The top 100 most cited articles in acne vulgaris: a bibliometric analysis

Sapir Itzhaki Gabay,[1,2] Barak Zlakishvili,3 Yuliya Valdman-Grinshpoun,[1,2] Amir Horev[2,4]

[1]Department of Dermatology, Soroka University Medical Center, Be'er-Sheva; [2]Faculty of Health Sciences, Ben-Gurion University of the Negev, Be'er-Sheva; [3]Hebrew University School of Medicine, Jerusalem; [4]Pediatric Dermatology Service, Soroka University Medical Center, Be'er-Sheva, Israel

Abstract

A substantial body of literature has been published on acne vulgaris (AV) in the past five decades. Bibliometric analysis (BA) is a scientific, statistical evaluation review of published articles, providing a quantitative assessment of past research. The Web of Science (webOS) citation indexing database was used on 11 June 2023 to identify the top 100 cited articles on AV. Articles were listed in descending order by their annual citation (AC). Data sets were then subdivided into senior author, year and age of publication, journal and its impact factor, the number of total citations according to the webOS, corresponding and senior author's affiliated institution, country of origin, manuscript type, study design, and research focus. The top 100 most cited articles were published between 1974 and 2020. The mean number of citations ranges between 82 and 688. The most cited paper was *Guidelines of care for the management of Acne Vulgaris* by Zaenglein, with an AC of 98.2. The largest number of manuscripts was published between 2001 and 2010 (n = 47). The *British Journal of Dermatology* had the highest number of published manuscripts (15). Of the original research papers, 28% were of a level of evidence 1, 56% focused on treatment, 19.5% on epidemiology, and 16.5% on pathogenesis. This analysis provides detailed bibliometric characteristics, highlighting the worldwide acne burden, with the hope that future researchers will explore the gaps in the AV literature.

Correspondence: Sapir Itzhaki Gabay, Department of Dermatology, Soroka University Medical Center, PO Box 151, Be'er-Sheva 84101, Israel.
Tel.: +972.502323705 - Fax: +972.86232334.
E-mail: sapirisarah@gmail.com

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Introduction

Acne vulgaris (AV) is a multifactorial, polymorphic inflammatory skin disease targeting the pilosebaceous unit, most commonly distributed along the face and, less frequently, the back and chest.[1] Its global estimated prevalence is around 9.4%,[2,3] making it the eighth most prevalent disease worldwide.[4]

Significant comorbidities have been associated with acne,[5] such as permanent scarring, depression, low self-esteem, embarrassment, anxiety, and suicidal ideation, negatively influencing the quality of life.[6]

Bibliometric analysis (BA) is a scientific, statistical evaluation review of published articles, providing a quantitative assessment of past research. In addition, it presents important messages and conclusions for physicians and investigators in a specific field and predicts research areas that need further investigation. Several fields in dermatology have been explored by BA, including atopic dermatitis,[7,8] psoriasis,[9] nail psoriasis,[10] psoriatic arthritis,[11] melanoma,[12] hidradenitis suppurative,[13,14] and rosacea.[15] However, to date, no BA of AV has been published.

In the current BA, we described the literature shaping AV practice by identifying important bibliometric characteristics in the top 100 cited AV papers over the last 50 years.

Materials and Methods

Search strategy

The top 100 most cited articles on acne were retrieved from the webOS citation indexing database on 11 June 2023.[16,17] To encompass the trends over the years, we decided to include publications that AV appeared in their title in the past 50 years, with no limitation on languages or document types. Approval from an ethics committee was not required, given that no data collection or intervention in animal or human experiments occurred.

Data extraction and bibliometric parameters

The top 100 most cited articles on acne were extracted to Microsoft Excel 2019. The search result directly led to the

retrieval of the title, total citations (TCs) by webOS database and publisher site, journal, year of publication, senior author, and manuscript type. Annual citation (AC), the division of TCs by how old the publication is, has been described as a tool to counter the bias arising from older publications having more prominent citations over time.[18,19,20] The study design and research focus were determined by screening the abstract, available full text, and keywords of the 100 articles. Country and institution were recorded according to the senior author's information. Finally, the webOS usage count since 2013, which states the number of times users accessed the study via full text since 2013, was extracted directly from the search result.

Statistical analysis

Statistical analysis was done on Jasp©. Normality of data was assessed using the Shapiro-Wilk test, and statistical differences were evaluated using the Mann-Whitney U test for non-parametric values.

Results

A total of 2,909 studies were retrieved, with the top 100 cited articles published between 1974 and 2020, ranked by AC and listed in Supplementary Table 1.

Year of publication

The increase in publications began after 1990, reaching its peak between 2001 and 2010 (n = 47) (Supplementary Table 1).

Citations

The TCs of the 100 articles ranged between 82 and 688, with a sum of 14,701 and a median of 112.5. Figure 1 shows the citation analysis for the mean AC and TC in each 10-year interval. The webOS usage count declines as the AC of publications lowers, showing a respective relationship in both as the publication rank degrades. (Supplementary Table 1).

Countries, institutions, and senior authors

The articles were sorted by country of origin, indicating that the US (n= 44), the UK (n= 12), and Germany (n= 6) were the countries that published the most cited articles concerning AV (Supplementary table 1). After controlling for population, these three countries were still those with the greatest number of publications on AV, in the following order: UK (1.77754E-07), US (1.30066E-07), and Germany (7.19685E-08). The most published countries, affiliated institute, senior author, and their respective number of articles are listed in Supplementary Table 2. The University of California(n= 5) was the most affiliated institution, and Professor William J Cunliffe was the most published senior author(n= 5).

Journal of publication

The 100 articles were published in 36 different journals, with 76% of the papers being in the field of dermatology (Figure 2). Of these articles, the largest number was published in the *British Journal of Dermatology* (n= 15), followed by the *Journal of the American Academy of Dermatology* (n= 14) and *Archives of Dermatology* (n= 10). The top five most published journals and their impact factors are listed in Supplementary Table 3.

Article design and research focus

Of the 100 most cited articles, 72 were original articles, 23 were reviews, and five were editorial materials.

The original articles were then classified into different research focuses: treatment (56%), epidemiology (19.5%), pathogenesis (16.5%), and others (8%) (Figure 3). Of the original articles that focus on treatment, 55% were clinical trials (n= 22), 33% were randomized controlled trials (n= 13) (RCT`s) and 28% of the original articles had a level of evidence (LOE) of 1 (Figure 4). Between 2001 and 2010, there was a surge in treatment focused original articles compared to prior decades (Figure 3). When analyzing the rise with respect to study design, analysis shown that the higher volume of publications is a result of a higher number of RCT`s (n= 13) and clinical trials. (n=10) Out of the 13 RCT`s, three were about the effect of a low-glycemic diet on AV and five

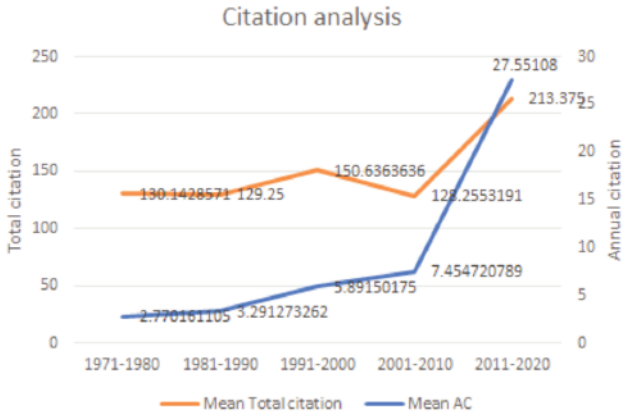

Figure 1. Citation analysis of the top 100 most cited articles as presented by total citation (TCs) and annual citation (ACs) in each 10-year interval.

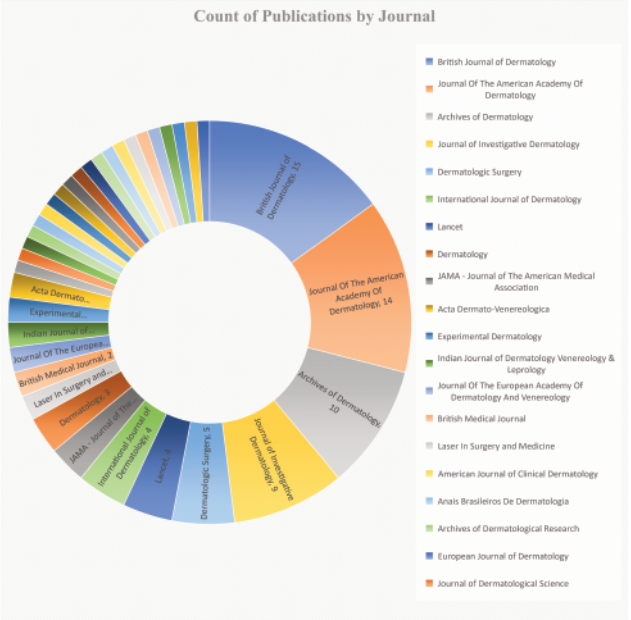

Figure 2. Distribution of publication journals that published the most articles on acne.

were about phototherapy and laser therapy for AV. When examining the difference between the AC and TC of RCT`s and clinical trials between 2001 and 2010 compared to the RCT`s and clinical trials in the remaining articles, the various periods differences in TC were not statistically significant, whereas the AC between 2001 and 2010 were significantly higher than the remaining articles (R_{AC}= 0.43, p = 0.02), with regards to RCT`s and clinical trials. Further analysis has raised three recurring themes: children (n=8), mental morbidity (n=5), and diet (n=4).

Of the original articles that were focused on treatment, 33% were about photo and laser therapy for acne, and of the epidemiology-related articles, 43% focused on adolescence. (Supplementary Table 1)

Discussion and Conclusions

In the current BA, we present the main highlights and changes that have taken place over the years, explain the differences regarding publication, and conduct conclusions that may help improve the general understanding of acne, eventually leading to better treatment. The top cited acne articles were published between 1974 and 2018. However, a substantial surge was noted between 2001 and 2012, in which 47 articles were published on AV (Supplementary table 1). This might be explained by the treatment research focus, also surging that decade (Figure 3). Photodynamic therapy (PTD) was the therapy of interest that decade, trying to find better treatment modalities than Isotretinoin due to its significant cutaneous and systemic side effects (21,22). Photodynamic therapy success is mainly due to sebaceous glands' destruction, leading to decreased sebum production.[22,23] Yet, there is no consensus on performing PDT for AV therapy.[22,24]

In addition, the surge in treatment research focus is likely due to the growing interest in the aesthetics, beautification, and cosmetology fields that have accelerated since 1990.[25] The sharp decline in publishing articles between 2012 to 2022 is due to a lower treatment research focus (Figure 3). The only article published regarding treatment that decade was the guideline (top cited) that arranged all the former treatment modalities. The high ACs of this article can be attributed to the importance of guidelines that presents updated grading, classification, and management options for a certain disease.[26] This points out that treatment modalities for AV should be further investigated to find an appropriate therapy.

The median and the mean TCs rate for AV are 113 and 142.73, respectively, placing AV relatively behind psoriatic arthritis (265.9) [15] and melanoma (526),[16] emphasizing that AV needs to be further investigated and will be a growing field in the future research.

The average of TC was ascending parallel to the increase in AC (Figure 1). In addition, a strong positive correlation was found between ranking by ACs and the respective decline in webOS usage count since 2013 (Supplementary table 1), supporting the idea that BA should rank cited articles according to Acs to counter the bias that older papers have a greater chance of being cited.[27] Our analysis indicated that most of the top cited articles sorted by country of origin after controlling for the population were the UK, the US, and Germany. This finding might be attributed to the global burden of acne disease, which may vary according to patient demographics.[4,28,29] Acne is most significant in Western Europe (including the UK and Germany), high-income North America, and southern Latin America. In addition, it may also be related to improved recording and high healthcare accessibility in those countries. More than that, acne was the most common reason for visiting a dermatologist below 18 years of age[30] and the most common skin condition across the US.[31] Economically related, annual acne cost is enormously high in US and Germany (estimated at $3 billion[32] and over 400 million euros/ year,[33] respectively). Another potential reason for the difference between the number of articles published among the countries (Supplementary Table 1) is the high glycemic index aspect associated with acne.[34,35] For example, the US ranked 12th highest obesity country worldwide due to an increased glycemic index diet,[36,37] compared to Japan, in which the traditional Japanese diet is known to prevent obesity.[38]

The majority of the top cited articles were published in the *British Journal of Dermatology, followed by* the *Journal of the American Academy of Dermatology* and the *Archives of Dermatology* (S2). This finding might be attributed to the countries in which these journals are published, also related to the acquired trend in which researchers are more likely to select high IF journals for citations (S1).

The epidemiology of acne ranked second behind treatment in the research focuses. According to our results, out of the epidemiological articles, three were concerning the psychiatric and psychological impact of acne,[39,40,5] seven were regarding the prevalence of acne in adolescence,[5,39,41-45] and two focused on the incidence of Propionibacterium Acnes.[46,47] In addition, an obvious peak of RCTs studies between 2003 and 2012 was noticeable (Figure 4). Out of them, four were concerning the low glycemic diet on AV.[34,35,48,49]

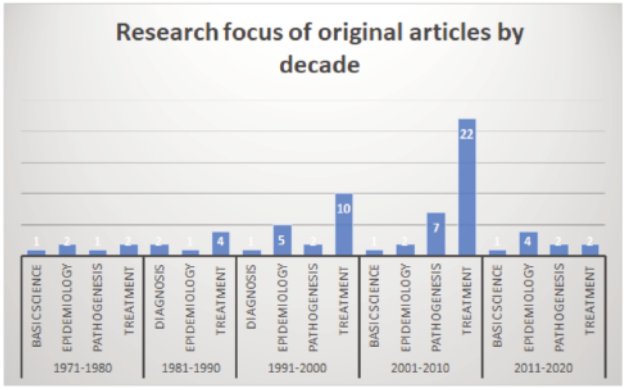

Figure 3. Distribution of original articles with a research focus by decade.

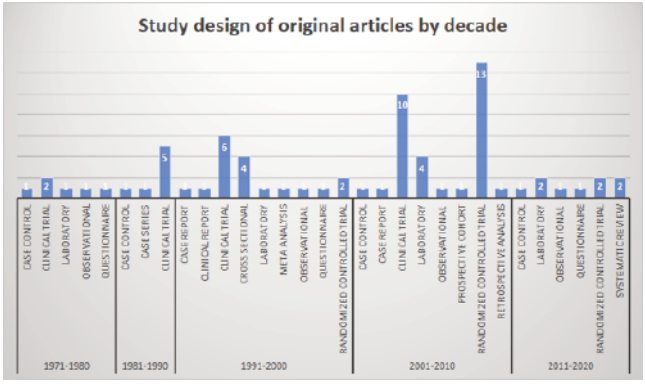

Figure 4. Distribution of study design by decade.

Only nine articles were related to the pediatric population; seven papers that focused on epidemiology, were about children's quality of life, one was about acne risk factors, and one revealed the psychological aspect of children with acne. As a result, the main question arises- is the current treatment for acne, a common skin disease influencing approximately 85% of teenagers, satisfactory?

The current study had several limitations. First, our citation analysis didn't exclude the influence of self-citation, which may point out that citation ranking does not always measure quality but rather awareness of a specific topic and degree of recognition. In addition, older articles had higher chances of being cited, and even the most cited papers have no citations when they are just published.[27] Our analysis tried to correct this bias by ranking the articles according to ACs.

In conclusion, our study provides a detailed BA of the top 100 cited articles related to AV in the last five decades, analyzing acne's epidemiology and treatment modalities.

References

1. Nast A, Dréno B, Bettoli V, et al. European evidence-based (S3) guidelines for the treatment of acne. J Eur Acad Dermatol Venereol JEADV. 2012;26,Suppl 1:1–29.
2. Bhate K, Williams HC. Epidemiology of acne vulgaris. Br J Dermatol. 2013 Mar;168:474–85.
3. Heng AHS, Chew FT. Systematic review of the epidemiology of acne vulgaris. Sci Rep. 2020;10:5754.
4. Layton AM, Thiboutot D, Tan J. Reviewing the global burden of acne: how could we improve care to reduce the burden? Br J Dermatol. 2021;184:219–25.
5. Aktan S, Ozmen E, Sanli B. Anxiety, depression, and nature of acne vulgaris in adolescents. Int J Dermatol. 2000;39:354–7.
6. Gupta MA, Gupta AK. Depression and suicidal ideation in dermatology patients with acne, alopecia areata, atopic dermatitis and psoriasis. Br J Dermatol. 1998;139:846–50.
7. Thompson AM, Seivright J, Hsiao JL, et al. Bibliometric analysis of the 50 most cited publications in atopic dermatitis. Pediatr Dermatol. 2022;39:578–83.
8. Kim D, Chae Y, Park HJ, et al. A Bibliometric Analysis of Atopic Dermatitis Research over the Past Three Decades and Future Perspectives. Healthc Basel Switz. 2021;9:1749.
9. Wu JJ, Choi YM, Marczynski W. The 100 most cited psoriasis articles in clinical dermatologic journals, 1970 to 2012. J Clin Aesthetic Dermatol. 2014;7:10–9.
10. Malik S, Matushansky JT, Thomas C, et al. The Top 100 Most-Cited Articles on Nail Psoriasis: A Bibliometric Analysis. Cutis. 2021;108:76.
11. Berlinberg A, Bilal J, Riaz IB, et al. The 100 top-cited publications in psoriatic arthritis: a bibliometric analysis. Int J Dermatol. 2019;58:1023–34.
12. Joyce CW, Sugrue CM, Joyce KM, et al. 100 citation classics in the melanoma literature: a bibliometric analysis. Dermatol Surg Off Publ Am Soc Dermatol Surg Al. 2014;40:1284–98.
13. Shih T, De DR, Thompson AM, et al. Global geographic bibliometric analysis of hidradenitis suppurativa publications. Int J Dermatol. 2021;17.
14. Seivright J, Thompson AM, Atluri S, et al. Hidradenitis suppurativa research from Africa: a bibliometric analysis. Int J Dermatol. 2021;60:e410–4.
15. Wang Y, Zhang H, Fang R, et al. The top 100 most cited articles in rosacea: a bibliometric analysis. J Eur Acad Dermatol Venereol JEADV. 2020;34:2177–82.
16. Mahamud I, Mainwaring A. 50 years in urinary incontinence: a bibliometric analysis of the top 100 cited articles of the last 50 years. Int Urogynecology J. 2022;33:919–30.
17. Bullock N, Ellul T, Bennett A, et al. The 100 most influential manuscripts in andrology: a bibliometric analysis. Basic Clin Androl. 2018;28:15.
18. Antoniou SA, Lasithiotakis K, Koch OO, et al. Bibliometric Analysis of Scientific Contributions in Minimally Invasive General Surgery. Surg Laparosc Endosc Percutan Tech. 2014;24.
19. Mainwaring A, Bullock N, Ellul T, et al. The top 100 most cited manuscripts in bladder cancer: A bibliometric analysis (review article). Int J Surg Lond Engl. 2020;75:130–8.
20. Ellul T, Bullock N, Abdelrahman T, et al. The 100 most cited manuscripts in emergency abdominal surgery: A bibliometric analysis. Int J Surg Lond Engl. 2017;37:29–35.
21. Amichai B, Shemer A, Grunwald MH. Low-dose isotretinoin in the treatment of acne vulgaris. J Am Acad Dermatol. 2006;54:644–6.
22. Sakamoto FH, Lopes JD, Anderson RR. Photodynamic therapy for acne vulgaris: a critical review from basics to clinical practice: part I. Acne vulgaris: when and why consider photodynamic therapy? J Am Acad Dermatol. 2010;63:183–93; quiz 193–4.
23. Sakamoto FH, Torezan L, Anderson RR. Photodynamic therapy for acne vulgaris: a critical review from basics to clinical practice: part II. Understanding parameters for acne treatment with photodynamic therapy. J Am Acad Dermatol. 2010;63:195–211; quiz 211–2.
24. Zaenglein AL, Pathy AL, Schlosser BJ, et al. Guidelines of care for the management of acne vulgaris. J Am Acad Dermatol. 2016;74:945-973.e33.
25. Jacobsen T. Beauty and the brain: culture, history and individual differences in aesthetic appreciation. J Anat. 2010;216:184–91.
26. Zaenglein AL, Pathy AL, Schlosser BJ, et al. Guidelines of care for the management of acne vulgaris. J Am Acad Dermatol. 2016;74:945-973.e33.
27. Garfield E. The history and meaning of the journal impact factor. JAMA. 2006;295:90–3.
28. Karimkhani C, Dellavalle RP, Coffeng LE, et al. Global Skin Disease Morbidity and Mortality: An Update From the Global Burden of Disease Study 2013. JAMA Dermatol. 2017;153:406–12.
29. Cordain L, Lindeberg S, Hurtado M, et al. Acne vulgaris: a disease of Western civilization. Arch Dermatol. 2002;138:1584–90.
30. Peck GM, Roberson FA, Feldman SR. Why Do Patients in the United States Seek Care from Dermatologists? Dermatol Ther. 2022;12:1065–72.
31. Bickers DR, Lim HW, Margolis D, et al. The burden of skin diseases: 2004 a joint project of the American Academy of Dermatology Association and the Society for Investigative Dermatology. J Am Acad Dermatol. 2006;55:490–500.
32. Tassavor M, Payette MJ. Estimated cost efficacy of U.S. Food and Drug Administration-approved treatments for acne. Dermatol Ther. 2019;32:e12765.
33. Radtke MA, Schäfer I, Augustin M. [Pharmacoeconomy in acne—evaluation of benefit and economics]. J Dtsch Dermatol Ges J Ger Soc Dermatol JDDG. 2010;8 Suppl 1:S105-114.
34. Smith RN, Mann NJ, Braue A, et al. The effect of a high-protein, low glycemic-load diet versus a conventional, high

glycemic-load diet on biochemical parameters associated with acne vulgaris: a randomized, investigator-masked, controlled trial. J Am Acad Dermatol. 2007;57:247–56.
35. A low-glycemic-load diet improves symptoms in acne vulgaris patients: a randomized controlled trial - PubMed [Internet]. [cited 2022 Dec 20]. Available from: https://pubmed-ncbi-nlm-nih-gov.ezproxy.bgu.ac.il/17616769/
36. Wells HF, Buzby JC, editors. Dietary Assessment of Major Trends in U.S. Food Consumption, 1970-2005. 2008. 20 p. (Economic Information Bulletin).
37. Neri D, Martinez-Steele E, Monteiro CA, et al. Consumption of ultra-processed foods and its association with added sugar content in the diets of US children, NHANES 2009-2014. Pediatr Obes. 2019;14:e12563.
38. Imai T, Miyamoto K, Sezaki A, et al. Traditional Japanese Diet Score - Association with Obesity, Incidence of Ischemic Heart Disease, and Healthy Life Expectancy in a Global Comparative Study. J Nutr Health Aging. 2019;23:717–24.
39. Tasoula E, Gregoriou S, Chalikias J, et al. The impact of acne vulgaris on quality of life and psychic health in young adolescents in Greece. Results of a population survey. An Bras Dermatol. 2012;87:862–9.
40. Lasek RJ, Chren MM. Acne vulgaris and the quality of life of adult dermatology patients. Arch Dermatol. 1998;134:454–8.
41. Lucky AW, Biro FM, Huster GA, et al. Acne vulgaris in early adolescent boys. Correlations with pubertal maturation and age. Arch Dermatol. 1991;127:210–6.
42. Lynn DD, Umari T, Dunnick CA, et al. The epidemiology of acne vulgaris in late adolescence. Adolesc Health Med Ther. 2016;7:13–25.
43. Kilkenny M, Merlin K, Plunkett A, et al. The prevalence of common skin conditions in Australian school students: 3. acne vulgaris. Br J Dermatol. 1998;139:840–5.
44. Cunliffe WJ, Gould DJ. Prevalence of facial acne vulgaris in late adolescence and in adults. Br Med J. 1979;1:1109–10.
45. Lucky AW, Biro FM, Simbartl LA, et al. Predictors of severity of acne vulgaris in young adolescent girls: results of a five-year longitudinal study. J Pediatr. 1997;130:30–9.
46. Leyden JJ, McGinley KJ, Mills OH, et al. Propionibacterium levels in patients with and without acne vulgaris. J Invest Dermatol. 1975;65:382–4.
47. Jahns AC, Lundskog B, Ganceviciene R, et al. An increased incidence of Propionibacterium acnes biofilms in acne vulgaris: a case-control study. Br J Dermatol. 2012;167:50–8.
48. Smith RN, Braue A, Varigos GA, et al. The effect of a low glycemic load diet on acne vulgaris and the fatty acid composition of skin surface triglycerides. J Dermatol Sci. 2008;50:41–52.
49. Kwon HH, Yoon JY, Hong JS, et al. Clinical and histological effect of a low glycaemic load diet in treatment of acne vulgaris in Korean patients: a randomized, controlled trial. Acta Derm Venereol. 2012;92:241–6.

Supplementary material

Table S1. Top 100 cited articles on acne vulgaris retrieved from the Web of Science database.

Table S2. The number of publications in the three countries with the most published articles on acne, the affiliated institution, and senior authors with the largest numbers of publications, and the respective number of published articles.

Table S3.The number of publications by the five journals with the most articles on acne vulgaris and the journal's impact factor (2022).