ORIGINAL ARTICLE

Prevalence of most common skin diseases in Europe: a population-based study

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Abstract

Background The assessment of the prevalence of diseases is of primary importance in planning health policies. No complete data on the prevalence of skin diseases across European countries are available.

Objective To estimate the prevalence of the most frequent skin conditions or diseases in 27 European countries (24 EU countries, plus Norway, Switzerland, and the United Kingdom).

Methods We conducted a population-based study on representative and extrapolable samples of the general population aged 18 years or more in each of the 27 countries surveyed. Participants were selected using stratified, proportional sampling with a replacement design. Data were collected using a web-based online survey. All participants were asked to fill in a questionnaire with sociodemographic data and to declare if they have had one or more skin conditions or diseases during the previous 12 months.

Results A total of 44 689 participants from 27 countries responded to the questionnaire, 21 887 (48.98%) men and 22 802 (51.02%) women. The proportion of participants who reported having suffered from at least one dermatological condition or disease during the previous 12 months was 43.35% (95% CI: 42.89%, 43.81%). The projection in the total population of the 27 countries included in the study resulted in 185 103 774 individuals affected by at least one dermatological condition or disease. Accordingly, we can estimate that more than 94 million Europeans complain of uncomfortable skin sensations like itch, burning, or dryness. The most frequent conditions were fungal skin infections (8.9%), acne (5.4%), and atopic dermatitis or eczema (5.5%). Alopecia, acne, eczema, and rosacea were more common in women, whereas men were more likely to suffer from psoriasis and sexually transmitted infections.

Conclusion Skin diseases are an important public health concern. Their high prevalence has to be taken into account in planning access to dermatological care to address patient needs.

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Introduction

Skin conditions are an important public health concern. They affect between 30% and 70% of people worldwide,[1,2] and they are the most frequent reason for consultation in general practice.[3] More than 3000 skin diseases have been described, both acute and chronic, that affect individuals of all ages and social

conditions. Some of them, such as skin cancer, may be life-threatening. However, even when this is not the case, they may pose a heavy burden on patients in terms of quality of life impairment and costs.[4,5]

Skin diseases resulted to be the fourth leading cause of non-fatal burden expressed as years lost due to disability.[6] They are a heterogeneous group of conditions, that include chronic diseases (such as psoriasis and atopic dermatitis) and skin cancers, which affect a large part of the population, but also rare conditions, such as genodermatoses. The approach to investigate the epidemiology of these dissimilar types of the population is very different since the study of rare diseases is based on registries, medical literature, or case reports.

In this study, we focused on the most common skin conditions and diseases, using a population-based approach. Most of the previous studies estimated the prevalence of skin conditions using systematic reviews of the literature or meta-analysis, e.g., for psoriasis[7] or atopic eczema.[8] Other reports focused on a single condition such as atopic eczema[9] or rosacea.[10] The large Global Burden of Disease Study 2010[6] evaluated the prevalence of 15 categories of skin diseases based on a systematic review of the published literature.

At a population-based level, an important study analysed the prevalence of skin conditions in five European countries.[11] However, to the best of our knowledge, no epidemiological data on the prevalence of skin conditions across Europe are available.

In the framework of the population-based survey on the 'Burden of skin diseases in Europe' initiated and supported by the EADV, the aim of this study was to evaluate the prevalence of the most common dermatological diseases and conditions of adult patients across Europe.

Materials and methods

Study design
This multinational, cross-sectional study was conducted on a representative sample of the general populations of 27 European countries [24 belonging to the European Union plus United Kingdom (UK), Switzerland (SW), and Norway (NO), henceforth referred to with the acronym NEUKS (Norway, EU24, UK and SW)].

Data collection
Data were collected using a web-based online survey. A polling institute (HC Conseil, Paris) conducted the study. The study population was selected from the mega database used for market research and opinion surveys, which includes more than 200 million e-mail addresses worldwide (Megabase, Kantar Health, New York, NY, USA). A representative sample of the general population aged 18 years or more was recruited in each country using a stratified, proportional sampling with a replacement design.

Proportional quota sampling was used for each country based on the distribution of the population according to age, sex, administrative region, environment (large cities, towns, and rural areas), and income, to guarantee national representativeness of the sample.

Reference data on the socio-demographic distribution of the population in each country were extracted from the Eurostat database, updated at the time of the survey (2020), and completed by data provided by United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects: the 2019 Revision. https://population.un.org/wpp/.

The eligibility of a respondent for the survey was based on demographic data, which were used to create a quota-based sample. When one quota was filled, subsequent people in this category were no longer eligible. Selected participants from all the respective countries were contacted by personal email inviting them to take part in a survey without any specification of the subject of the survey. This prevented a self-selection bias since participants with a skin disease could have been more prone to participate in the study if its purpose had been disclosed. If contact was not successful, another potential participant with the same sociodemographic characteristics was randomly selected. To ensure the robustness of the data collected, individuals who did not complete the whole survey were excluded. The survey was conducted during the same period across all countries (from 10 November 2020 to 5 August 2021). Since the study used anonymized data and did not involve any clinical examination, institutional review board approvals were not required.

Data collection were done in respect of ethical codes of the European Society for Opinion and Marketing Research (ESOMAR) in compliance with the GDPR rules*

[REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)].

Sample size
The sample size was calculated for each country for the main outcomes, i.e., the prevalence of subjects with skin conditions or a history of skin conditions. The calculation was based on the results of two recent studies conducted in France with the French Society of Dermatology which used the same sampling method ('Objectifs Peau'[12] and 'Dermatologist Use'[13]). In these studies, about 30% of the French population aged 15 years and more reported at least one skin problem or disease in the previous 12 months. Based on these estimates, the margin of error of different sample sizes (with a confidence interval of 95%) was calculated (Table 1). For example, a sample size of 4000 individuals would allow to estimate a prevalence of a skin condition or disease in the previous 12 months of 30% with a margin of error

of ±1.42. The breakdown by country of the total number of inhabitants, of the number of inhabitants aged 18 years or older, and of the sample size is reported in Table 2. The sample size per country (4000–1000) also depended on the capacities of the panels referenced in each country to extract a representative sample. Around 4000 respondents were selected in Germany, France, Italy, Spain, and the United Kingdom, 2500 in Poland, 2000 in Romania, 1000 respondents in the other countries, and only 850 in Ireland because the panel did not allow for a larger representative sample size in this country. Only three countries of the European Community could not be included because no suitable panels of Internet users were available: Cyprus (881 952 inhabitants), Luxembourg (620 001 inhabitants), and Malta (584 862 inhabitants). Together, these three countries represent only 0.3% of the total population of the European Union. The number of individuals recruited by country was deemed to be sufficient to estimate the prevalence of the main skin diseases at both a national (4000–1000) and European level.

Questionnaire and outcomes

The questionnaire for data collection was designed in English by an international steering Committee (P Gisondi, T Nijsten, C Paul, L Puig, MA Richard, C Salvalatsru, A Stratigos, M Trakatelli). To ensure linguistic similarity and cultural coherence between different language versions, the translations produced by native speakers were then 'back-translated' in English and the two versions were compared by an EADV practicing dermatologist in each country.

The questionnaire consisted of two modules.

A - questions asked to the whole sample.
B - questions were asked to individuals who reported at least one skin condition during the previous 12 months.

Module A was completed by all interviewees of the representative sample of the general population. It included information on socio-demographic characteristics, skin phototype, comorbidities, medical consultations in the previous 12 months, and

Table 2 Breakdown by country of the number of inhabitants and the proposed sample size

Country	Total number of inhabitants (in 2019)	Number of inhabitants 18 years and older (in 2019)	Proposed sample sizes per country
Germany	83 517 045	69 502 000	4011
United Kingdom	67 530 161	53 370 000	4030
France	65 129 729	51 214 000	4014
Italy	60 550 092	50 855 000	4021
Spain	46 736 782	38 598 000	4022
Poland	37 887 770	31 089 000	2521
Romania	19 364 558	15 753 000	2006
Netherlands	17 097 122	13 769 000	1010
Belgium	11 539 326	9 189 000	1011
Czech Republic	10 689 213	8 702 000	1011
Greece	10 473 452	8 725 000	1010
Portugal	10 226 178	8 553 000	1011
Sweden	10 036 391	7 950 000	1010
Hungary	9 684 680	7 995 000	1020
Austria	8 955 108	7 397 000	1015
Switzerland	8 591 361	7 051 000	1012
Bulgaria	7 000 116	5 788 000	1010
Denmark	5 771 877	4 620 000	1010
Finland	5 532 159	4 469 000	1013
Slovakia	5 457 012	4 451 000	1000
Norway	5 378 859	4 249 000	1010
Ireland	4 882 498	3 667 000	855
Croatia	4 130 299	3 408 000	1010
Lithuania	2 759 631	2 266 000	1010
Slovenia	2 078 654	1 710 000	1018
Latvia	1 906 740	1 546 000	1010
Estonia	1 325 649	1 071 000	1008
Total	**524 232 462**	**426 957 000**	**44 689**

general health status/quality of life as assessed by the EuroQol-5D questionnaire (EQ5D).[14,15]

Each participant was asked about the presence of a skin condition or disease or unpleasant sensation in the 12 months prior to the study from a given list (Table 3).

Module B was completed only by individuals reporting at least one skin condition or disease during the previous 12 months, and elicited information about the health care pathway of the patient and the role of health professionals. Patients had to answer specific questions about stigmatization, the burden of disease, and how much their professional or personal life was affected and impaired by the skin condition or disease. Dermatology-related quality of life was assessed using the DLQI.[16,17] Depending on the presence or absence of a skin condition or disease, and on the respondent's health care history, the questionnaire could consist of 30 to a maximum of 101 questions (200 items). The maximum total duration required for questionnaire completion was 30 min.

Table 1 Margin of error according to country sample size

	12 months prevalence	Confidence interval based on sample size		
		n = 4000	*n* = 2500	*n* = 1000
At least one skin condition or disease in the last 12 months	30%	1.42%	1.80%	2.84%
Consulted a dermatologist in the last 12 months	22%	1.28%	1.62%	2.57%
Acne	12%	1.01%	1.27%	2.01%
Atopic dermatitis	5%	0.68%	0.85%	1.35%
Psoriasis	5%	0.68%	0.85%	1.35%
Vitiligo	1%	0.31%	0.39%	0.62%

Table 3 Skin diseases, symptoms, and skin-related surgical/cosmetic procedures recorded in the questionnaire

In the past 12 months, have you been confronted with any of the following situations?
Acne
Rosacea
Atopic dermatitis, eczema
Chronic urticaria
Hidradenitis suppurativa (recurrent abscesses or painful cysts in armpits, Groins, Buttocks, etc)
Psoriasis
Seborrheic dermatitis
Alopecia areata
Vitiligo
Hair lice
Scabies
Warts
Molluscum contagiosum
Bacterial skin infections
Viral skin infections
Sexually transmitted diseases (STI)
Non-cancerous skin lesions or growths
Mole cancer screening
Keratoses (seborrheic. actinic)
Non-melanoma skin cancers
Melanoma
Ulcers
Tinea
Skin drug reactions
Skin rash
Nail disease
Alopecia (or hair loss)
Fungal skin infection
Mucosal disorder (mouth, Genital, or anal) such as ulcers, pimples, or sores
Varicose veins or troubles associated with leg venous insufficiency
Brown or dark stains or spots (such as melasma, chloasma)
Birthmarks (such as angioma/haemangioma)
Excessive dry skin or tightness
Itching and pruritus
In the past 12 months, have you undergone any of the following procedures or made cosmetic consultations regarding your skin?
A surgical procedure with removal of cysts, nodules, moles, or skin tumours
A technical procedure such as laser, cryotherapy, or phototherapy
A cosmetic procedure such as botulin toxin injection, hyaluronic acid, or filler injection, peeling
A hair transplant
At least one aesthetic specific consultation

Statistical analysis

Qualitative and ordinal variables were described by their number and frequency. Quantitative variables were described by their mean value, standard deviation, median, and distribution. In each country, the total population of individuals suffering from each skin condition or disease, as well as the total sex- and age-specific population, were calculated by direct extrapolation of the proportions from the proportionally stratified sample in each country. The total European population was estimated by summing the population of each of the 27 countries in the survey.

The comparison test used, between the modalities of the qualitative variables, was determined by means of the Z-test. The quantitative variables were compared using the Student's t-test. The risk of error of type 1 (a) was set at 0.05 for all tests.

The statistical analyses were carried out using the HARMONIE 1.7 software, registered with the INPI under the name DSE-HARMONIE since 25 April 2013 with the registration number 4000937.

Results

The survey was conducted on the population of NEUKS, with the exception of Cyprus, Luxembourg, and Malta, for a total of 27 countries and 524 232 462 inhabitants. This represented 99.6% of the whole NEUKS population (526 319 277 inhabitants). Taking into account only individuals aged 18 or more, the total population from which the sample was extracted was 426 956 956 inhabitants. A total of 44 689 individuals, 21 887 (48.97%) men and 22 802 (51.03%) women, were included in the survey.

Overall (Table 4), 22 986 (50.9%) participants reported having had at least one disease, condition, or symptom. Out of all participants, 21 401 [47.20% (95% CI 46.74%–47.66%)] reported having had at least one dermatological disease or condition, including mole check or skin cancer screening, during the previous 12 months. The projection of this result on the total population of the 27 included European countries (i.e. 426 956 956 inhabitants aged ≥18 years) implies that 201 514 146 adults were affected by at least one dermatological condition or disease in the previous 12 months.

Excluding mole check and cancer screening, 19 915 participants [43.35% (95% CI 42.89%–43.81%)] reported having had at least one dermatological condition or disease in the past 12 months. Overall 56.65% of participants reported no skin conditions, 15.34% had one skin disease, 10.50% had two skin diseases, 6.09% had three skin diseases, and 11.42% had four skin diseases or more. In the group of participants who reported a skin condition or disease (n = 19 915), 35.38% had one skin disease, 24.32% had two skin diseases, 14.06% had three skin diseases, and 26.34% had four skin diseases or more. On average, they reported 3.04 ± 3.23 skin diseases (median 2.00).

The prevalence of the 12 most frequent skin conditions or diseases is reported in Table 5. The highest prevalence was observed for a fungal skin infection (8.92%), followed by acne (5.36%), atopic dermatitis/eczema (5.48%), alopecia (5.12%), and psoriasis (3.92%). Table 5 also reports the standardized overall prevalence estimates, and the projections to determine the number of affected individuals in the European population. According to

Table 4 Prevalence of reported skin diseases, conditions, or symptoms in the last 12 months (27 countries, *N* = 44 689)

	n	%	95% Margin of error
At least one disease, condition, or symptom	22 986	50.9%	0.46%
At least one disease or condition	21 401	47.2%	0.46%
At least one disease or condition excluding mole check	19 915	43.4%	0.46%

the projections, e.g., more than 38 million European individuals would be affected by a fungal skin infection, about 23 million by atopic dermatitis/eczema, and more than 16 million by psoriasis. The prevalence of the most frequent skin diseases affecting the sample of the European population and the corresponding projections by sex is reported in Table 6.

Alopecia, acne, eczematous dermatitis, and rosacea were more common in women, whereas men were more likely to suffer from psoriasis and sexually transmitted infections (STI). These differences in sex prevalence, except for fungal skin infection, were all statistically significant.

Table 7 reports the prevalence of the 12 skin diseases affecting the representative sample according to age. Acne, vitiligo, and STI affected mainly young adults, whereas respondents older than 25 years reported psoriasis more often than young participants.

The prevalence of unpleasant and uncomfortable skin sensations according to sex and age is reported in Table 8. Tightness and itch were reported by 14.8% and 13.6% of the general sample, respectively, mainly by women and young respondents. Based on the prevalence of 22.2% observed in our sample, it can

Table 5 Prevalence of the 12 main skin diseases in the study population aged 18 or over

Reported diseases	*n*	%	Estimated prevalence per 100 000 persons (95% CI)	Extrapolation in millions of individuals
Fungal skin infection	4053	8.9%	8922 (8658–9186)	38.10
Acne	2452	5.4%	5357 (5148–5566)	22.87
Atopic dermatitis, eczema	2385	5.5%	5484 (5273–5695)	23.42
Alopecia (or hair loss)	2331	5.1%	5117 (4913–5322)	21.85
Psoriasis	1758	3.9%	3922 (3742–4102)	16.75
Sexually transmitted diseases	1258	2.8%	2779 (2627–2931)	11.87
Rosacea	865	2.0%	2010 (1880–2140)	8.58
Chronic urticaria	468	1.0%	978 (887–1069)	4.18
Non-melanoma skin cancers	462	1.1%	1110 (1013–1207)	4.74
Vitiligo	355	0.8%	796 (714–878)	3.40
Hidradenitis suppurativa (recurrent abscesses or painful cysts in armpits, groins, buttocks, etc)	280	0.6%	623 (550–696)	2.66
Melanoma skin cancers	255	0.6%	600 (528–671)	2.56

Estimated prevalence and extrapolation in the EU population (27 countries, *N* = 426 957 000).

Table 6 Prevalence of the 12 main skin diseases in the study population aged 18 years or over by gender

Reported diseases	Male (*N* = 21 887)			Female (*N* = 22 802)			Extrapolation in millions of males	Extrapolation in millions of females
	n	%	95% ME	*n*	%	95% ME		
Fungal skin infection	1980	8.9%	0.38%	2073	8.9%	0.37%	18.77	19.32
Acne	916	4.2%	0.26%	1536	6.5%	0.32%	8.71	14.16
Atopic dermatitis, eczema	930	4.4%	0.27%	1455	6.6%	0.32%	9.17	14.24
Alopecia (or hair loss)	990	4.5%	0.27%	1341	5.8%	0.30%	9.35	12.50
Psoriasis	933	4.2%	0.27%	825	3.7%	0.24	8.76	7.99
Sexually transmitted diseases	810	3.6%	0.25%	448	2.0%	0.18%	7.58	4.29
Rosacea	276	1.3%	0.15%	589	2.7%	0.21%	2.73	5.85
Chronic urticaria	212	0.9%	0.13%	256	1.0%	0.13%	1.90	2.28
Non-melanoma skin cancers	297	1.4%	0.16%	165	0.8%	0.12%	2.99	1.75
Vitiligo	205	0.9%	0.13%	150	0.7%	0.10%	1.97	1.43
Hidradenitis suppurativa (recurrent abscesses or painful cysts in armpits, groins, buttocks, etc)	161	0.7%	0.11%	119	0.5%	0.09%	1.56	1.10
Melanoma skin cancers	165	0.8%	0.12	90	0.4%	0.08	1.66	0.91

Table 7 Prevalence of the 12 main skin diseases in the study population by age

Reported diseases	18–25 years (N = 5543)			26–54 years (N = 23 593)			55 years or more (N = 15 553)		
	n	%	95% ME	n	%	95% ME	n	%	95% ME
Fungal skin infection	525	9.5%	0.77%	2297	9.6%	0.38%	1231	7.8%	0.42%
Acne	737	13.5%	0.90%	1545	6.4%	0.31%	170	1.0%	0.16%
Atopic dermatitis, eczema	311	5.5%	0.60%	1487	6.5%	0.31%	587	4.0%	0.31%
Alopecia (or hair loss)	311	5.8%	0.61%	1348	5.7%	0.30%	672	4.1%	0.31%
Psoriasis	150	2.9%	0.44%	972	4.2%	0.25%	636	3.9%	0.30%
Sexually transmitted diseases	375	6.6%	0.65%	806	3.4%	0.23%	77	0.5%	0.11%
Rosacea	94	1.7%	0.34%	514	2.2%	0.19%	257	1.8%	0.21%
Chronic urticaria	79	1.4%	0.31%	284	1.1%	0.14%	105	0.6%	0.12%
Non-melanoma skin cancers	74	1.3%	0.30%	232	1.0%	0.13%	156	1.1%	0.17%
Vitiligo	69	1.2%	0.29%	201	0.9%	0.12%	85	0.5%	0.11%
Hidradenitis suppurativa (recurrent abscesses or painful cysts in armpits, groins, buttocks, etc)	52	0.9%	0.25	185	0.8%	0.11	43	0.3%	0.08
Melanoma skin cancers	47	0.9%	0.25	131	0.6%	0.10	77	0.5%	0.11

be extrapolated that almost 95 million European adults complain of unpleasant skin sensations.

Discussion

In this survey, we observed that 43.35% of the NEUKS adult population reported having had at least one dermatological disease or condition. Projecting this result on the general population, means that more than 185 million people aged 18 years or more in NEUKS are potentially affected by a skin condition.

The prevalence was 47.20% when including mole check or skin cancer screening. Projecting this result on the general population, means that more than 201 million people aged 18 years or more in NEUKS are potentially affected by a skin condition or a suspicion of skin cancer, or undergo screening for skin cancer.

This result is consistent with data on a representative sample of the French population,[1] where the prevalence of skin problems during the previous 24 months was estimated as 43.2%. Results are different when a specific population is analysed when the skin problem has been confirmed by a dermatologist, or when only skin problems in need of treatment are considered. For example, in a German population of healthy workers who underwent a dermatological examination[27] 26.8% of them exhibited a dermatological finding in need of treatment or further clarification.

On the other side, in a study conducted in a real-life setting on 2701 individuals,[18] at least one skin abnormality was observed in 64.5% of participants, mainly actinic keratosis, rosacea, and eczema.

Compared to data from the large French population-based study 'Objectifs Peau',[19] in which a similar methodology was used to evaluate the prevalence of five chronic skin inflammatory diseases (atopic dermatitis, psoriasis, alopecia areata, vitiligo, and hidradenitis suppurativa), the results were similar. The prevalence of atopic dermatitis in the French population was 4.65% and in this study it was 5.48%, and that of psoriasis was 4.42% in the French population, and 3.92% in this study. The prevalence of vitiligo was higher in our study (0.80% vs. 0.46%), as well as that of hidradenitis suppurativa (0.62% vs. 0.15%). Obviously, the two studies are not completely comparable, since one concerns only a single country and the other 27 different European countries. Moreover, in the French study data were collected also on younger participants (15 years or higher). Additionally, data from the previous population-based study by Wolkenstein *et al.*[1] are not comparable with ours, since they investigated the presence of dermatological conditions in the previous 24 months, and thus the prevalence reported was generally higher than the one in our study. On the other hand, Svensson *et al.*'s data[11] concerned the history of skin problems that had lasted >3 days during the previous month or previous year, and thus our results are comparable. For example, in their study the prevalence of acne was 5.0% and in ours 5.4%, of psoriasis 3.1% and 3.9%, and of urticaria 1.7% and 1.0%, respectively.

Data concerning skin cancer are probably biased for various reasons. For example, in our study a high prevalence of melanoma was reported, probably due to the fact that people may confuse the diagnosis of melanoma and the presence of nevi. On the other side, the overall prevalence of skin cancer in our study was low. It is possible that the patient is not always aware that, e.g., basal cell carcinoma is a type of skin cancer. Then, probably, people do not always consult a dermatologist for skin cancer,

Table 8 Prevalence of skin symptoms (unpleasant or uncomfortable skin sensations) that affect the European population at least once a day for at least four consecutive weeks by gender and age (27 countries, *N* = 44 689)

Skin symptoms	Total (*N* = 44 689)			Men (*N* = 21 887)			Women (*N* = 22 802)		
	n	%	95% ME	*n*	%	95% ME	*n*	%	95% ME
Global unpleasant and uncomfortable skin sensations	9948	22.2%	0.39%	4042	18.3%	0.51%	5906	26.0%	0.57%
Tightness, excessive skin dryness	6486	14.8%	0.33%	2250	10.4%	0.40%	4236	19.1%	0.51%
Itching, pruritus	6204	13.6%	0.32%	2751	12.3%	0.44%	3453	14.7%	0.46%
Skin symptoms	**18–25 years** (*N* = 5543)			**26–54 years** (*N* = 23 593)			**55 years or more** (*N* = 15 553)		
	n	%	95% ME	*n*	%	95% ME	*n*	%	95% ME
Global unpleasant and uncomfortable skin sensations	1327	24.4%	1.13%	5569	23.5%	0.54%	3052	19.7%	0.62%
Tightness, excessive skin dryness	897	16.7%	0.98%	3710	16.0%	0.47%	1879	12.4%	0.52%
Itching, pruritus	777	13.9%	0.91%	3505	14.5%	0.45%	1922	12.1%	0.51%

since its manifestations are not generally as impairing as other skin conditions. In a Dutch study[20] in which a full-body skin examination was performed, the prevalence for any kind of skin cancer was higher (4.9% vs. 1.7% in our study, including melanoma and NMSC together). It must also be noted that the Dutch study concerned elderly people, in whom the prevalence of skin cancer is higher.

Moreover, it is also possible, in elderly populations, that health professionals do not clearly express the diagnosis of cancer on the one hand, and on the other that there is a possible discrepancy between what the doctors say and what the patients retain (PACTIS survey, https://doi.org/10.4000/questionsdecommunication.7340).

We observed higher prevalence rates in women than in men for several conditions, especially alopecia, acne, eczematous dermatitis, and rosacea. On the contrary, psoriasis was more frequent in men, at variance with the previous studies.[21] Acne and STI affected mainly young adults, while psoriasis was more frequent in respondents older than 25 years. The high prevalence of skin cancer reported by young participants is probably due to the growing awareness of young people towards skin cancer prevention.

To the best of our knowledge, this is the largest epidemiological population-based study of dermatological diseases/conditions, including more than 44 000 people across 27 European countries. Other population-based studies generally concerned a single country and only some specific conditions. The choice of an online data collection allowed to reach a large representative population in all European countries, including individuals who do not regularly consult a health professional for their skin problems.

The acceptance rates of online-based surveys (which was about 80% in this study) are today higher than telephone, face-to-face, or postal surveys. Furthermore, inclusion bias related to an interest in skin problems was avoided, because the subject was not informed about the subject of the survey at the time of recruitment. In addition, the representativeness of each country was guaranteed by using quotas,[22] determined by age, sex, region, and income. This allowed us to construct samples that are scaled-down models of the general population. Using quotas cancels out the main biases associated with the acceptance rate: e.g., higher response rates are often seen in people living in urban areas or in those who have higher levels of income or education.

A further advantage is that the sample obtained using this approach requires no weighted-adjustment. We thus hypothesize that our results could also be generalized to the whole European population.

A limitation of this study is that data were based on self-reporting by the participants. Thus, the diagnosis of skin disease may have been established by various health professionals, and not only by dermatologists. It should be stated that for most diseases evaluated in the study which are common, the diagnosis is easily done by a general practitioner. Declarative data can be affected by recall bias from the respondent, possible misclassification, or lack of awareness of the real diagnosis. For example, there may be an underestimation of conditions such as seborrheic dermatitis or actinic keratosis compared to studies conducted by physicians in a random sample like in the Dutch study.[20] Data on the agreement between self-report of a skin condition by a patient and the diagnosis is done by the dermatologist are discordant. A study[23] highlighted that there was a good agreement between self-reported psoriasis, hidradenitis suppurativa or vitiligo, and dermatologists' diagnosis. On the contrary, a study evaluating the agreement between self-reported and dermatologists' diagnoses for five chronic dermatoses,[24] i.e., acne, eczema, fungal infection, psoriasis, and seborrheic dermatitis, reported a low agreement, with an underestimation of the prevalence by the patient. In the abovementioned study conducted in a

real-life setting,[18] clinical examinations showed that nearly two-thirds of the affected participants were unaware of their abnormal skin findings. Indeed, self-reported data usually tend to underestimate the prevalence, so it is possible that dermatological conditions are even more frequent than what is reported by individuals.

Also, focusing on 1-year prevalence may lead to an underrepresentation of acute conditions, such as drug reactions. Thus, we observe that the top 12 skin diseases concern mainly chronic skin diseases of adults. Moreover, we did not include children, so conditions such as warts were less frequent compared to a general population of all ages. Furthermore, the negative aspect of quota sampling is that there is no information on non-responders, so it has to be assumed that the individuals selected are similar to non-selected ones.

The knowledge of the prevalence and incidence of diseases is crucial to designing appropriate health care services. In particular, the estimation of the prevalence of a chronic condition allows one to evaluate its burden on the health and social care system at a particular point in time. Adequately addressing the prevalence of skin diseases, their impact on patients' quality of life, and their economic burden is of primary importance in planning health policies. As mentioned above, Hay et al.[6] published a landmark study in 2014 in terms of the burden generated by skin diseases, and he reported that three skin diseases were in the top 10 most common diseases globally in 2010 [i.e. fungal skin diseases (4th global prevalence), other skin and subcutaneous diseases (5th), and acne vulgaris (8th)]. Also, the analysis of differences in subgroups of patients, e.g., for age and sex, allows to better define specific needs.

With the results of this large study epidemiological study, we expect to raise awareness about the importance of skin diseases. To meet patients' needs in Europe, it is important to ensure timely and easy access to specialized dermatological care. Skin diseases should be regarded as a real public health problem and deserve greater consideration by political stakeholders and public health systems' managers.

Acknowledgements

Data availability statement

The data are property of the EADV and may be provided to industry partners with monetary compensation.

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