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Report

# Sensitive skin in the American population: prevalence, clinical data, and role of the dermatologist

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## Abstract

**Introduction** Sensitive skin is a complex dermatological condition, defined by abnormal sensory symptoms. The aim of this epidemiological survey was to assess the prevalence of sensitive skin and collect data on sensitive skin in the US population.

**Methods** A phone survey was conducted in the USA by a poll institute in 2007. A sample was drawn from a representative national cohort of the American population at least 18 years of age through the quota method. Data on demographic characteristics, environmental and climatic factors, skin characteristics, dermatological disorders, cosmetics use, and visits to the dermatologist were collected.

**Results** Of 994 subjects who answered (495 men and 499 women), 44.6% declared having "sensitive" or "very sensitive" skin. Women were more concerned than men (50.9% vs. 38.2%, $P < 0.0001$). There was no significant difference related to geographic localization, age, or ethnic distribution. Subjects with sensitive skin had mainly dry (34.5%) or mixed skin (35.7%), fair phototypes, dermatological disorders, higher skin reactivity to cosmetics and various environmental factors in comparison with subjects who stated having only a "slightly" sensitive or not sensitive skin. The dermatologist had a strong influence on subjects with "sensitive" or "very sensitive" skin through the prescription of skin care products.

**Conclusion** This study, based on a representative sample of the American population, reveals a high prevalence of sensitive skin in the USA. Sensitive skin is mainly associated with dry skin, fair phototype, reactivity to climatic and environmental factors, and cosmetics. American dermatologists seem largely involved in the care of this condition.

## Introduction

"Sensitive skin" is defined as the triggering of abnormal sensations such as tingling, chafing, burning or prickling, and possibly pain or pruritus by multiple factors, whether they are physical (ultraviolet, heat, cold, wind), chemical (cosmetics, soaps, water, pollution), psychological (stress), or hormonal (menstrual cycles).[1,2] The term "sensitive skin" mainly refers to facial skin, but it can also concern other body areas such as hands, scalp, or genital area.[3–6]

The putative pathophysiology of sensitive skin includes the alteration of the skin barrier allowing potentially irritating substances to penetrate the skin and generate an inflammatory reaction, with involvement of the cutaneous innervation routes.[1,3,7,8] Several tests have been developed in an attempt to evaluate objectively the severity of sensitive skin: the stinging test,[9] heat sensitivity test, and capsaicin test,[1,2,10] but they do not provide reproducible results, mainly because subjective effects are difficult to quantify.[11] This is the reason why most data available so far on sensitive skin are subjective and have been collected through epidemiological studies based on subjects' declarations. In order to investigate sensitive facial skin, epidemiological studies have indeed been conducted in industrialized countries through self-questionnaires sent by mail or telephone.[12–14] In particular, a recently published 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.[12,13] Based on the quota method, this survey has been carried out on a representative sample of the population of each studied country. Therefore, its results could be extrapolated to the general European population. In the USA, no similar large-scale survey has been conducted so far in a nationally representative cohort of the US population.

The objective of our study was to provide an estimate of the prevalence of sensitive skin in the overall American population, and to characterize the factors associated with sensitive skin in this country. A representative cohort of the US population was sampled using the quota method, and demographic data and various parameters related to sensitive skin (type of skin, environmental factors, cosmetics, dermatological disorders, and visits to the dermatologist) were evaluated in this cohort.

## Methods

### Survey

A survey was carried out in 2007 by the CSA international polling institute (Paris, France). A cohort of 1000 individuals from a national sample representative of the American population aged at least 18 years old was selected according to the quota method (sex, age, ethnic group, profession, area of living)[15] and interviewed by phone. A systematic control of the interviews was carried out by calling back 20% of the interviewees. In case of discrepancy about a questionnaire, all the interviews carried out by the pollster concerned were to be checked.

### Questionnaire

The first part of the questionnaire was related to demographics (geographical origin, age, gender, ethnic group) and also to skin type and phototype. The second part dealt with skin sensitivity on the face. Subjects were requested to rate their skin as: "very sensitive," "sensitive," "slightly sensitive," or "not sensitive at all." Skin sensitivity was assessed according to environmental (variations in temperature, pollution, air conditioning, water) and climatic (cold, heat, sun, wind, dry, or wet air) factors. People were also asked about their skin reactivity after emotion or use of cosmetics, the presence of a dermatological disease, their last visit to a dermatologist, and the purchase of skin care products.

### Statistical analysis

Between-group analyses of quantitative variables were performed using the Student *t*-test (if two groups) or an ANOVA (if more than two groups). When the conditions required to use these tests were not fulfilled, non-parametric tests such as Wilcoxon's and Kruskal–Wallis tests were carried out. Qualitative variables were compared using the Chi-square test or Fisher's exact test. Statistical analyses were carried out using SAS software version 8.2 (SAS Institute, Raleigh, NC, USA).

## Results

### Population

Of 1000 individuals surveyed, six subjects were unable to define sensitivity of their skin (0.6%) and were excluded from the study. Among the 994 who filled out the questionnaire and were included, 495 were men (49.8%) and 499 (50.2%) were women. The geographic distribution, area of residence, skin types and ethnicity are presented in Table 1.

**Table 1** Demographic data

| | | *n* | % of subjects |
|---|---|---|---|
| Geographic distribution | East | 177 | 17.8 |
| | Central | 225 | 22.6 |
| | West | 229 | 23 |
| | Mountain | 363 | 36.5 |
| Area of residence | Urban area | 547 | 55 |
| | Suburban area | 212 | 21.3 |
| | Rural area | 235 | 23.7 |
| Skin types | Dry | 236 | 23.7 |
| | Normal | 371 | 37.3 |
| | Oily | 70 | 7 |
| | Combined | 314 | 31.6 |
| | Do not know | 3 | 0.3 |
| Ethnicity | Caucasian | 697 | 70.1 |
| | Black | 119 | 12 |
| | Hispanic | 133 | 13.4 |
| | Asian | 27 | 2.7 |
| | Not reported | 18 | 1.8 |

Among the subjects interviewed, 44.6% ($n = 443$) reported having "sensitive" or "very sensitive" skin and 55.4% ($n = 551$) having "slightly" or "not at all" sensitive skin.

In this cohort, 12.8% ($n = 127$) reported suffering from a dermatological disorder, with a similar prevalence in both sexes. Among the dermatological diseases reported, pigmentary marks were the most frequent (3.9%). Furthermore, 50.7% of the subjects ($n = 500$) declared having seen a dermatologist at least once, mostly women compared with men (56.5% vs. 44.5% $P < 0.0001$). For 35% ($n = 175$) of them, the last visit occurred less than 1 year ago. Concerning skin care product purchase, the subjects reported following advice from a dermatologist, a pharmacist, and others (friends, family, media), in respectively 13.4%, 6.4%, and 57.2% of cases.

### Characterization of sensitive skin

In order to characterize sensitive skin in the US population, the characteristics of the subjects with "sensitive" or "very sensitive" skin ("sensitive" skin group) were compared with those of the subjects having a skin only "slightly sensitive" or "not at all sensitive" ("non-sensitive skin" group).

### Sensitive skin and demographic data

Between "sensitive skin" and "non-sensitive skin" groups, no significant difference was observed in terms of age distribution ($P = 0.940$; Table 2), socio-professional category

**Table 2** Age distribution in ''sensitive skin'' and ''non-sensitive skin'' groups ($n$ = 994)

| Age | *n* | Subjects with sensitive skin, *n* (%) (*n* = 443) | Subjects with ''non-sensitive'' skin,[a] *n* (%) (*n* = 551) |
|---|---|---|---|
| 18–24 years | 157 | 65 (14.7%) | 92 (16.7%) |
| 25–34 years | 170 | 80 (18.1%) | 90 (16.3%) |
| 35–44 years | 182 | 82 (18.5%) | 100 (18.2%) |
| 45–54 years | 187 | 84 (19.0%) | 103 (18.7%) |
| 54–64 years | 134 | 61 (13.8%) | 73 (13.3%) |
| 65 years and more | 164 | 71 (16.0%) | 93 (16.8%) |
| Between-group comparison | | | $P$ = 0.940 |

[a]Non-sensitive skin, i.e. having slightly or not sensitive skin.

**Table 3** Sensitive skin according to gender

| Study population (*n* = 994) | *n* | Subjects with sensitive skin (%)(*n* = 443) | Subjects with ''non-sensitive'' skin[a] (%)(*n* = 551) |
|---|---|---|---|
| Men | 495 | 38.2 | 61.8 |
| Women | 499 | 50.9 | 49.1 |
| Between-group comparison | | $P$ < 0.0001 | |

[a]Non-sensitive skin, i.e. having slightly or not sensitive skin.

distribution ($P$ = 0.104), region ($P$ = 0.638), and area of residence ($P$ = 0.724).

By contrast, ''sensitive'' or ''very sensitive'' skin conditions were more prevalent in women compared to men (50.9% vs. 38.2%, $P$ < 0.0001; Table 3).

### Sensitive skin and types of skin

Skin types were significantly different between the ''sensitive skin'' and ''non-sensitive skin'' groups ($P$ < 0.001, Fig. 1). Subjects with ''sensitive'' or ''very sensitive'' skin mainly had dry (34.5%) or mixed skin (35.7%). A significant difference in phototypes was also noted between the two groups indicating that sensitive skin mainly concerns fair skin ($P$ < 0.001) (Fig. 2).

### Skin sensitivity according to climatic and environmental factors

Between-group differences were noted in terms of skin sensitivity to all climatic and environmental factors (Table 4). The percentage of subjects experiencing cutaneous reactivity to climatic and environmental factors was always significantly higher in the ''sensitive skin'' group than in the ''non-sensitive skin'' group.

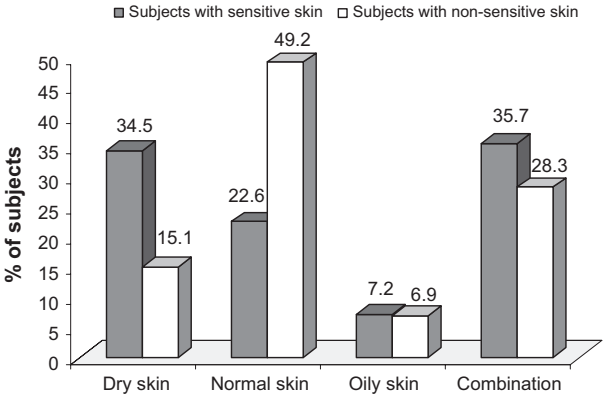


**Figure 1** Sensitive skin according to skin types. Skin types distribution analysis was significantly different between the groups having and not having sensitive skin ($P$ < 0.001)

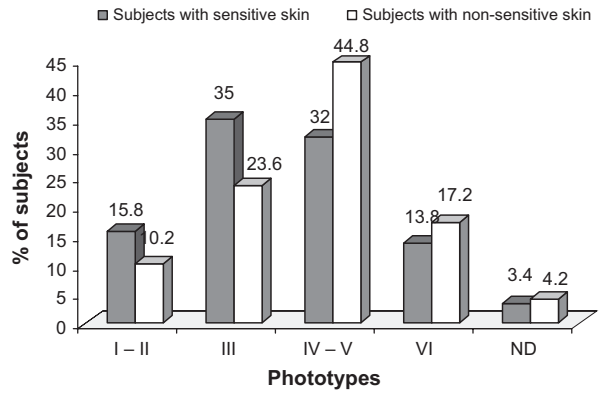


**Figure 2** Skin phototype distribution in subjects with sensitive skin and non-sensitive skin. The analysis of the skin phototype distribution showed a significant difference between the groups having and not having sensitive skin ($P$ < 0.001)

Among the subjects having experienced severe sunburn during childhood, 57% declared suffering from sensitive skin ($P$ < 0.001). Similarly, 57.8% of those who declared going red after sun exposure were subjects with ''sensitive'' or ''very sensitive'' skin ($P$ < 0.001).

Skin reactivity to emotion was significantly higher in the ''sensitive'' skin group in comparison with the ''non-sensitive skin'' group (53% vs. 47%; $P$ < 0.001).

### Skin sensitivity and ethnic groups

The prevalence of sensitive skin was similar in the four ethnic groups: it varied slightly from 43.2% for Caucasian to 52.1% for black individuals, without statistical significance ($P$ = 0.352) (Fig. 3). Likewise, no statistical difference was noted in terms of skin sensitivity to

 

**Table 4** Skin sensitivity in subjects sensitive to environmental and climatic factors

| Subjects sensitive to | *n* | Subjects with sensitive skin (%) (*n* = 443) | Subjects with "non-sensitive" skin[a] (%) (*n* = 551) | *P* |
|---|---|---|---|---|
| Environmental factors | | | | |
| Variations in temperature | 314 | 66.9 | 33.1 | 0.001 |
| Pollution | 230 | 66.5 | 33.5 | 0.001 |
| Air conditioning | 85 | 74.1 | 25.9 | 0.001 |
| Water | 102 | 67.7 | 32.3 | 0.001 |
| Climatic factors | | | | |
| Cold | 415 | 60.2 | 39.8 | 0.001 |
| Heat | 189 | 68.8 | 31.2 | 0.001 |
| Wind | 406 | 62.6 | 37.4 | 0.001 |
| Dry air | 423 | 62.7 | 37.3 | 0.001 |
| Wet air | 100 | 64.0 | 36.0 | 0.001 |

[a]Non-sensitive skin, i.e. having a slightly or not sensitive skin.

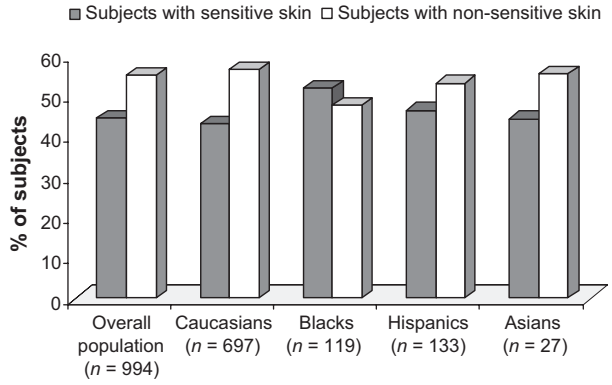


**Figure 3** Ethnic groups and sensitive skin. Analysis of the prevalence of sensitive skin according to the ethnic group revealed no between-group difference ($P = 0.352$)

climatic and environmental factors between the different ethnic groups.

### Sensitive skin and cosmetics

Four percent of the subjects interviewed declared having their face easily irritated only after having used a cosmetic product (prickling or irritation and burning sensations). Among them, about three-quarters were subjects with "sensitive" or "very sensitive" skin (79.9% vs. 20.1%; $P < 0.001$).

Eleven percent of the subjects reported prickling or irritation and burning sensations after using cosmetic products. Among them, 70% and 68.6% had sensitive skin, respectively ($P < 0.001$).

### Sensitive skin and skin disorders

In the group of subjects with sensitive skin, 20.3% reported suffering from a skin disease compared with only 6.7% in the "non-sensitive skin" group ($P < 0.001$). Pigmentary marks were the most frequent pathology in both groups (Table 5). Psoriasis and rosacea were observed more frequently in the "sensitive skin" group compared with the "non-sensitive skin" group (17.1% vs. 9.4% and 12.2% vs. 6.3%, respectively), whereas acne was less frequent in the "sensitive skin" group (17.1% vs. 25%). However, the skin disease distribution was not significantly different between the "sensitive skin" and "non-sensitive skin" groups ($P = 0.811$).

### Role of the dermatologist

The prevalence of "sensitive" or "very sensitive skin" within the American population that had previously seen a dermatologist was 59.6% (vs. 40.4% in the "non-sensitive" skin group; $P < 0.0001$).

Individuals with "sensitive" or "very sensitive skin" were more likely to purchase skin care products following medical advice than individuals with "non-sensitive" skin (26.4% vs. 14.5%). Indeed, among the interviewees having reported purchasing skin care products on advice from their dermatologist or their pharmacist, 60.9% and 56.3% had "sensitive" or "very sensitive skin", respectively.

## Discussion

This phone survey of 994 subjects has provided an estimate of the prevalence of sensitive skin in the general US population. As the polling subjects were selected by the

**Table 5** Distribution of the subjects with "sensitive skin" and "non-sensitive skin" among the subjects having an associated disease

| Subjects with an associated disease (*n* = 114) | *n* | Subjects with sensitive skin (%) (*n* = 82) | Subjects with non-sensitive skin (%) (*n* = 32) |
|---|---|---|---|
| Pigmentary marks | 39 | 32.9 | 37.5 |
| Acne | 22 | 17.1 | 25.0 |
| Psoriasis | 17 | 17.1 | 9.4 |
| Rosacea | 12 | 12.2 | 6.3 |
| Atopic dermatitis | 11 | 9.8 | 9.4 |
| Seborrheic dermatitis | 4 | 3.7 | 3.3 |
| Contact dermatitis | 3 | 2.4 | 3.1 |
| Others | 6 | 4.8 | 6.0 |
| Between-group comparison | | | $P = 0.811$ |

quota method, they formed a representative sample of the US population, which is a prerequisite to extrapolate results on sensitive skin or any other skin disease within the general population.[5,12,13,16] By contrast, assessments of the prevalence of sensitive skin from two studies previously conducted in the US could not be extrapolated to the general American population. Indeed, these studies were carried out on women only[17] or on young women mainly (83.6% of the study population)[6] and they were conducted in a single geographic area (San Francisco and Cincinnati, respectively). The first one carried out in 800 women living in the San Francisco area reported that 52% had sensitive facial skin.[17] This figure was confirmed by our results, showing that 51.9% of women reported having ''sensitive'' or ''very sensitive'' skin. More recently, a second survey conducted on 1039 subjects from Cincinnati (Ohio) indicated that 34.4% had ''moderately'' or ''very sensitive'' facial skin.[6] Among the subjects interviewed in our study, men ($n = 495$) and women ($n = 499$) were equally represented and 44.6% reported having ''sensitive'' or ''very sensitive'' skin, whereas 55.4% reported a ''slightly'' or ''not sensitive skin.'' The prevalence of sensitive skin of 44.6%, which stands for a large cohort on the scale of the American population, is higher than in Europe. Also based on the quota method and performed by the same pollster, a comparable large survey conducted in eight European countries (Belgium, Greece, Germany, Italy, France, Portugal, Spain, and Switzerland) showed that 38.4% of subjects interviewed ($n = 4506$) reported having a ''sensitive'' or ''very sensitive'' skin.[13] The prevalence of sensitive skin varied from 25.8% of subjects interviewed in Belgium to 53.8% in Italy.

In our study, the fact that sensitive skin condition was not evaluated by objective measurements but only through patients' declarations may introduce a bias, and as a consequence, some results could have been overestimated or underestimated.[16] However, all epidemiological studies conducted so far on sensitive skin, and particularly the European survey, have followed the same methodology,[12–14,18] which allows comparison between the countries. Furthermore, our study showed that self-reporting is a relevant way to gather information on this condition because its symptoms are easily recognizable without the help of a dermatologist. Indeed, subjects were able to identify their skin condition with various degrees of sensitivity as the percentage of no reply to this question was below 1%.

In the present study, sensitive skin was independent from age distribution or residence area but depended on gender. Most publications also suggest that women complain of sensitive skin more often than men.[5,6,12–14,16–18] A survey conducted in the UK reported the incidence of skin sensitivity to be 51.4% and 38.2% for women and men, respectively.[14] These figures are consistent with our results, showing that 50.9% of women declared having ''sensitive'' or ''very sensitive'' skin vs. 38.2% of men ($P < 0.0001$). In addition, Loffler *et al.*[19] 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.[19] 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.[20] This might help to explain the differences in skin sensitivity between women and men.

In addition, our results suggest that fair skin phototype was more commonly associated with self-reported ''sensitive'' and ''very sensitive'' skin. However, the analysis of facial skin sensitivity according to ethnic groups did not reveal any statistical difference between the four ethnic groups in terms of sensitive skin prevalence. This observation is consistent with previous reports.[6,17] Nevertheless, some variability has been shown according to various ethnic origins in perceived symptoms and factors provoking skin sensitivity such as the influence of stress,[8] spicy food or alcoholic beverage intake,[17] or the threshold of subjective irritancy perception.[21]

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 association between sensitive and dry skin points to a tendency to barrier impairment. Skin disorders have also been associated with sensitive skin. Indeed, a concomitant dermatological disease was reported by 20.3% of subjects with ''sensitive'' or ''very sensitive'' skin in our study and by 28% in an epidemiological study conducted in France.[12] In our US study, the main skin disorder reported was pigmentary marks (3.9%). By contrast, the most frequently reported diseases in the European population were acne (2.5%) and contact eczema (2.4%).[12,13] This is consistent with the concept that some dermatological diseases or their treatments might lead to sensitive skin conditions.[13,14]

Sensitive skin is frequently associated with the 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. In the present study, 79.5% of subjects where skin was easily irritated after cosmetics were subjects with ''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.[14] In addition to cosmetics, environmental factors were also found to increase skin sensitivity. In a previous study, we showed that seasonal changes were able to modify skin sensitivity, the skin being more sensitive in summer than in winter.[18] The molecular mechanism underlying temperature perception might involve temperature-sensitive transient receptors potential channels,[22] which were shown to be predominantly expressed in epithelial cells.[22] Indeed, various studies carried out on animals suggest that their activation may influence the skin barrier homeostasis.[23] Moreover, sun reactivity was previously observed as a major component of skin sensitivity.[24] In our study, we 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.

The majority of subjects having seen a dermatologist at least once were mainly subjects with ''sensitive'' or ''very sensitive'' skin (59.6%), suggesting that the dermatologist has a crucial role in the management of sensitive skin. Several studies have reported that the quality of life of patients with sensitive skin was impaired, particularly its psychological component as measured by the mental component of the SF-12 quality of life questionnaire, and that psychological factors such as stress, emotion, or anxiety should be taken into consideration in the treatment of these patients.[17,25] Thus, in some cases, the dermatologist may downplay the sensitive skin sensation and reframe it into physiological context (thermoregulation, physiological response to external aggressions, etc.). Moreover, it seems that visits to the dermatologist might be explained by the fact that sensitive skin is often associated with a dermatological disorder.[13] Furthermore, among the subjects that reported purchasing skin care products on advice from their dermatologist, 60.9% of them were said to have ''sensitive'' or ''very sensitive skin.'' Therefore, The dermatologist can play an essential role in prescribing and advising skin care products for sensitive skin in the USA. Disparities in sensitive skin may be due to greater healthcare access or more frequent visits to the dermatologist.

In conclusion, this study reveals that the prevalence of sensitive skin in a nationally representative cohort of the general US population is about 45%, according to the interviewees' declarations. Furthermore, this skin condition mainly seems to affect women. Cosmetics and environmental and climatic factors can increase skin reactivity. The dermatologist may play a central role in advising and prescribing products.

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