Epidemiology of Psoriasis in Portugal: A Population-Based Study

Epidemiologia da Psoríase em Portugal: Um Estudo de Base Populacional

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ABSTRACT

Introduction: Psoriasis is a common, chronic, and inflammatory skin disorder with a high personal, social and economic burden and important implications for healthcare systems. The aim of this study was to provide an epidemiological characterization of individuals with psoriasis in Portugal.

Material and Methods: A large observational, cross-sectional, nationwide, population-based survey study developed by the Portuguese Psoriasis Group of the Portuguese Society of Dermatology and Venereology (GPP-SPDV). A structured questionnaire was designed and applied by experienced interviewers to a random, representative sample of Portuguese individuals with psoriasis and/or psoriatic arthritis. Patients were considered to have psoriasis if they replied positively to one of the following questions: "Does any physician have ever diagnosed you with psoriasis?" or "Do you have a skin disorder characterized by scaling, reddish skin lesions located in the elbows/knees/scalp?".

Results: A total of 6381 individuals were interviewed, of which 283 met the criteria for psoriasis, corresponding to a prevalence rate of 4.4% (95% CI 3.95 – 4.98). Out of the participants that met psoriasis criteria, 24% had suggestive signs/symptoms but did not have a clinical diagnosis established and were not being monitored by a physician. Although more than 70% of participants had active disease (scaling, erythema, or pruritus) and one third had joint symptoms, only 12% were on systemic treatment. Fifty percent of participants with psoriasis (n = 139) had relevant comorbidities (most frequently depression/anxiety and cardiometabolic diseases). Sixteen percent of participants with psoriasis (n = 46) reported that psoriasis interfered with their daily activities (median impact of 5 in a 0 – 10 scale) and 12% mentioned the disease had an impact in their sexual life (median impact of 5 in a 0 – 10 scale).

Conclusion: The results of this study suggest that the prevalence rate of psoriasis is likely to be high in Portugal, and several gaps exist at different levels of healthcare delivery to these patients, from diagnosis to treatment. This study provides important data for the future planning of interventions targeting the improvement of psoriasis care in Portugal.

Keywords: Arthritis, Psoriatic/epidemiology; Portugal; Psoriasis/epidemiology; Surveys and Questionnaires

RESUMO

Introdução: A psoríase é uma doença inflamatória crónica da pele com um elevado impacto ao nível pessoal, social e também económico nos sistemas de saúde. Este estudo foi desenhado com o objetivo de providenciar uma caracterização epidemiológica da população de doentes com psoríase em Portugal.

Material e Métodos: Estudo observacional, transversal, nacional, de base populacional desenvolvido pelo Grupo Português de Psoríase da Sociedade Portuguesa de Dermatologia e Venereologia (GPP-SPDV). Para o efeito, desenhou-se um questionário que foi posteriormente aplicado por entrevistadores experientes a uma amostra aleatória e representativa dos indivíduos portugueses com psoríase e/ou artrite psoriática. Os critérios para diagnóstico de psoríase neste estudo incluíram a resposta positiva a pelo menos uma das seguintes questões: "Já foi diagnosticado com psoríase por algum médico?" ou "Tem alguma doença da pele que curse com lesões descamativas avermelhadas localizadas nos cotovelos/joelhos/escalpe?".

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Resultados: Foi realizado um total de 6381 entrevistas. Destas, 283 corresponderam a indivíduos com psoríase de acordo com critérios pré-estabele-cidos, correspondendo a uma prevalência de 4,4% (IC 95% 3,95 – 4,98). Dos participantes que cumpriram os critérios para psoríase, 24% tinham sinais ou sintomas sugestivos, mas não tinham diagnóstico clínico estabelecido ou acompanhamento médico. Apesar de mais de 70% dos participantes terem doença ativa (descamação, eritema ou prurido) e um terço ter sintomas articulares, apenas 12% estavam a receber tratamento sistémico e menos de um terço estavam a ser acompanhados por um médico. Cinquenta porcento dos participantes (n = 139) referiram comorbilidades relevantes (sendo as mais frequentes depressão/ansiedade e doenças cardio-metabólicas). Sessenta por cento dos participantes com psoríase (n = 46) admitiram que a psoríase interferia com as suas atividades de vida diária (impacto mediano de 5 numa escala de 0 – 10), sendo que 12% referiram ainda um impacto na vida sexual (impacto mediano de 5 numa escala de 0 – 10).
Conclusão: Os resultados do estudo sugerem que a prevalência da psoríase parece ser elevada em Portugal, existindo atualmente várias lacunas no que concerne à prestação de cuidados de saúde a estes doentes, desde o diagnóstico ao tratamento. Este estudo providencia informação importante para o planeamento de estratégias interventivas que visem melhorar os cuidados de saúde aos doentes com psoríase.
Palavras-chave: Artrite Psoriática/epidemiologia; Inquéritos e Questionários; Portugal; Psoríase/epidemiologia

INTRODUCTION

Psoriasis is a common chronic inflammatory skin disorder that affects 0.51% to 11.43% of the population.[1] Visible lesions, skin symptoms and consequent discomfort trigger a negative cascade that markedly decreases the quality of life of patients. When compared with other chronic disorders (including cancer, ischemic heart disease and congestive heart failure), only depression and chronic lung disease were shown to impair psychological quality of life more than psoriasis.[2] The disease burden is further increased by the frequently associated comorbidities, such as metabolic syndrome and cardiovascular disease. Due to the importance of the psoriasis burden, the World Health Organization (WHO) raised awareness of this disease in the 67th World Health Assembly, in 2014. In its Global Report, WHO recognized psoriasis as a "chronic, noncommunicable, painful, disfiguring, and disabling disease for which there is no cure".[3] The high burden of psoriasis was also highlighted, resulting from the "inaccurate or delayed diagnosis, a lack of access to care, and therapeutic options which are limited in their ability to achieve patient satisfaction".[3]

The etiology of psoriasis is thought to be multifactorial, involving a combination of genetic, immunological and environmental factors.[4,5] Its prevalence is known to vary according to the geographic location and cultural environment, and there is currently an unmet need to better characterize the epidemiology of psoriasis on a country-basis.[1] To our knowledge, only one small study in Portugal that was published in 2000 has made an attempt to estimate the prevalence of psoriasis, but no further characterization of this population was performed.[6] Over the last decade, advances concerning the pathophysiology of the disease and the development of highly effective biologic drugs revolutionized the natural history and management of psoriasis.[7] However, a considerable proportion of patients remains undertreated.[8] Most of this data is unknown to the Portuguese psoriatic population. Therefore, the proper characterization of the Portuguese population with psoriasis is essential so that better nationwide strategies and protocols that can address the current needs in healthcare regarding this frequent dermatosis can be developed.

This study protocol was designed to obtain an epidemiological characterization of psoriasis in Portugal by recruiting and studying a random, representative sample and applying a specifically developed questionnaire. The aim of this study was to describe the prevalence of psoriasis, as well as the clinical characteristics, impact in quality of life, comorbidities, and treatment patterns of patients with psoriasis.

MATERIAL AND METHODS

This was a nationwide, epidemiological, observational, cross-sectional study that was designed to characterize the Portuguese population with psoriasis and/or psoriatic arthritis and to estimate the prevalence of psoriasis in Portugal. The Institute of Public Health of the University of Porto approved the protocol, and all participants gave their oral consent before participation. The study was performed in accordance with the tenets of the Declaration of Helsinki.

The study protocol consisted of a structured phone questionnaire with a limited duration of 20 minutes and was applied between May 2021 and November 2021. The questionnaire included six main sections: section I: focusing on the demographic characterization of the overall sample; section II: focusing on the demographic characterization of the subsample with psoriasis; section III: focusing on the social habits, medications, and co-morbidities of participants with psoriasis; section IV: focusing on the clinical characteristics and burden of psoriasis; section V: focusing on the treatment of psoriasis; section VI: focusing on psoriatic arthritis.

Patients were considered to have psoriasis if they replied positively to one of the following questions: "Has any physician ever diagnosed you with psoriasis?" or "Do you have a skin disorder characterized by scaling, reddish skin lesions located in the elbows/knees/scalp?". Psoriatic arthritis was defined as a positive answer by patients with psoriasis to one of the following questions: "Have you been diagnosed with psoriatic arthritis?" or "Are you attending rheumatology

appointments due to joint problems?" or "Have you ever had a swollen painful joint in the hands, feet, wrists, ankles or knees?".

The sample was collected by a random selection of telephone numbers from distinct geographic regions of Portugal with the aim of achieving a distribution matching that of the Portuguese population. Using this strategy, we warranted a random sampling representative of the target population. Our methods and strategy were in line with other similar previous studies.[8] A total of 80 000 phone numbers were set as the target sample size using the aforementioned method. We estimated extracting 40% of valid numbers, and a positive participation response rate of 50%, corresponding to a total of 16 000 participants. Considering that the estimated prevalence of psoriasis is 2.5%, we set a target sample size of 400 individuals aiming for an effect size of 16%, a power of 90% and a significance level of 0.05%. All phone calls were tried for a predefined number of attempts and time schedules. The inclusion criteria consisted of individuals who were residents in Portugal at the time of the study (regardless of the nationality). The exclusion criteria included: individuals living in nursing homes/prisons or other similar institutions and individuals with communication barriers (cognitive or neurological disease, deafness). We also excluded phone numbers attributed to enterprises/institutions. All information was collected and managed by experienced professionals in interviewing and health data collection.

In order to ensure the representativity of the sample, its demographic characteristics were compared to those from the Portuguese population using data provided by the National Statistics Institute (Instituto Nacional de Estatística, INE).

Statistical Analysis

For the comparison of proportions, the Pearson's chi-squared test if its assumptions are met, otherwise Fisher's exact test. In the case of comparison of two proportions, continuity correction was performed. Descriptive statistics were presented as total number (n) and percentage for categorical variables and as mean and standard deviation (SD) or median and first/third quartiles (Q1, Q3 respectively). The pooled prevalence of psoriasis was presented with the respective 95% confidence intervals (95% CI). Statistical analyses were performed with R, Version 4.2.1 with a significant level value of 0.05.

RESULTS

A total of 6381 individuals were interviewed by phone call and of those, 283 met the criteria for psoriasis. The main results of the questionnaire by section are presented below.

Section I: Demographic characterization of the total sample

The geographical characterization of the sample is presented in Fig. 1. The sample homogenously represented the territory of Portugal, including the archipelagos of Madeira and Azores, with no significant differences for age, gender or education level when compared with the population data for Portugal provided by the National Statistics Institute [Appendix 1, Table 1 (https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/19048/Appendix_01.pdf)]. Fifty-two percent (n = 3284) of participants were female and the majority (71%, n = 4494) were aged between 25 and 64 years-old, following a distribution that is representative of the Portuguese population [Appendix 1, Table 1 (https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/19048/Appendix_01.pdf)]. Most of the sample (61%, n = 2333) had at least 10 years of education.

Section II: Subsample of patients with psoriasis

A total of 283 participants met the criteria for psoriasis, corresponding to a prevalence rate of 4.4% (95% CI 3.95 - 4.98). From those, 133 (47%) were female and 196 (69%) were over 40 years old. Out of the 283 participants who met the criteria for psoriasis, 216 (76%) had been diagnosed by a physician: in 57% (n = 160) the diagnosis was performed by a dermatologist, in 11% (n = 30) by a family physician, and in 1% of cases (n = 4) by a rheumatologist. The remaining 67 participants (24%) met the selected criteria for psoriasis, although without a previous clinical diagnosis of psoriasis.

Section III: Habits, medications, and comorbidities in patients with psoriasis

More than half of the patients with psoriasis (n = 164, 59%) were/had been smokers and the majority (n = 249, 89%) were consumers of alcoholic beverages (no quantitative data was collected) (Table 1). In addition, more than 80% (n = 229) had a sedentary lifestyle and about 60% (n = 163) were overweight or obese (Table 1).

Fifty percent of participants with psoriasis (n = 139) had relevant comorbidities, requiring regular medical follow-up, and were taking regular medication (n = 148, 52%) (Table 1). The most frequent comorbidities were depression/anxiety (n = 35, 18%), and cardiometabolic diseases [hypertension (n = 20, 10%), dyslipidemia (n = 20, 10%), diabetes (n = 12, 6%) and

cardiovascular disease (n = 6, 3%) (Table 1). Of note, 5.5% of participants had an oncologic disease (cured or active).

Section IV: Clinical characteristics and burden of the disease

The mean age at which the first signs and symptoms appeared was 29.7 (16.9) years-old, but the diagnosis of psoriasis was made at a mean age of 32.6 (16.6) years, with no sex-related differences found (*p* = 0.68). Most participants (n = 170, 62%) had no family history of psoriasis.

Although nearly 80% had visited a dermatologist at least once in their lifetime (n = 227, 82%), only 32% (n = 90) were currently being monitored by a physician at the time of the study, which in most cases was a dermatologist (n = 61, 68%) (Table 2). From the 90 patients regularly monitored, 39 patients (43%) had appointments twice a year or more. Although only a minority of 1.5% of the patients (n = 4) had ever been hospitalized due to psoriasis, 17% (n = 47) had to seek an urgent appointment at least once.

For those patients with active disease, the most common locations were the scalp (59%) followed by elbows (50%), trunk (31%), knees (27%), face (25%), genitals (18%), nails (15%), and palms and soles (9%). The most frequently reported signs and symptoms at the time of the study were scaling (n = 173, 80%), erythema (n = 161, 73%) and pruritus (n = 158, 73%), and the most bothersome signs/symptoms were pruritus (n = 146, 66%), followed by scaling (n = 112, 50%) (Table 3). Of note, 31% mentioned joint pain as the most bothersome symptom (Table 3).

Sixteen percent of participants with psoriasis (n = 46) reported that the disease interfered with their daily activities and 12% (n = 32) reported an impact in their sexuality (median impact of 5 in a 0 - 10 scale). At least 7% (n = 18) admitted that psoriasis interfered with the career choice, and 4% (n = 12) had been on leave because of the disease (Table 3). Nearly 7% (n = 20) also admitted that psoriasis affected the way they took care of their children, and the majority (n = 165, 61%) admitted fearing that their children may develop the disease (Table 3). For those patients with active psoriasis lesions, the median global impact of psoriasis in daily life (in a 0 - 10 scale) was 5 (Table 4).

Section V: Psoriasis treatment

Data on psoriasis treatment is presented in Table 5. Most participants with psoriasis had never received systemic treatment, neither oral (n = 176, 70%) nor injectable (n = 253, 95.8%). At the time of the interview, most patients were applying topical treatments (n = 194, 71%), while 12.1% were being treated with systemic therapy (only 3.3% were receiving biologic therapy). Regarding treatment satisfaction, the most satisfied patients were those receiving injectable drugs (median satisfaction of 9 in a 0 - 10 scale). The factors that were mostly valued by patients in a treatment strategy included complete resolution of lesions (n = 143, 64%), fastest onset of action (n = 142, 65%), pruritus relief (n = 109, 50%), quality of life improvement (n = 97, 45%) and treatment safety (n = 87, 41%).

Section VI: Psoriatic arthritis

A total of 120 participants (42%) with psoriasis met the selected criteria for psoriatic arthritis although only 8% (n = 22) mentioned they had the diagnosis confirmed by a physician. For those patients who met our criteria for psoriatic arthritis, the majority mentioned the joint manifestations appeared after skin involvement (60%, n = 72) and only a minority were being monitored by a rheumatologist (n = 8, 3%). Nearly 25% (n = 31) admitted their joint pain was not controlled. Detailed data is presented in Table 2 of the Appendix 1 (https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/19048/Appendix_01.pdf).

DISCUSSION

This study presented an epidemiological characterization of a representative sample of Portuguese individuals with psoriasis. A total of 283 participants met the criteria for psoriasis – 76% of the patients were previously diagnosed by a clinician, corresponding to a prevalence rate of 4.4% (95% CI 3.95 - 4.98). As such, we can estimate that about 440 000 individuals may have psoriasis in Portugal, and this represents a huge burden for healthcare systems and calls for appropriate screening strategies. The published prevalence rate of psoriasis ranges between 0.51 to 11.43% worldwide, varying with the geographical region, and the broad interval highlights the absence of high-quality real world epidemiological data.[1,9] Prior to our work, only one small study estimated the prevalence rate of psoriasis in Portugal in 2000, and the estimate found was slightly lower: 1.9%.[6] However, this study was based on a small sample from a restricted geographic location and no further characterization of this population was performed. The increased prevalence rate that we found may also reflect the recent improvements in the knowledge and diagnosis of the disease as well as the effect of disease awareness campaigns.

Importantly, this study suggests that psoriasis may be underdiagnosed in Portugal. Although most participants with

psoriasis (n = 216, 76%) had been diagnosed by a physician – we found a gap of three years between the appearance of the first symptoms and the time of clinical diagnosis, a delay that we know that can impact the natural history of the disease.[4] Nearly a quarter of patients (n = 67, 24%) reported that they had lesions compatible with psoriasis, but no official clinical diagnosis. Both public awareness and screening strategies are needed to address the current challenges of early recognition and management of psoriasis in Portugal. Concerning this matter, a recently published study[10] analyzed the unmet needs in the diagnosis and management of psoriasis in Spain from a different range of perspectives. The authors of that study raised awareness about the importance of not only addressing the clinical effectiveness of new treatments, but most importantly, to focus on patient-related challenges (including educational strategies) in the decision-making process, in clinical communication and at a social level. It is therefore essential to establish multidisciplinary and multidimensional strategies when approaching psoriasis.[11-13]

We also found that psoriasis was undertreated in our Portuguese sample, which is in accordance with the published literature.[14] Although an accurate evaluation of severity of the disease was not performed in our study, we know from the literature that 20% to 30% of the population with psoriasis has moderate-to-severe disease, requiring systemic therapy.[14] In our population, more than 70% of participants had active disease and nearly one third had joint pain. From those with active disease, 73% (n = 158) of patients reported such an important symptom as pruritus. However, only 12% of participants were on systemic treatment and less than one third were being monitored by a physician. In addition, an important proportion of patients reported skin lesions in highly impactful and difficult-to-treat areas such as the scalp (59%), nails (15%), palms and soles (9%), or sensitive areas such as the face (25%) and genitals (18%) – similar proportions compared to the worldwide literature.[15,16] These findings reinforce the extent of undertreatment in our population, since current guidelines recommend systemic therapy for patients with psoriasis affecting body areas where it is difficult to apply topical treatment such as the scalp, nails or palms and soles – leading to lower adherence to treatment and worse control of the disease – and sensitive regions such as face and genitals due to the high impact of the disease in patient quality of life.[17]

Regarding the treatment strategy, our population with psoriasis valued the complete resolution of skin lesions (64%), fastest onset of action (65%) and relief of pruritus (50%) the most. Interestingly, these factors were even more valued than improvement of quality of life (45%) or treatment safety (41%). These findings suggest that our population with psoriasis seeks highly effective and fast-acting therapeutic options, such as the biological agents that we now have in the armamentarium of psoriasis management and that should be considered in each patient when other options fail.

More than half of participants with psoriasis in our study had comorbidities requiring clinical monitoring. The most frequent one was depression/anxiety, and our rate (18%) is in line with the literature that estimates that depression affects between 9% - 55% of patients with psoriasis.[18] Depression in these patients is thought to be multifactorial. In fact, several factors play a role in the psychological burden of the disease, including the stigma that these patients feel due to the appearance of their disease, as well as uncontrolled symptoms – in our sample, mainly pruritus (66.1%) – that impact daily activities, or the fear of transmitting the disease to their children.[19] Evidence also suggests that the chronic proinflammatory state can play a role and explain the increased rates of anxiety and depression in patients with psoriasis.[18,20] The high burden of the disease results in an enormous impact of psoriasis on the quality of life of patients,[2] and this is clear in our sample: participants admitted psoriasis interfered with daily activities (16%), with sexual life (12%), with family life (7% admitted the disease affected the way they took care of their child), and with their career (4% were on sick leave due to their disease). Nearly 61% of the patients with psoriasis had a constant fear that their children would also develop psoriasis. The psychosocial impact of psoriasis in undeniable, and it has been shown to severely debilitate patients in several dimensions since the onset of the first symptoms.[21] Patients with psoriasis are at risk for absenteeism and their sexual life is also negatively affected by the disease, as patients may experience feelings of embarrassment and shame due to their condition.[22] The psychological and social impact of psoriasis is a very important aspect in patient counselling, and providers should be aware of this – not only through the assessment of traditional measures such as Dermatology Life Quality Index (DLQI), but also through the evaluation of highly impactful symptoms such as pruritus, skin pain or burning sensation –, as the patients' understanding of the illness may be limited and support lacking.

Cardiovascular risk factors were among the most frequent comorbidities (obesity, hypertension, diabetes, and dyslipidemia). This relationship has also been highlighted in the literature and the evidence linking psoriasis and cardiovascular diseases is strong.[23] The explanation for this association appears to involve a combination of a predisposing chronic inflammatory state and higher rates of unhealthy behavioral risk factors including smoking and alcohol use and a sedentary lifestyle, that were also found to be present in our sample – nearly 59% were/had been smokers, nearly 89% were consumers of alcoholic beverages, and nearly 58% were sedentary.[24-27] Obesity has also shown to be a key component of psoriasis[28] and in our sample more than half of the participants were overweight or obese. Adipose tissue is known to actively contribute to the proinflammatory state in psoriasis, thus potentiating the

consequences of the disease.[29] Not only obesity is a risk factor for developing psoriasis, but it also aggravates an existing condition.[30] In addition, overweight may interfere with the medical management of the disease, reduce the efficacy of biological drugs, and further increases the cardiovascular burden that is already high in these patients.[30,31] The high prevalence rate of overweight/obesity in our sample also highlights the unmet need of addressing this modifiable risk factor in the Portuguese population. The long-term consequences of the association between psoriasis and cardiovascular risk factors are undeniable, with a recent cohort study demonstrating that patients with moderate-to-severe psoriasis have increased mortality that is mostly related with cardiovascular diseases.[32] Besides this strong association, no clear guidelines have been defined for screening cardiovascular disease in patients with psoriasis. In addition, the role of the new drugs in the natural history of psoriasis-associated cardiovascular disease also remains poorly understood. Specific programs and preventive strategies using multidisciplinary approaches should be considered in the future. It is also important to highlight the role of physical activity as potentially modifiable risk factor for psoriasis. In our sample, more than 80% (n = 229) of the individuals reported they had a sedentary lifestyle. Decreased levels of physical activity have been associated with psoriasis, for both psychological and physiological reasons.[33] The stigma of psoriasis may work as a psychological barrier in this population, leading to social avoidance, including sports and collective showers. In addition, as discussed, obesity and overweight are more prevalent in patients with psoriasis, which may therefore impact the physical performance of these patients. Importantly, the lack of physical activity may further aggravate the cardiovascular risk profile in these patients.[33] Therefore, patients with psoriasis should be encouraged to modify their sedentary habits, as this may further reduce the cardiovascular risk load, obesity, and act as a measure to promote generalized psychological wellbeing in this population.

Psoriasis is notably associated with psoriatic arthritis, a specific form of inflammatory arthritis usually characterized by asymmetry and seronegativity for rheumatoid factor.[5] In our sample, around 40% of participants with psoriasis met our criteria for suspected psoriatic arthritis that most commonly appeared after skin changes, and this is in line with the literature that points out that psoriatic arthritis is found in about 20% - 30% of the patients with the skin condition.[34] Importantly, only 8% had a formal clinical diagnosis, which could mean that there is an unmet need for addressing psoriatic arthritis in patients with psoriasis . One possible explanation for this last finding could be the low number of patients (3.2%) that were seeing rheumatologists due to joint problems. However, we should stress that several conditions may cause joint complaints in adults and older populations (more than 30% of participants had more than 55 years of age), leading to the fact that our proportion – nearly 40% – of patients with suspected psoriatic arthritis could be overestimated and required further evaluation and investigation that could not be performed in a 20-minute phone questionnaire. Another limitation is the fact that in our questionnaire we did not consider axial complaints for the diagnosis of psoriatic arthritis. Axial psoriatic arthritis is an important condition that is difficult to diagnose and should not be forgotten in daily practice by all clinicians seeing patients with psoriasis. As the burden of psoriatic arthritis has important implications for healthcare policies and treatment implementation, it is essential to raise awareness to this problem among all physicians that manage psoriasis so that the prevalence of undiagnosed disease can be reduced.[35]

Our results can also be compared to those of the Multinational Assessment of Psoriasis and Psoriatic Arthritis (MAPP) that included several participants from different countries – Portugal was not included, but several European countries such as Spain, France, United Kingdom, Italy, or Germany were.[36] The prevalence rate of patients with psoriasis ranged from 1.4% (Spain) to 3.3% (Canada). In European countries, just like in our sample, 22.3 to 52.1% had scalp psoriasis - it was the most common location of skin lesions in the United Kingdom, France and Germany, and the second most common in Spain and Italy. Regarding psoriasis in sensitive areas, and like our population, 4.5% - 10.6% of patients in European countries had genital psoriasis, while 5.9% - 21.5% had facial skin lesions. Pruritus was the most bothersome symptom (31% - 41%, compared to 66% in our population). The analysis of data from European countries also highlighted the importance of underdiagnosis of psoriatic arthritis in their populations: 36% of patients that did not have a diagnosis of psoriatic arthritis reported joint pain, and 30% of patients had more than four joints affected. Undertreatment was also highlighted in the results and discussion of the study: particularly in Spain and similarly to our study population, the vast majority (nearly 84%) were receiving no systemic treatment.

Although the importance of our study is clear, it has potential limitations that should be considered. Firstly, it is based on data from responders to a questionnaire and this study design has inherent biases, including the respondents' inaccurate recall and interpretation of questions, as well as nonresponse. Secondly, our results should not be extrapolated to other cultural environments with, for instance, medical facilities and systems that are different from those in Portugal. Thirdly, the survey lacked a control group. Fourthly, our study did not include any traditional measure of quality of life, such as the Dermatology Life Quality Index (DLQI), due to the limited time for the phone

questionnaire. Finally, our definitions were partially based on the positive answer to a clinical scenario and not on an objective evaluation of patients, which may have over/under-diagnosed both psoriasis and psoriatic arthritis and limited our capacity to assess the severity of the disease. We also have to highlight that we did not reach our initial target sample size (283 of 400). However, this size allowed us to achieve the same power, significance level and an effect size of 0.19 or larger, which is not meaningfully different from our initial aim. Besides the potential limitations, the main strengths of our study are its design that was planned to avoid selection bias and provide a representative sample of the Portuguese population, thus providing data that is essential for future intervention strategies in this population.

CONCLUSION

This cross-sectional population-based study provides important data for the future planning of interventions aiming to improve the management of psoriasis patients in Portugal. The pooled prevalence rate of psoriasis in our study was 4.4%, and the survey results suggest that several gaps exist in the diagnosis, management, and treatment of these patients: our sample of patients were likely underdiagnosed and undertreated, with insufficient management of their clinical condition. This is a high-risk population due to the associated comorbidities and implications in terms of quality of life and healthcare burden. Further nationwide strategies are important to address the current challenges, and to disseminate the best healthcare possible to psoriasis patients in Portugal.

AUTHOR CONTRIBUTIONS

All authors contributed to the literature research, study conception and design, data collection, analysis and interpretation, drafting of the article, version review, critical review of the article's content and approval of the final version.

PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association updated in 2013.

DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

COMPETING INTERESTS

TT has received consultancy and/or speaker's honoraria from and/or participated in clinical trials sponsored by AbbVie, Amgen, Almirall, Amgen, Arena Pharmaceuticals, Biocad, Biogen, Boehringer Ingelheim, Bristol Myers Squibb, Celgene, Fresenius-Kabi, Janssen, LEO Pharma, Eli Lilly, MSD, Mylan, Novartis, Pfizer, Samsung-Bioepis, Sanofi-Genzyme, Sandoz and UCB.

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RTB has received consultancy and/or speaker's honoraria from Abbvie, Bioderma, Galderma, Janssen, Leo Pharma, Eli Lilly, Medinfar, Novartis, Pfizer, UCB.

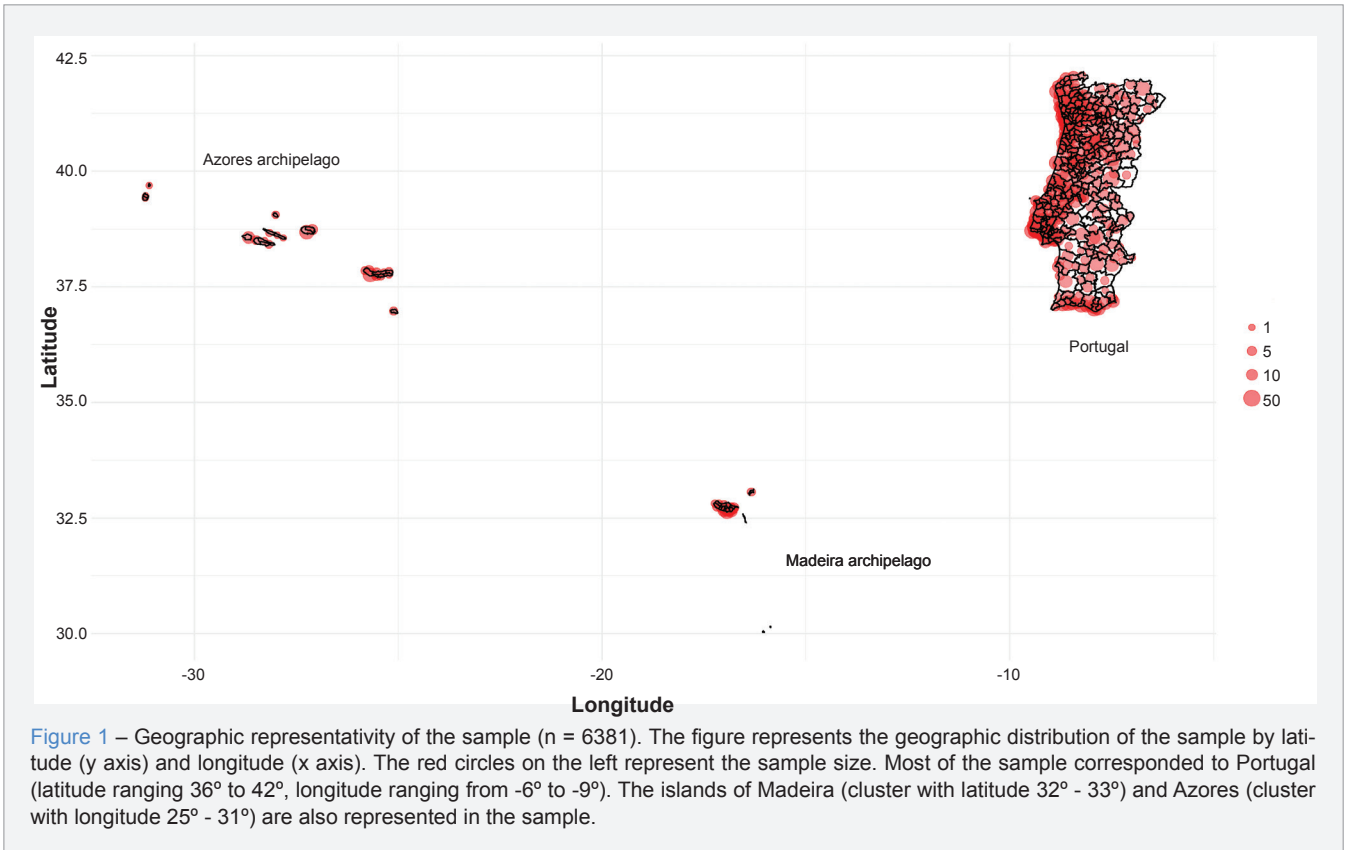PF, AF, APS, CR, MS, AM have declared that no competing interests exist.

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Figure 1 – Geographic representativity of the sample (n = 6381). The figure represents the geographic distribution of the sample by latitude (y axis) and longitude (x axis). The red circles on the left represent the sample size. Most of the sample corresponded to Portugal (latitude ranging 36º to 42º, longitude ranging from -6º to -9º). The islands of Madeira (cluster with latitude 32º - 33º) and Azores (cluster with longitude 25º - 31º) are also represented in the sample.

Table 1 – Habits and co-morbidities in all participants that met the criteria for psoriasis (n = 283)

Question	n
Did you ever smoke?	
No, n (%)	115 (41.2)
Yes, n (%)	164 (58.8)
NA	4
Did you ever drink alcoholic beverages?	
No, n (%)	30 (10.8)
Yes, n (%)	249 (89.2)
NA	4
Daily activity, n (%)	
I spend most of the time standing	112 (40.1)
I spend most of the time very active	50 (17.9)
I spend most of the time sitting	117 (41.9)
NA	4
Do you practice exercise?	
No, n (%)	161 (57.9)
Yes, n (%)	117 (42.1)
NA	5
BMI, kg/m^2	
(17.2, 25)	114 (41.2)
(25, 30)	115 (41.5)
(30, 43.4)	48 (17.3)
NA	6
Do you have any disease that requires regular medical vigilance?	
No, n (%)	139 (50.0)
Yes, n (%)	139 (50.0)
NA	5
Co-morbidities specification:	
Depression/Anxiety	35 (17.5)
Hypertension	20 (10.0)
Dyslipidemia	20 (10.0)
Rhinitis/sinusitis	17 (8.5)
Diabetes	12 (6.0)
Asthma	8 (4.0)
Cardiac disease	6 (3.0)
Oncologic disease (active)	6 (3.0)
Oncologic disease (cured)	5 (2.5)
Obesity	4 (2.0)
Sexual dysfunction	3 (1.5)
Chronic pulmonary disease	2 (1.0)
Chronic hepatic disease	2 (1.0)
Chronic kidney disease	1 (0.5)
Hyperuricemia	1 (0.5)
Inflammatory Bowel Disease	0 (0)
Other	34 (17.0)
Do you take any regular medication?	
No, n (%)	129 (46.6)
Yes, n (%)	148 (54.3)
NA	6

BMI: body mass index; NA: data non available.

Table 2 – Family history and psoriasis surveillance in all participants with criteria for psoriasis (n = 283)

Question	n
Does any of your direct relatives have psoriasis?	
No, n (%)	170 (61.6)
Not sure, n (%)	11 (4.0)
Yes, n (%)	95 (34.4)
NA	7
Have you ever visited a Dermatologist?	
No, n (%)	49 (17.8)
Yes, n (%)	227 (82.2)
NA	7
Have you ever visited a Rheumatologist?	
No, n (%)	255 (92.7)
Yes, n (%)	20 (7.3)
NA	8
Are you currently being monitored by a physician?	
No, n (%)	186 (67.4)
Yes, n (%)	90 (32.6)
NA	7
Have you had an appointment in the last 12 months?	
No, n (%)	185 (67.3)
If no, why?	
- The disease is not severe	88 (48)
- I don't think it can help	12 (6)
- I could not book an appointment	13 (7)
- I can't afford it	3 (2)
- My current treatment is working	34 (18)
- Other	35 (19)
Yes, n (%)	90 (32.7)
Dermatologist	61 (68)
General Practitioner	24 (27)
Rheumatologist	5 (6)
NA	6
What is the frequency of your psoriasis appointments?	
I'm not being followed by a physician.	191 (69.5)
Less than once a year	15 (5.5)
At least once a year	30 (10.9)
Twice a year or more	39 (14.2)
NA	6
Have you ever had an urgent appointment due to psoriasis?	
No, n (%)	227 (82.8)
Yes, n (%)	47 (17.2)
NA	9
Have you been hospitalized due to psoriasis?	
No, n (%)	270 (98.5)
Yes, n (%)	4 (1.5)
NA	9
How do you classify your general health?	
Very poor, n (%)	9 (3.3)
Poor, n (%)	17 (6.2)
Fair, n (%)	105 (38.6)
Good, n (%)	110 (40.4)
Very good, n (%)	31 (11.4)
NA	11

NA: data non available.

Table 3 – Characterization of symptoms and impact in different life aspects in all participants with criteria for psoriasis (n = 283)

Question	n
Symptoms that affect you most:	
Pruritus	146 (66.1)
Scaling	112 (50.2)
Dandruff	101 (45.9)
Erythema	83 (38.1)
Skin Pain	73 (34.9)
Articular pain	68 (31.2)
Burning	66 (30.6)
None of the above	57 (22.1)
I have no complaints	49 (19.0)
Sleepiness	42 (20.0)
Skin bleeding	39 (19.0)
Bleeding from the lesions	34 (16.0)
Have you ever had to stop your daily activities due to a lesion?	
No, n (%)	227 (83.2)
Yes, n (%)	46 (16.8)
NA	10
In the last year, how many days did you miss work due to psoriasis?	
0 days, n (%)	183 (67.0)
Up to 5 days, n (%)	9 (3.3)
> 5 days, n (%)	3 (1.1)
Does not apply/I don't have a job, n (%)	78 (28.6)
NA	10
Have you been on leave due to psoriasis?	
No, n (%)	252 (92.3)
Does not apply, n (%)	9 (3.3)
Yes, n (%)	12 (4.4)
NA	10
Do you feel psoriasis affected your career choice?	
No, n (%)	254 (93.4)
Yes, n (%)	18 (6.6)
NA	11
Do you feel psoriasis affect the way you take care of your child?	
No, n (%)	233 (85.7)
Does not apply, n (%)	19 (7.0)
Yes, n (%)	20 (7.4)
NA	11
Do you feel psoriasis affected your desire of being a parent?	
No, n (%)	263 (96.7)
Yes, n (%)	9 (3.3)
NA	10
Do you fear your children may have psoriasis?	
No, n (%)	91 (33.5)
Does not apply, n (%)	16 (5.9)
Yes, n (%)	165 (60.7)
NA	11

NA: data non available.

Table 4 – Impact of psoriasis in daily life.

Question	N0	%	M	Q1	Q3
How would you rate the global impact of lesions in your daily life?	66	24.0	5	3	7
How would you rate your current pruritus?	86	32.0	4	2	5
How would you rate the impact of lesions in your sleep?	200	74.0	4	2	6
How would you rate the impact of lesions in your sexuality?	237	88.1	5	2	7

N0: number of participants that answered "no impact"; M: median of impact for those individuals with at least one lesion, graded in a 0-10 scale, along with first (Q1) and third (Q3) quartiles.

Table 5 – Psoriasis treatment history in all participants with criteria for psoriasis (n=283).

Question	n
Have you received oral treatment?	
No, n (%)	176 (70.4)
Yes, n (%)	74 (29.6)
NA	33
Have you received injectable biological drugs?	
No, n (%)	253 (95.8)
Yes, n (%)	11 (4.2)
NA	19
Do you currently apply topical treatments?	
No, n (%)	79 (28.9)
Yes, n (%)	194 (71.1)
NA	10
Are you currently taking pills?	
No, n (%)	250 (91.6)
Yes, n (%)	23 (8.4)
NA	10
Are you currently receiving phototherapy?	
No, n (%)	272 (99.6)
Yes, n (%)	1 (0.4)
NA	10
Are you currently receiving injectable drugs?	
No, n (%)	264 (96.7)
Yes, n (%)	9 (3.3)
NA	10

NA: data not available.