14-item and 10-item version in 11 countries in different languages on 2,966 participants. Tautness, itching, burning and sensations of heat were the most frequently perceived sensations (Misery 2014). It confirms that sensitive skin is characterised by redness (objective sign) and abnormal sensations, and that the Sensitive Scale is a suitable tool for measuring it's severity (Misery 2014). There was no significant difference when comparing the results achieved on the modified Sensitive scale with sex, age or skin type of respondents. The correlation with dry skin type, higher age, female gender and fair phototypes is an indirect confirmation of the worth of The Sensitive Scale because these factors are known to be associated with a higher severity of sensitive skin (Misery 2014).

Individual burden accounts for the broadest aspects of disease related disability, including psychological, physical, social and economic factors, and all of these aspects must be integrated in specifically dedicated questionnaires (Salzes 2016).

At the Burden of Sensitive Skin (BoSS) questionnaire the question regarding soap and toiletries usage was answered with the highest average score, followed by the question about tolerating air conditioning and the question about buying cosmetics. Sensitive skin is often perceived as a cosmetic disorder, whereas it has an unexpected impact on patients' quality of life. Currently, the psychological consequences of sensitive skin have been poorly studied (Misery 2018). Our results clearly show that there is a burden of sensitive skin and that further studies with this tool will confirm this impact. Sensitive skin is frequently associated with cosmetic intolerance syndrome. This syndrome is often due to the use of soap and hygiene products, cosmetics, sunscreens and chemical peels not suitable for the subject's skin type. Symptoms of cosmetic intolerance syndrome included prickling, irritation, or burning sensations (Misery 2011). In a 2011 publication, Misery et al. reported that 79.5% of subjects whose skin was easily irritated after cosmetic usagehad "sensitive" or "very sensitive" skin. In their UK survey, Willis et al. reported that 80.1% of women with sensitive skin had experienced an adverse reaction to a cosmetic product (Willis 2001). In addition to cosmetics, environmental factors were also found to increase skin sensitivity. Misery et al. observed that the large majority of subjects with "sensitive" or "very sensitive" skin had sunburn during childhood and redden easily after sun exposure. This could be due to skin phototype as sensitive skin mainly affects fair skinned subjects (Misery 2011).

CONCLUSION

This study investigated the prevalence of sensitive skin and the burden of sensitive skin in the population of Herzegovina-Neretva County. Findings concurred with existing evidence that individuals with sensitive skin represent almost half the examined population. The prevalence of perceived sensitive skin was significantly higher in females than in males. The main skin symptom was itching, followed by prickling, warmth and numbness. Our results clearly show that there is a burden of sensitive skin. This study is the first to focus on sensitive skin among Herzegovina-Neretva County population.

Sensitive skin is a common but often disregarded dermatologic condition. Considerable efforts should be undertaken in order to standardize diagnostic methodologies, treatment options, methods of detection of subtle skin benefits or potential adverse effects. Further studies are needed to bolster epidemiological data and physiological pathways of sensitive skin syndrome.

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Conflict of interest : None to declare.

Contribution of individual authors:

Anita Ostojić: writing manuscript,concept and design of the article, literature searches,approval of the final version.

Ivona Tomić: comments on the concept and design of article, literature searches.

Romana Babić: comments on design of the article, approval of final version.

Filip Gunarić: concept and design of the article, writing manuscript, approval of final version, literature searches.

Marina Prlić: comments on design of the article, approval of the final version.

Marta Mandić: literature searches, approval of the final version.

Dubravka Šimić: idea, concept and design of the article, approval of the final version.

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Appendix 1. Please indicate the intensity of each of the following symptoms during the past 7 days

Skin condition felt/ Visible skin conditions	0	1	2	3	4
Irritation					
Prickling					
Burning sensation					
Warmth					
Numbness					
Itching sensation					
Soreness					
General discomfort					
Sudden feeling of heat					
Skin redness					
Peeling skin					
Swelling					
Moistening					
Crust					

0=zero intensity, 4=intolerable intensity), mark one number between 0 and 4.

Appendix 2. For each of the following statements, please choose from one of the 5 answers given rated as follows:
0 - for never, 1 - for rarely, 2 - for sometimes, 3 - for often and 4 - for constantly

For each of the following statements, choose from one of the 5 answers given. Reply as spontaneously as possible by thinking of your own situation in the last week. There are no right or wrong answers	0	1	2	3	4
When buying clothes I have to think about my sensitive skin.					
When buying cosmetics I have to think about my sensitive skin.					
Due to my sensitive skin I have to avoid certainfood.					
Due to my sensitive skin I find it difficult to stay in air conditioned areas.					
I have given up hobbies and holidays because of my sensitive skin.					
Urban pollution increases the sensitivity of my skin.					
Blushing for no reason while with other people causes me discomfort.					
Due to redness of my face I refrain from appearing in pictures.					
It is unimaginable for me to wear jewelry not made of gold.					
Sport activities make my face turn red.					
Woollen clothes make my skin very uncomfortable.					
When choosing everyday clothes I have to think about my sensitive skin.					
When choosing a washing powder I have to think about my sensitive skin.					
I always have to take my own soap and toiletries when away from home, because I cannot use someone else's.					

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