REVIEW ARTICLE

Identifying erroneously used terms for vascular anomalies: A review of the English literature

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Abstract

Background: The classification of vascular anomalies includes terms of nomenclature that are not based on histogenesis resulting in confusion among health professionals of different specialties. Ongoing efforts to classify them properly have taken place. This literature review aimed to identify erroneous nomenclature of vascular anomalies and to investigate their continued use over the past four years after the last International Society for the Study of Vascular Anomalies (ISSVA) update.

Methods: Literature research was based on pertinent classifications (ISSVA, WHO) and books related to vascular anomalies and soft tissue pathology. After identifying twelve entities with confusing terminology, new research in the Pubmed database was conducted to verify their continued use in the last four years.

Results: The literature review highlighted terms referring to vascular malformations as neoplasms. In addition, terms used as equivalents represent entirely different entities. On the other hand, different terms to characterize the same entity were also recorded. Furthermore, regardless of the last ISSVA update in 2018, terms that are only descriptive or do not correspond to vascular anomaly histogenesis are consistently used.

Conclusion: Despite intensive efforts in the last decades for correct terminology and classification of vascular anomalies, modifications are still required. A common and broadly accepted scientific terminology should be applied, accurately representing histogenesis or pathogenesis, to obtain a common language among medical specialists, given that a multidisciplinary approach is crucial for managing vascular anomalies. HIPPOKRATIA 2022, 26 (4):126-130.

Keywords: Vascular tumors, vascular malformations, vascular anomaly, terminology in vascular anomalies, pathology of vascular anomalies

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Introduction

Vascular anomalies are frequently encountered clinical entities that mainly affect neonates and pediatric patients[1]. Their interpretation and classification have been historically a puzzle, often inducing disagreements and conflicts among the medical community[2,3].

Until the mid-twentieth century, vascular anomalies were considered a consequence of complication during labor or a divinely sent curse and were "treated" accordingly. Mulliken and Glowacki, in 1982[4], were the first who tried to unravel the hank of yarn and proposed the division of vascular anomalies into vascular tumor/hemangioma (the suffix -oma for "tumor or mass"[4]) and malformation categories based on their clinical findings and histopathological features[5]. Fourteen years later (in 1996), in a meeting in Rome[6], the International Society for the Study of Vascular Anomalies (ISSVA) adopted their proposal for distinguishing and classifying vascular anomalies and additionally defined the particular characteristics of each category[7]. Specifically, vascular or vasoproliferative neoplasms derive from abnormal, active cell proliferation and may be classified as benign, borderline, or malignant[8-10]. On the other hand, vascular malformations represent inborn defects in vascular morphogenesis. They are generally characterized by abnormally formed channels within a vascular apparatus, lined by normal (in number and size) endothelial cells[2,8-11]. This classification provided the initial framework for great strides in research and treatment in the field[7,12-15].

Since then, various corrections and revisions have been made, resulting in the expansion of the classification system in the 2014 ISSVA workshop in Melbourne[7] as well as the recent updates (ISSVA, 2018[16] and 2022[17]). The latest updates divide vascular anomalies again into tumors (benign, locally aggressive, malignant) and malformations (simple, combined, of major vessels, and

associated with other anomalies)[18] but also incorporate considerably more information, including newly named entities and identified genes[7]. However, even this system does not always take into consideration the pathogenesis and the biological behavior of the anomalies, which is confusing when it comes to treatment and prognosis. In this literature review, we aimed to identify objectionable terms in the nomenclature of vascular anomalies to emphasize the need for a common language among healthcare professionals of different specialties.

Methods and Materials

Search strategy

This particular literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement)[19].

Studying the nomenclature of vascular anomalies in the current literature [classifications of ISSVA[16,17], World Health Organization (WHO)[20-23] and related books: Soft Tissue Tumors by Enzinger & Weiss[24,25], Vascular Anomalies by Mulliken & Young[5], and Surgical Pathology by Rosai & Ackerman[26]], we identified twelve entities whose nomenclature did not take into consideration histogenesis or biological behavior, causing profound confusion among the specialists. A search in the PubMed electronic database was conducted to look into the continued use of this confusing nomenclature after the most recent ISSVA classification update by using the following keywords: "cavernous hemangioma", "lymphangioma", "hobnail hemangioma", "port-wine stain", "Kimura disease and angiolymphoid hyperplasia with eosinophilia", "Kaposiform hemangioendothelioma and tufted angioma", "Verrucous hemangioma and angiokeratoma", and "Dabska type tumors and retiform hemangioendothelioma".

Study selection and data collection process

The results of the electronic research were examined by two authors (KB, TK) independently and selected based on the predefined inclusion and exclusion criteria. Specifically, eligible studies were considered those i) oriented to the nomenclature of vascular malformations and vascular tumors or ii) to the historical conversion in the definition of the studied vascular entities, iii) written in the English language, and d) published as original articles, reviews, and case reports during 2019-2022. Studies regarding cavernous hemangioma, lymphangioma, hobnail hemangioma, and port-wine stain were excluded should they concerned with i) a mere report regarding differential diagnosis, ii) congenital abnormalities, vascular malformations of infants or children under ten years old, iii) surgical techniques, therapeutic methods, preoperative preparation or postoperative complications, and iv) experimental animal studies. For Kimura disease and angiolymphoid hyperplasia with eosinophilia, the search was focused on whether these two entities were considered identical. For Kaposiform hemangioendothelioma and tufted angioma, as well as Dabska-type tumors and retiform hemangioendothelioma, all the studies interpreted these "pair-entities" as completely different diseases were recorded. Abstracts were reviewed independently by each author, and generated a list of studies to retrieve for full-text review. The lists were compared, and any discrepancies were resolved by consensus.

After the selection of the agreed reviews, original studies, and case reports, we designed an Excel spreadsheet where we collected all the required information. The three authors performed the data extraction independently and subsequently verified between them. The following outcomes were extracted and assessed: year of publication, age of onset, pathophysiology and origin of each vascular anomaly, clinical presentation, histopathologic and immunohistochemical characteristics, biological behavior, and prognostic factors.

Results

For "cavernous hemangioma", "lymphangioma", "hobnail hemangioma", and "port-wine stain", the search strategy retrieved 18,613 publications in total from the PubMed database. Out of these, 2,059 accounted for the period 2019-2022. Forty-nine (49) reports were excluded for being mere reports, usually in context to the differential diagnosis of other entities. Subsequently, 146 studies were ruled out as concerned with congenital or pediatric disease, while 557 were not included as they were focused on surgical techniques, therapeutic methods, and postoperative complications. Finally, eight studies were disregarded because they involved experiments on animals. Among the remainder of 1,299 studies (Figure 1), only four were interested in the nomenclature of vascular anomalies, two of which mentioned the erroneous use of the term lymphangioma and proposed using the term "lymphatic malformation" instead. The other two studies referred to "cavernous hemangioma" and its renaming to "cavernous malformation". In 399 out of 1,299 studies, we came across the term "lymphangioma" without any report of the term "lymphatic malformation". Among the 722 studies referring to "cavernous hemangioma", we also encounter the term "cavernoma" in 22, the term cavernous angioma in 25, and only in one study the term "cavernous lymphangioma". Concerning "hobnail hemangioma", only one study was acceptable after the implementation of the exclusion criteria. In 177 out of the 1,299 studies, we came across the term "port wine stain", either as a "single" disease or as part of various syndromes such as Klippel-Trenaunay syndrome or Sturge Weber syndrome. Indeed, among the last 177 studies, there were five that proposed the term "nevus flammeus" instead.

Regarding the "pair entities", the search in the PubMed database retrieved 730 publications in total. For the last four years, the publication number was decreased by 80. Only 15 studies out of 80 were about a comparative analysis among the two entities of each pair. Seven of 15 studies referred to "Kimura disease and angiolymphoid

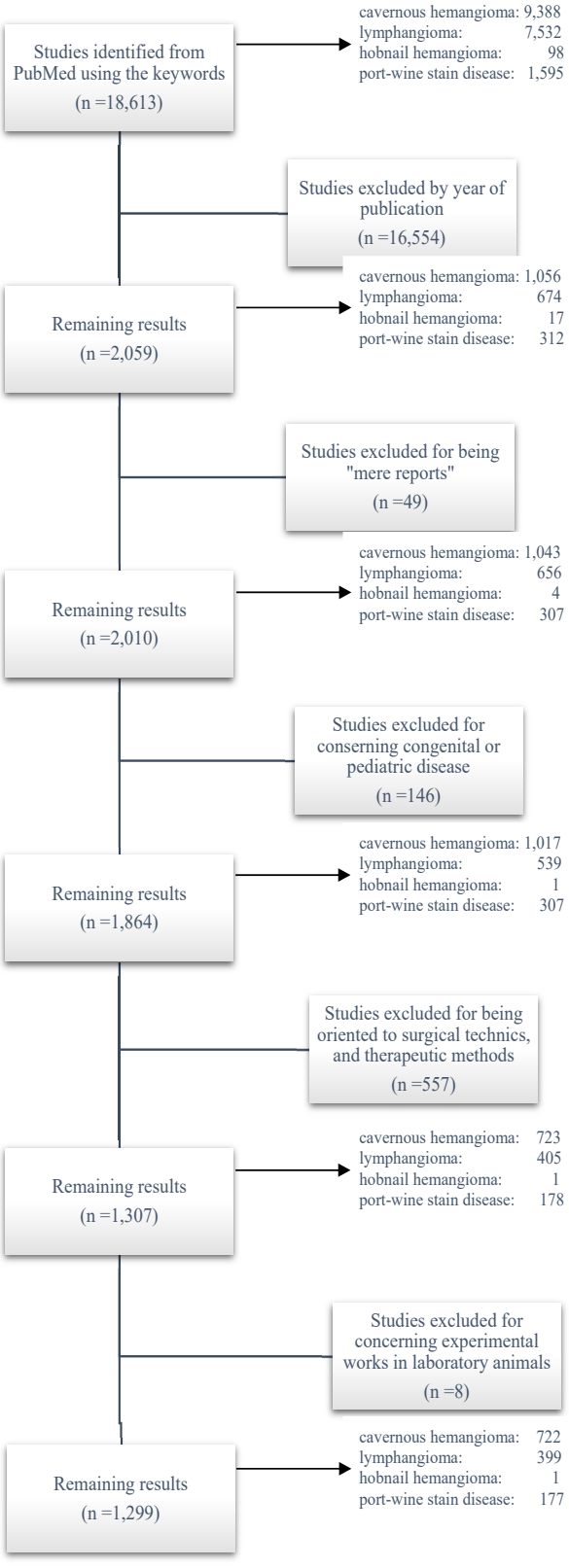

Figure 1: Flow chart of the search strategy and data collection process followed in this review that identified erroneously used terms for vascular anomalies.

hyperplasia with eosinophilia". In six of them, the entities mentioned above were interpreted as different anomalies and in one as the same. Five studies concerned "Kaposiform hemangioendothelioma and tufted angioma", with four studies considering them to belong to the same spectrum and one study being different entities. Only one study referred to "verrucous hemangioma and angiokeratoma" where the authors declared that those entities are distinct based on the different locations of the lesions. Finally, two reports referred to "Dabska-type tumors and retiform hemangioendothelioma", and both agreed that those entities are alike.

Discussion

The literature search indicates that several medical terms are used incorrectly in everyday clinical practice without considering the pathogenesis, the origin, the immunophenotype, or the clinical behavior of the diseases. Typical instances are those of lymphangioma and cavernous hemangioma, the nomenclature of which refers to neoplasms, whereas they frankly represent malformations due to some kind of dysregulation in vascular development[27,28]. In detail, lymphangiomas result from the failure of lymphatics to communicate with the venous system[26], while cavernous hemangiomas represent a kind of endothelial dysmorphogenesis from a lesion that is present at birth in the venous system[24]. Both lesions are benign and usually clinically present at birth or during the first few years of life[26,29]. It is also worth mentioning that both entities are characterized by the absence of endothelial hyperplasia[5,9] .

Quite intriguing is also the fact that different terms are used for the same histomorphology based on the location of the lesion. In particular, tufted angioma and Kaposiform hemangioendothelioma appear to have common histological features (lobules of varying size comprising capillary-sized vessels with oval to spindled cells in the dermis or subcutaneous tissue-they can both present with lymphangioma-like areas) and an identical immunophenotype [Podoplanin (D2-40), Cluster of Differentiation (CD) 34, CD31 positivity, but Glucose transporter isoform 1 (GLUT1) negativity] while their differences concern mainly the location (superficial vs deep infiltrative lesion) and the biological behavior (benign vs aggressive) of each lesion[1,5,11,21,26,30]. The same applies to retiform hemangioendothelioma and Dabska-type lesions, the age of onset of which constitutes the main discrimination point (adults-children). However, the similar macroscopic (ill-defined, plaque-like lesions) and microscopic features (well-formed vessels lined by hobnail endothelial cells and surrounded by a dense fibrous-hyaline stroma with prominent lymphocytes), the common immunophenotypic profile with an intense expression of CD34 and D2-40 (a reason why Fanburg-Smith et al suggested the term papillary intralymphatic angioendothelioma for Dabska type hemangioendothelioma[25]), the exact location (usually distal extremities), and equal prognosis lend further support to their grouping as hobnail hemangioendothe-

lioma[21,22,25,26,31].

On the other hand, some of the terms used as equivalents represent entirely different entities. Typical examples are Kimura disease and angiolymphoid hyperplasia with eosinophilia, which used to be considered identical entities in the literature due to their similar histological features, while in essence, they differ in location (lymph nodes vs subcutaneous tissue of the head and neck), epidemiology (Asians vs Europeans), laboratory findings (elevated serum immunoglobulin IgE levels vs normal serum immunoglobulin levels), and treatment (conservative management in asymptomatic cases and surgery followed by glucocorticosteroids, cyclophosphamide, and radiotherapy in advanced cases vs complete surgical excision in every case)[5,20,26,32-35].

In addition, there have been several reported cases in the literature where the lesion's origin is not taken into account when entitled. Such is the case of hobnail hemangioma, whose immunophenotypic characteristics suggest lymphatic origin, while its nomenclature indicates a tumor of blood vessels[26,36].

An issue that has emerged ever since the first meeting of ISSVA was using the terms angioma and hemangioma as synonyms (e.g., venous angioma but cavernous hemangioma). In fact, the former represents an umbrella term that encloses a broad spectrum of entities originating from blood (hemangiomas) or lymphatic vessels (lymphangiomas). Accordingly, it may be more prudent to maintain the term angioma exclusively for entities whose origin has not been established yet. The terms hemangioma and lymphangioma should be applied to entities of vascular and lymphatic origin, respectively. Terms like cystic hygroma and lymphangioma that were widely used in the past have already been revised in the current literature to perpetuate concerns among clinicians[29,37,38].

At the other end of the spectrum, descriptive expressions, which are currently used among clinicians, should be replaced by terms that are based on histopathologic and biological features. For instance, the clinical term "port wine stain" corresponds to a common indolent venocapillary dysplasia[11,39] and should be named as so.

A particular allusion should be made for verrucous venous malformation/hemangioma (VH) and angiokeratoma (AK), two entities yet not classified, prompting diagnostic confusion among pathologists[40]. Concerning VH, classification is still unclear because it exhibits clinical (favorable prognosis, rare regression) and histopathological features (absence of endothelial hyperplasia) similar to those seen in vascular malformations but expresses an immunoprofile [GLUT1+, Wilms' tumor 1 (WT1) +] similar to vascular neoplasms[24,40-43]. This is probably why in the WHO skin classification of 2018, this entity appertains to the category of hemangiomas[20]. The same also applies to angiokeratoma[20], albeit its superficial depth of invasion, indolent behavior, and lack of GLUT1/WT1 positivity, raising doubts among specialists. The equivalent occurs with synovial and intramuscular hemangiomas, which in the WHO soft tissue classification of 2020 are categorized as vascular tumors (hemangiomas) while, in fact, they both represent benign proliferations[44] and ISSVA characterized them as provisional entities[45]. Among provisionally unclassified entities by ISSVA are also identified hepatic cavernomas or hepatic hemangiomas, or sinusoidal hemangiomas[27].

Conclusions

Vascular anomalies cover a wide spectrum of lesions that may predominantly affect children but sometimes lead to serious, lifelong sequelae; with this into consideration, it is crucial to approach the diagnosis and treatment of these patients optimally and punctually, a fact that requires the appropriate definition and classification of the above entities[3]. "The investigation of the meaning of words is the beginning of wisdom" ("Αρχὴ σοφίας ἡ τῶν ὀνομάτων ἐπίσκεψις") orated Antisthenes in the 4th century before Christ (BC), meaning that in order to solve a problem, you should initially confer to it an appropriate and representative name.

A considerable number of medical terms concerning vascular anomalies are still used incorrectly in everyday clinical practice. In all respects, the nomenclature of vascular anomalies should consider the pathogenesis, the histological features, and the clinical behavior of the entities and not be limited to their location or clinical manifestations. Also, it is necessary to reconsider terms given before the initial classification of vascular anomalies into tumors and malformations, and are preserved to this day for historical reasons (such as cavernous hemangioma, a term that Rudolf Virchow gave in 1863)[5]. Furthermore, the supersession of descriptive clinical terms based on subjective criteria is important to prevent any differential diagnostic considerations or pitfalls.

Since managing vascular anomalies requires cooperation among several medical specialists in the context of a multidisciplinary approach, adopting a common communication channel in this field is crucial. Therefore, a common scientific terminology should be decided and applied.

Conflict of interest

Authors declare no conflicts of interest.

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RESEARCH ARTICLE

A pilot study of resilience and severity of depressive symptoms in patients with psoriasis

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Abstract

Background: Patients with psoriasis show an increased prevalence of depressive symptoms that worsen disease outcomes. This study investigated the effect of resilience and other sociodemographic/clinical variables on depressive symptoms' severity in patients with psoriasis.

Methods: This study included 58 psoriasis patients consecutively enrolled during the 14 months of the study. We evaluated psoriasis severity using the Psoriasis Area and Severity Index, Body Surface Area, and Physician Global Assessment. The psychometric assessment included the Resilience Scale and the Beck Depression Inventory-II (BDI-II). We divided participants into two subgroups based on the optimal BDI-II cut-off score (Group A: BDI-II ≤17; Group B: BDI-II >17). A stepwise regression analysis explored whether the variation in the BDI-II score could be predicted by a linear combination of sociodemographic and clinical variables.

Results: Psoriasis patients with more severe depressive symptoms (Group B patients) showed lower resilience levels than Group A patients ($p < 0.001$). Moreover, depressive symptoms correlated only with resilience levels ($p < 0.001$), with a negative correlation. The stepwise regression analysis revealed that resilience explained 37.1 % of the variance in BDI-II scores, whereas resilience, gender, and comorbidity with other physical illnesses combined explained 51.3 % of the variance.

Conclusion: Resilience may alleviate depressive symptoms in psoriasis patients. This study underscores the importance of resilience-building interventions for these patients. HIPPOKRATIA 2022, 26 (4):131-137.

Keywords: Depressive symptoms, psoriasis, psychodermatology, resilience

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Introduction

Formerly, the medical term "psoriasis" (from the Greek "psora" meaning "itch") was used to describe a skin condition regarded as a form of leprosy. It is now well established that psoriasis is a non-contagious, chronic, multifactorial disease. The clinical manifestation varies concerning the degree of skin involvement and lesions' progression, ranging from minimal to severe. Clinical signs may not be limited to the skin; one out of four patients develops psoriatic arthritis. Furthermore, psoriasis patients show a high prevalence of depressive disorder (10-27.6 %) or experience depressive symptoms (25-68 %)[1,2].

Depression is not solely a psychological reaction to the esthetic consequences of psoriasis. Shared immune-inflammatory processes and neurochemical changes may underlie both conditions, maintaining a bidirectional pathophysiological link. Therefore, most studies focus on the association between psoriasis severity and depressive symptoms[3,4]. Although several psoriasis-related clinical features are associated with depressive symptoms' severity, improvement in psoriasis signs does not alleviate depressive symptoms in all patients[5]. Psychological factors, such as the stigma attached to the disease[6], feelings of shame[5], and low self-esteem[7], may be partly responsible for the emergence of depressive symptoms. Furthermore, a study investigating resilience reported that psoriasis patients display lower resilience levels than healthy individuals[8].

The term "resilience" encompasses both adaptation and growth despite adversity. Different scales assess resilience by its conceptualization as a trait, a process, or an outcome[9]. High trait resilience is related to mental health[10]. Moreover, higher resilience levels are associated

with improved outcomes of chronic psychosomatic diseases[11]. Vice versa, the relation between low resilience levels and vulnerability to depression is well-established[12].

Altogether, psoriasis is classified as a psychophysiological skin disorder triggered or exacerbated by emotional stress. Depressive symptoms, a source of emotional stress, may not be associated with psoriasis severity alone. This study conceptualized resilience as a positive personal characteristic promoting adaptation to chronic diseases. The aim was to investigate whether this protective factor may influence depressive symptoms' severity in psoriasis patients.

Methods

Participants

Study participants were consecutive psoriasis patients recruited from the Psoriasis Outpatient Clinic of the 2nd Department of Dermatology and Venereology of the Aristotle University of Thessaloniki during the 14 months of the study. Inclusion criteria were: i) newly diagnosed (first diagnosis of untreated psoriasis during the study period) or known psoriasis with active lesions; ii) age 18-65 years; iii) Greek as the native language. Exclusion criteria were: i) comorbidity with another skin disorder; ii) diagnosis of overt central nervous system diseases, such as neurocognitive, neurodegenerative, demyelinating disorders, or traumatic brain injury.

This study was approved by the Scientific Committee of "Papageorgiou" General Hospital (decision No 233, dated 1/7/2015) and the Hellenic Personal Data Protection Authority (approval No 1606, GN/EX/6107-3-17/12/2015). All participants provided written informed consent.

Assessments

We recorded patients' sociodemographic data, medical history and medications, psychiatric history, and positive/adverse life events during the preceding six months based on a semi-structured interview and the patient's medical records.

Three measures, internationally and routinely used in clinical practice and research, were applied for the reliable evaluation of psoriasis severity: the Psoriasis Area and Severity Index (PASI) [score range: 0 (absent) - 72 (maximum)], the Physician Global Assessment (PGA) [6-point measure: 0 (clear) - 5 (severe)], and the Body Surface Area (BSA) (total BSA =100 %)[13,14].

We assessed the depressive symptoms utilizing the Greek version of the Beck Depression Inventory-II (BDI-II)[15,16], commonly applied for screening psoriasis patients[1]. We divided study participants into two subgroups based on the optimal BDI-II cut-off score of 17 in the Greek population[15]. Group A (BDI-II ≤17) comprised 39, whereas Group B (BDI-II >17) included 19 psoriasis patients.

We evaluated resilience employing the Greek version of the 25-item self-administered Resilience Scale (RS)[17,18], which assesses resilience based on five innate characteristics, each explored by five items on a 7-point scale (1 =strongly disagree; 7 =strongly agree; total score range =25-175; higher scores reflect greater resilience levels).

Statistical analyses

We performed all statistical analyses using IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY, USA). We utilized Spearman's rho to calculate correlations and the chi-square test to explore group differences in nominal variables, whereas the Student's t-test was used for continuous demographic variables. The Kolmogorov-Smirnov test was employed to test scale scores for normality. Since none of the variables tested were normally distributed, non-parametric statistics were used (Mann-Whitney test).

Effect sizes [d and phi (φ)] were estimated and reported accordingly [Cohen's d statistic: small (d =0.2), medium (d =0.5), large (d =0.8), very large (d ≥1) effect size; phi (φ) statistic: small (φ =0.1), medium (φ =0.3), large (φ =0.5), very large (φ ≥0.7) effect size]. We set the level of statistical significance at $p < 0.05$, two-tailed, adjusted with the Bonferroni correction for multiple comparisons (0.05:8) to a corresponding $p < 0.00625$ level.

We conducted a stepwise regression analysis to explore whether the variation in the BDI-II score could be predicted by a linear combination of sociodemographic and clinical variables. Based on the minimum of ten subjects per independent variable recommendation and according to the correlations between measured variables, we included the following independent variables in the stepwise regression analysis: age, gender, duration of psoriasis, past depressive episodes, comorbidity with other physical illness, presence of psoriasis symptoms on the face or torso, BSA, and RS. The independence of residuals was assessed with the Durbin-Watson statistic at 1.639.

Results

Sixty psoriasis outpatients, in total, agreed to participate and were screened for complying with inclusion/exclusion criteria. Among them, 58 were eligible for the study. The research group comprised 35 men (60.3 %, aged 43.46 ± 12.48 years) and 23 women (39.7 %, aged 47.22 ± 14.66 years). The mean duration of psoriasis was 14.60 ±11.26 years (none of the participants were newly diagnosed). Psoriasis treatment varied significantly (topical treatment in eight patients, various biologics in 22 patients, combination treatment in ten patients, methotrexate in eight patients, cyclosporine in seven patients, acitretin in two patients, and apremilast in one patient).

Concerning psychiatric history, 18 participants (31 %) had a history of depressive episodes; one was diagnosed with obsessive-compulsive disorder, whereas two were occasionally consuming cannabis. At the time of recruitment, none of the patients received psychiatric medication. Several patients (44.8 %) suffered from a comorbid

medical condition and were under appropriate treatment.

No statistically significant differences were found between Group A (BDI-II ≤17) and Group B (BDI-II >17) regarding age (p =0.331), years of education (p =0.164), marital status (p =0.405), or living arrangements (p =0.453). In contrast, Group B included more female patients (p =0.002) and fewer employed individuals (p =0.03) than Group A (Table 1).

Concerning participants' clinical characteristics, there were no statistically significant differences in the duration of psoriasis (p =0.632), the presence of psoriatic arthritis (p =0.267), the three psoriasis severity indexes [PASI (p =0.852), PGA (p =0.779), and BSA (p =0.168)], and the presence of psoriasis symptoms on the face (p =0.514) or torso (p =0.792). In addition, there were no differences regarding the prior history of depressive episodes (p =0.505). In contrast, Group B suffered more from other physical illnesses than Group A patients (p =0.05). Lastly, Group A showed significantly higher resilience levels than Group B patients (p <0.001); the mean resilience score was significantly higher in males (142.09 ± 16.67) compared with females (124.52 ± 30.01) [t-test =2.862, df =31.005, p =0.016] (Table 2).

Based on the correlation analysis, depressive symptoms' severity was only correlated with resilience levels (negative correlation) (Table 3).

According to the regression analysis, the variables contributing significantly to calculating the BDI-II score were gender, comorbidity with other physical illnesses, and the RS score. In contrast, age, duration of psoriasis, presence of psoriasis symptoms on the face or torso, past depressive episodes, and BSA were dropped from the final third regression step [$F_{(3,54)}$ =21.028, p <0.001]. Resilience displayed a protective role against depressive symptoms (adjusted R^2 =0.371) that remained statistically significant even after controlling for the effect of gender and comorbidity with other physical illnesses (adjusted R^2 =0.513) (Table 4).

Discussion

Research evidence suggests that skin lesions' severity and concomitant psoriatic arthritis may be associated with depressive symptoms, though not in all psoriasis patients. The impact of the duration of psoriasis on depressive symptoms is also inconsistent[5,19]. This study examined the differences between psoriasis patients with clinically non-significant and more severe depressive symptoms. Results revealed a high effect size for the BSA, reflecting psoriasis-affected skin area, but small effect sizes for the PASI and PGA indexes, the presence of psoriasis symptoms on the face or torso, the presence of psoriatic arthritis, and the duration of psoriasis. The

Table 1: Sociodemographic data of the 58 psoriasis patients enrolled in this study investigating the effect of resilience and other clinical variables on depressive symptoms' severity.

Variables	Group A (BDI-II ≤17) n =39 (67.2 %)	Group B (BDI-II >17) n =19 (32.8 %)	Statistical analyses
Gender			
Male	29 (74.4 %)	6 (31.6 %)	$\chi^2_{(3)}$ =9.771, p =0.002
Female	10 (25.6 %)	13 (68.4 %)	
Age (years)	43.74 ± 13.35	47.42 ± 13.49	t(56) =0.981, p =0.331
Educational level (years)	13.08 ± 3.25	11.68 ± 4.05	t(56) =1.411, p =0.164
Marital status			
Single	8 (20.5 %)	7 (36.8 %)	
Married	28 (71.8 %)	12 (63.2 %)	$\chi^2_{(3)}$ =2.917, p =0.405
Divorced	2 (5.1 %)	-	
Widowed	1 (2.6 %)	-	
Employment status			
Employed	25 (64.1 %)	4 (21.1 %)	
Retired	3 (7.7 %)	3 (15.8 %)	$\chi^2_{(4)}$ =10.718, p =0.03
Unemployed	6 (15.4 %)	9 (47.4 %)	
Studying	2 (5.1 %)	1 (5.3 %)	
Other	3 (7.7 %)	2 (10.5 %)	
Living arrangements			
With own family	28 (71.8 %)	11 (57.9 %)	
With parents / other relatives	6 (15.4 %)	6 (31.6 %)	$\chi^2_{(3)}$ =2.626, p =0.453
With someone	1 (2.6 %)	1 (5.3 %)	
Alone	4 (10.3 %)	1 (5.3 %)	

Values are given as means ± standard deviation or as number with percentage in brackets.. BDI-II: Beck Depression Inventory-II, n: number.

Table 2: Clinical characteristics of the 58 psoriasis patients enrolled in this study investigating the effect of resilience and other clinical variables on depressive symptoms' severity.

Variables	Group A (BDI-II ≤17) n =39 (67.2 %)	Group B (BDI-II >17) n =19 (32.8 %)	Statistical analyses	Effect size
Duration of psoriasis (years)	14.10 ± 10.99	15.63 ± 12.05	t(56) =0.482, p =0.632	d =0.135
PASI	6.77 ± 9.32	5.81 ± 8.88	Z =0.186, p =0.852	d =0.105
PGA	5 ± 1.7	1.55 ± 1.46	Z =0.28, p =0.779	d =0.097
BSA	63 ± 12.82	5.32 ± 7.5	Z =1.38, p =0.168	d =0.652
Psoriasis symptoms on the face				
Present	13 (33.3 %)	8 (42.1 %)	$\chi^2_{(2)}$ =0.426, p =0.514	φ =0.086
Absent	26 (66.7 %)	11 (57.9 %)		
Psoriasis symptoms on the torso				
Present	13 (33.3 %)	12 (63.2 %)	$\chi^2_{(2)}$ =0.07, p =0.792	φ =0.035
Absent	26 (66.7 %)	7 (36.8 %)		
Psoriatic arthritis				
Present	6 (15.4 %)	1 (5.3 %)	$\chi^2_{(2)}$ =1.233, p =0.267	φ =0.146
Absent	33 (84.6 %)	18 (94.7 %)		
Other physical illness				
Present	14 (35.9 %)	12 (63.2 %)	$\chi^2_{(1)}$ =3.839, p =0.05	φ =0.257
Absent	25 (64.1 %)	7 (36.8 %)		
Past depressive episodes				
Present	11 (28.2 %)	7 (36.8 %)	$\chi^2_{(2)}$ =0.445, p =0.505	φ =0.088
Absent	28 (71.8 %)	12 (63.2 %)		
BDI-II	7.95 ± 4.75	28.42 ± 9.22	t(22.771) =9.101, p <0.001	d =2.546
RS	144.67 ± 13.81	115.53 ± 29.3	Z =3.812, p <0.001	d =1.152

Values are given as means ± standard deviation or as number with percentage in brackets.. BDI-II: Beck Depression Inventory-II, n: number, PASI: Psoriasis Area and Severity Index, PGI: Physician Global Assessment, BSA: Body Surface Area, RS: Resilience Scale.

Table 3: Correlations between demographic and clinical variables regarding study's 58 psoriasis patients.

	Age (years)	Education (years)	Duration of psoriasis (years)	BDI-II	RS	PASI	PGA	BSA
Age (years)	-	-0.314 0.016	0.263 0.047	0.254 0.054	-0.068 0.614	-0.151 0.258	-0.117 0.381	-0.190 0.154
Education (years)		-	-0.028 0.837	-0.114 0.392	0.173 0.194	0.282 0.032	0.243 0.066	0.264 0.045
Duration of psoriasis (years)			-	0.034 0.799	0.042 0.754	0.036 0.787	-0.007 0.959	0.064 0.632
BDI-II				-	-0.517* <0.001	-0.042 0.756	-0.047 0.729	-0.223 0.092
RS					-	-0.090 0.501	-0.109 0.413	0.001 0.992
PASI						-	0.981* <0.001	0.941* <0.001
PGA							-	0.930* <0.001
BSA								-

Spearman rho sig. 2-tailed; *: Statistically significant after Bonferroni corrections for multiple comparisons (p <0.00625). BDI-II: Beck Depression Inventory-II, RS: Resilience Scale, PASI: Psoriasis Area and Severity Index, PGA: Physician Global Assessment, BSA: Body Surface Area.

Table 4: Stepwise regression coefficients for the Beck Depression Inventory-II score (dependent variable) and age, gender, duration of psoriasis, past depressive episodes, other physical illnesses, psoriasis sites (face-torso), Body Surface Area, and Resilience Scale scores (independent variables).

4a.

Model		Standardized Coefficients	t	p	95.0 % Confidence Interval for B		Adjusted R^2	S.E. of the estimate
		Beta			Lower Bound	Upper Bound		
1	(Constant)		7.906	<0.001	40.890	68.645	0.371	9.247
	Resilience	-0.618	-5.881	<0.001	-0.398	-0.196		
2	(Constant)		4.174	<0.001	18.919	53.863	0.456	8.597
	Resilience	-0.501	-4.791	<0.001	-0.341	-0.140		
	Gender	0.327	3.128	0.003	2.776	12.678		
3	(Constant)		5.134	<0.001	28.127	64.173	0.513	8.133
	Resilience	-0.486	-4.907	<0.001	-0.329	-0.138		
	Gender	0.283	2.827	0.007	1.946	11.441		
	Other physical illnesses	-0.257	-2.729	0.009	-10.372	-1.587		

4b.

	Excluded variables[a]			
	Model	Beta In	t	p
1	Age	0.159[b]	1.531	0.131
	Gender	0.327[b]	3.128	0.003
	Duration of psoriasis (years)	0.167[b]	1.607	0.114
	Other physical illnesses	0.300[b]	3.036	0.004
	BSA	-0.226[b]	-2.213	0.031
	Past depressive episodes	-0.219	-2.117	0.039
	Psoriasis symptoms on the face	0.002	0.019	0.985
	Psoriasis symptoms on the torso	-0.075	-0.707	0.482
2	Age	0.123[c]	1.258	0.214
	Duration of psoriasis (years)	0.109[c]	1.089	0.281
	Other physical illnesses	0.257[c]	2.729	0.009
	BSA	-0.164[c]	-1.648	0.105
	Past depressive episodes	-0.171[c]	-10.735	00.088
	Psoriasis symptoms on the face	0.071[c]	0.701	0.486
	Psoriasis symptoms on the torso	-0.030[c]	-0.300	0.765
3	Age	0.011[d]	0.100	0.921
	Duration of psoriasis (years)	0.095[d]	1.003	0.320
	BSA	-0.167[d]	-1.788	0.080
	Past depressive episodes	-0.146[d]	-1.549	0.127
	Psoriasis symptoms on the face	0.053[d]	0.551	0.584
	Psoriasis symptoms on the torso	-0.018[d]	-0.186	0.853

[a]: dependent variable: BDI-II, [b]: predictors in the model: (constant), resilience, [c]: predictors in the model: (constant), resilience, gender, [d]: predictors in the model: (constant), resilience, gender, other physical illnesses, BDI-II: Beck Depression Inventory-II, BSA: Body Surface Area.

effect size for past depressive episodes was again small, with both study groups displaying similar rates. On the contrary, the effect size for the resilience index was significant, indicating that patients with higher resilience levels are less likely to suffer from severe depressive symptoms. Moreover, depressive symptoms were only correlated (inversely) with resilience levels.

Several studies revealed a higher prevalence of depressive symptoms in female psoriasis patients[3,19] and an increased risk of depression due to comorbid physical illnesses[20]. This study's regression analysis supported the protective effect of resilience against depressive symptoms after controlling for the effects of gender and comorbidity with other physical illnesses. According to the results, resilience explained 37.1 % of the variance in BDI-II scores, whereas resilience, gender, and comorbidity with other physical illnesses combined explained 51.3 % of the variance. Neither psoriasis-related clinical factors nor the history of depressive episodes contributed to depressive symptoms' severity.

Depressive symptoms worsen psoriasis outcomes, triggering or exacerbating physical symptoms[3], which, in turn, affect different aspects of patients' functioning[5]. Furthermore, depressive symptoms affect the quality of life[21] and adherence to psoriasis treatment[22]. Moreover, the higher suicide risk in psoriasis patients is a solemn issue[23]. For all these reasons, treating depressive symptoms in psoriasis patients is essential. Although 32.8 % of this study's participants scored above the BDI-II cutoff score for clinically significant depressive symptoms, none were under psychiatric medication, an observation hinting at limited screening and treatment of depression in psoriasis patients.

Antidepressants may alleviate psychiatric symptoms, but they may exacerbate psoriasis symptoms[5]. Biologics may also improve depressive symptoms[22,24]. Nonetheless, sufficient treatment of psoriasis does not alleviate depressive symptoms in all patients[5,25]. Therefore, supplementary therapeutic approaches are required since the "recovery" concept involves more than physical symptoms' improvement; it encompasses overall well-being.

Patients with chronic physical diseases display low resilience levels associated with more severe depressive symptoms[11,26]. In contrast, high trait resilience contributes significantly to mental health[10], protecting against the emergence of depression[12,27]. This study showed that resilience mitigates depressive symptoms in patients with psoriasis, a chronic psychosomatic disease. Most importantly, resilience is a modifiable characteristic that may be enhanced by psychological interventions, contributing to well-being[28]. A meta-analysis of psychotherapeutic interventions in dermatological patients revealed encouraging results[29], with cognitive behavioral therapy being a promising approach[30]. However, psychotherapeutic interventions promoting resilience in psoriasis patients require further investigation.

This study had some limitations: i) the cross-sectional design hindered elucidation of causal relationships; ii) the sample size was relatively small; iii) the self-administered tools may suffer from bias related to self-report; iv) although most studies use validated questionnaires to assess depressive symptoms, a practical tool for clinical settings, a definite diagnosis of depression requires diagnostic interviews based on standard diagnostic criteria; v) it was not feasible to investigate the effects of psoriasis medication on depressive symptoms due to divergence in psoriasis treatment.

Conclusively, this was the first study to investigate the effect of resilience and several sociodemographic/clinical variables on depressive symptoms in Greek psoriasis patients. Assessing resilience in different populations is worthwhile due to its social and cultural contributors[9]. Psoriasis is a psychodermatological disorder requiring a multidimensional therapeutic approach. Evaluating and treating depressive symptoms is essential for improving the disease's global outcome. This study underscores the implementation of resilience-building interventions since resilience may alleviate depressive symptoms in psoriasis patients. Such interventions could either prevent the emergence of depressive symptoms or complement antidepressant treatment in cases of established depressive symptoms.

Conflict of interest

The authors have no competing interests to report.

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