

Applications of Dermatoglyphics in Dentistry- A Bibliographic Review

SUBHASHREE MOHAPATRA¹, RAHUL MOHANDAS²

ABSTRACT

Introduction: Dermatoglyphics is the study of the characteristic ridged skin patterns on the fingertips, palms, toes, and soles of all primates, including humans. Due to this unique and unalterable nature, dermatoglyphics can be used as an excellent tool for population studies, personal identification, and morphological and genetic research. In recent years, dermatoglyphics has drawn a lot of attention in the field of dentistry, as a potential adjunct diagnostic tool in the identification of various orofacial and dental anomalies.

Aim: To identify and analyse all the articles published on applications of dermatoglyphics in dentistry.

Materials and Methods: A comprehensive search of bibliographic databases was performed by two independent reviewers, from October 2022 to December 2022, using medical sub-heading terms like "Dermatoglyphics", "Dental", and "Oral" in several

combinations. All types of published studies were included in this bibliographic analysis. The articles were identified, tabulated and analysed to extract the various bibliometric details.

Results: A total of 536 citations were achieved cumulatively by 57 publications included in this review. The article that received the maximum number of citations (citation=46) was by Reddy BRM et al., published in the Journal of Clinical and Diagnostic Research in year 2013. Maximum publications (n=46) originated from India. Most of the published articles were focused on application of dermatoglyphics for the diagnosis of dental caries (n=21) followed by malocclusion (n=14).

Conclusion: The present bibliometric analysis identifies and analyses the most-cited articles on applications of dermatoglyphics in dentistry. The findings of this review not only provide insight into the scientific evolution in the field but also reveal trends in further research and clinical practice.

Keywords: Analysis, Cleft lip, Cleft palate, Dental caries, Fingerprint, Malocclusion

INTRODUCTION

Dermatoglyphics or 'epidermal ridge configurations' is defined as the study of the characteristic ridged skin patterns on the fingertips, palms, toes, and soles of all primates, including humans [1]. The term dermatoglyphics originated from the Greek words '*derma*' meaning skin and '*glyphic*' meaning 'carvings' [2]. The term was coined by Dr. Harold Cummins, the father of dermatoglyphics in 1926 as was mentioned in searchable study by Asen D [3]. The epidermal ridge development begins around the 13th week of intrauterine life and is completed by the 19th week [4]. The ridge patterns are influenced by the blood vessel-nerve bundle pairs present at the border of the dermis and epidermis. The patterns may be altered by a variety of factors such as inadequate oxygen supply, alterations in epithelial growth, and unusual distribution of sweat glands [5]. The epidermal ridge configuration is considered a sensitive marker of developmental dental anomalies as both originate from the same ectodermal germ layer in the 6th-7th intrauterine week [6].

The 'proof of no change' theory was put forth by Galton, stating that an individual's fingerprint remains unchanged throughout his/her lifetime [7]. Due to this unique and unalterable nature, dermatoglyphics can be used as an excellent tool for population studies, personal identification, and morphological and genetic research [8]. Dermatoglyphic studies include qualitative and quantitative analysis. Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), AB ridge count, and Axial tri-radius and Angular tri radius (Atd) angle are the qualitative assessment methods. Quantitative assessment includes analysis of the dermal patterns, independently and combined, along with detection of abnormal palmar creases, Sydney lines, and Simian lines [9].

In recent years, dermatoglyphics has drawn a lot of attention in the field of dentistry [10]. It has been associated with a wide array of congenital and acquired dental pathologies like dental

caries, periodontal diseases, cleft lip, cleft palate, malocclusion, Down's syndrome, and Klinefelter's syndrome [11]. Moreover, an association between epidermal ridge pattern and oral submucous fibrosis, leukoplakia, and oral squamous cell carcinoma has also been established [12]. Dermatoglyphics can be used as a potential adjunct diagnostic tool in the identification of various orofacial and dental anomalies. It has various advantages like relative simplicity, versatility, and faster interpretation of the findings [8].

Several publications have shed light on the potential application of dermatoglyphics in the field of dentistry [9-65]. However, there is a lack of systematic identification and analysis of all the published literature on the topic, which can highlight the lacunae in existing research. A bibliometric analysis aids in identifying the key articles that have created an enormous impact in their respective fields, and have paved the way for other research and clinical practice. By this bibliometric analysis, the authors aim to identify and analyse all the articles published on applications of dermatoglyphics in dentistry and help guide future researchers by highlighting the most cited previous publications. As per our knowledge, this bibliographic analysis of literature published on applications of dermatoglyphics is a first-of-its-kind review on the topic.

MATERIALS AND METHODS

The current review followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline. This Bibliographic analysis was conducted at Dr. D.Y. Patil Dental College and Hospital, Pimpri, Pune District, Maharashtra State, India from October 2022 to December 2022. The institutional review board deemed that ethical approval was not necessary, as this was a bibliographic analysis where electronically available data was retrieved and evaluated retrospectively.

Inclusion criteria: Studies that focused on the application of dermatoglyphics in the dental specialty were included in the review.

Exclusion criteria: Manuscripts which were not related to applications of dermatoglyphics in dentistry. For instance, a study on the application of dermatoglyphics in diabetic and hypertensive patients was excluded.

Study Procedure

In October 2022, a comprehensive search of bibliographic databases like Google scholar, PubMed, and Scopus was performed by two independent reviewers. The search was performed using medical sub-heading terms like "Dermatoglyphics", "Dental", and "Oral" in several combinations. The search included all peer-reviewed journals and was not restricted to dental specialty journals. The search was done without any date, language, or type of study filter. All types of published studies were included in this bibliographic analysis. The gross result of the search was then analysed for the journal, year of publication, country of origin of the study, type of study, application in dentistry, and language. The results were then tabulated according to the total number of citations to date and then reviewed individually by both authors. The authors initially read the abstracts, and the entire manuscript was reviewed in cases where additional information was required. In cases of discrepancy between the two authors, a third author was included in the discussion until consensus was achieved.

For each of the published articles on applications of dermatoglyphics in dentistry, the following details were recorded: article title, author's name, journal name, publication year, the total number of citations, average citations per year, country of origin, type of study, application in dentistry and language of the publication. Typing and sub-typing of all the articles were also done, and they were categorised as pilot studies, review articles, cross-sectional studies, case-control studies, cohort studies, comparative studies, in-vivo studies, and randomised control trials.

RESULTS

The overall search yielded 31 articles in the Scopus database, 28 articles in the PubMed database, and 48 articles in the Google Scholar database. After eliminating the duplicates, based on the inclusion and exclusion criteria described above, a total of 57 articles were included in the review [6,9-11,13-65]. The publications were arranged in descending order of citations received. The details of the included publications are enlisted in [Table/Fig-1].

Article and Citation Analysis

A total of 536 citations were achieved cumulatively by all the publications included in this review. The citation number ranged from 46-0, with the mean citation count being 23. The article that received the maximum number of citations (n=46) was by Reddy BRM et al.,

S. No.	Title	Author's name	Place of study	Journal	Year	Citation	Citation density	Application
1	A comparative study of dermatoglyphics in individuals with normal occlusions and malocclusions [13]	Reddy BRM et al.,	India	Journal of Clinical and Diagnostic Research	2013	46	5.11	Malocclusion
2	A comparative evaluation of dermatoglyphics in different classes of malocclusion [14]	Jindal G et al.,	India	Saudi Dental Journal	2015	38	5.43	Malocclusion
3	Dermatoglyphic interpretation of dental caries and its correlation to salivary bacteria interactions: An in-vivo study [15]	Sharma A and Somani R	India	Journal of Indian Society of Pedodontics and Preventive Dentistry	2009	31	2.38	Dental caries
4	The frequency of fingerprint type in parents of children with Trisomy 21 in Japan [16]	Matsuyama N and Ito Y	Japan	Journal of Physiological Anthropology	2006	31	1.94	Genetic disorders
5	Association of dermatoglyphic peculiarities with dental caries in preschool children of Lucknow, India [17]	Singh E et al.,	India	International Journal of Clinical Paediatric Dentistry	2016	25	4.17	Dental caries
6	Dermatoglyphic findings in dental caries: A preliminary report [19]	Atasu M	Turkey	Journal of Clinical Paediatric Dentistry	1998	25	1.04	Dental caries
7	A comparative evaluation between dermatoglyphic patterns and different terminal planes in primary dentition [18]	Ravindra V et al.,	India	Journal of Clinical and Experimental Dentistry	2018	25	6.25	Malocclusion
8	Dermatoglyphics- A marker for malocclusion? [20]	Tikare S et al.,	India	International Dental Journal	2010	24	2.00	Malocclusion
9	Can dermatoglyphics be used as a marker for predicting future malocclusions? [21]	Eslami N et al.,	Iran	Electron Physician	2016	24	4.00	Malocclusion
10	Dermatoglyphic assessment in subjects with different dental arch forms: An appraisal [22]	Sachdeva S et al.,	India	Journal of Indian Prosthodontic Society	2014	23	2.88	Malocclusion
11	The mystery of handprints: Assesment and correlation of dermatoglyphics with early childhood caries a case-control study [23]	Navit S et al.,	India	Journal of Clinical and Diagnostic Research	2015	20	2.86	Dental caries
12	Dermatoglyphic patterns and salivary pH in subjects with and without dental caries: A cross-sectional study [24]	Yamunadevi A et al.,	India	Journal of Natural Sciences, Biology and Medicine	2015	19	2.71	Dental caries
13	Palmistry: A tool for dental caries prediction! [25]	Madan N et al.,	India	Indian Journal of Dental Research	2011	18	1.64	Dental caries
14	Qualitative and quantitative analysis of palmar dermatoglyphics among smokeless tobacco users [26]	Vijayaraghavan A and Aswath N	India	Indian Journal of Dental Research	2015	17	2.43	Tobacco habit
15	Role of dermatoglyphics as an indicator of precancerous and cancerous lesions of the oral cavity [27]	Gupta A and Karjodkar FR	India	Contemporary Clinical Dentistry	2013	14	1.56	Potentially malignant disorders and oral squamous cell carcinoma
16	Dermatoglyphics: A genetic marker of early childhood caries [29]	Anitha C et al.,	India	Journal of Indian Society of Pedodontics and Preventive Dentistry	2014	13	1.63	Dental caries
17	Evaluation of dermatoglyphic patterns using digital scanner technique in skeletal malocclusion: A descriptive study [28]	Charles A et al.,	India	Indian Journal of Dental Research	2018	13	3.25	Malocclusion

18	Correlation between dermatoglyphics, dental caries and salivary pH: an in-vivo study [6]	Veeresh T et al.,	India	Ethiopian Journal of Health Sciences	2019	12	4.00	Dental caries
19	Dermatoglyphics in patients with dental caries: A study on 1250 individuals [30]	Abhilash PR et al.,	India	Journal of Contemporary Dental Practice	2012	11	1.10	Dental caries
20	A cross-sectional study of dermatoglyphics and dental caries in Bengalee children [31]	Sengupta AB et al.,	India	Journal of Indian Society of Pedodontics and Preventive Dentistry	2013	9	1.00	Dental caries
21	Dermatoglyphics as a non invasive tool for predicting dental caries in cerebral palsy and healthy children: An in-vivo study [32]	Somani R et al.,	India	International Journal of Clinical Paediatric Dentistry	2019	8	2.67	Dental caries
22	Individuals with non syndromic orofacial clefts have increased asymmetry of fingerprint patterns [33]	Neiswanger K et al.,	Hungary, USA, Spain, and Argentina	PLoS One	2020	7	3.50	Orofacial cleft
23	Dermatoglyphic findings in dental caries and their correlation with salivary levels of Streptococcus mutans and Lactobacillus in school-going children in and around Moradabad [34]	Sharma R et al.,	India	Journal of Oral and Maxillofacial Pathology	2018	6	1.50	Dental caries
24	Comparison of dermatoglyphic traits and dental anomalies associated with cleft lip or cleft lip and palate patients with normal healthy children [11]	Maheshwari N et al.,	India	Journal of Indian Society of Pedodontics and Preventive Dentistry	2013	6	0.67	Orofacial cleft
25	Relationship between dermatoglyphics, cheiloscopy, rugoscopy, and dental caries: A cross-sectional study in Bengaluru, Karnataka [35]	Agarwal M et al.,	India	Contemporary Clinical Dentistry	2018	5	1.25	Dental caries
26	Karyotyping, dermatoglyphic, and sweat pore analysis of five families affected with ectodermal dysplasia [39]	Sidhu M et al.,	India	Journal of Oral and Maxillofacial Pathology	2012	5	0.50	Genetic disorders
27	Three-dimensional palatal anatomic characteristics' correlation with dermatoglyphic heterogeneity in angle malocclusions [40]	AlShahrani I et al.,	Saudi Arabia	The Angle Orthodontist	2019	5	1.67	Malocclusion
28	Comparison of dermatoglyphic pattern among cleft and non cleft children: A cross-sectional study [36]	Mayali SS et al.,	India	International Journal of Clinical Paediatric Dentistry	2017	5	1.00	Orofacial cleft
29	Cheiloscopy and dermatoglyphics as genetic markers in the transmission of cleft lip and palate: A case-control study [38]	Saujanya K et al.,	India	Journal of Indian Society of Pedodontics and Preventive Dentistry	2016	5	0.83	Orofacial cleft
30	A dermatoglyphic study in oral submucous fibrosis patients [37]	Kumar S et al.,	India	Journal of Indian Academy of Oral Medicine and Radiology	2014	5	0.63	Potentially malignant disorders and oral squamous cell carcinoma
31	A comparative study of dermatoglyphics in subjects with hypodivergent and hyperdivergent growth patterns [42]	Sahoo N	India	Journal of International Society of Preventive and Community Dentistry	2018	4	1.00	Growth patterns
32	Dermatoglyphics in periodontics: An assessment of the relationship between fingerprints and periodontal status- A cross-sectional observation study [41]	Vaidya P et al.,	India	Indian Journal of Dental Research	2017	4	0.80	Periodontitis
33	Qualitative analysis of dermatoglyphics in oral submucous fibrosis [43]	Munishwar PD et al.,	India	Journal of Indian Academy of Oral Medicine and Radiology	2015	3	0.43	Potentially malignant disorders and oral squamous cell carcinoma
34	Fingerprints as an index for investigating cooperation by children in dentistry: A pilot study [52]	Mokhtari S et al.,	Iran	European Archives of Paediatric Dentistry	2021	2	2.00	Behavioural science
35	Utility of dermatoglyphic pattern in prediction of caries in children of Telangana Region, India [46]	Asif SM et al.,	India	Journal of Contemporary Dental Practice	2017	2	0.40	Dental caries
36	Correlation between dermatoglyphics and dental caries in children: A case-control study [10]	Singh KK, et al.,	India	Journal of Family Medicine and Primary Care	2020	2	1.00	Dental caries
37	Determination and comparison of dermatoglyphic patterns and salivary streptococcus mutans counts and its correlation with dental caries among 3- to 6-year-old children [50]	Srilatha A et al.,	India	Oral Health and Preventive Dentistry	2018	2	0.50	Dental caries
38	Detection of dental caries' and dermatoglyphics' association with relative enamel thickness using CBCT Images in Saudi subpopulation: A novel approach [53]	Dawasaz AA et al.,	Saudi Arabia	BioMed Research International	2021	2	2.00	Dental caries
39	Role of dermatoglyphics as a diagnostic tool in medical disorders [44]	Kumar S	India	International Journal of Dentistry and Oral Science	2021	2	2.00	General dentistry
40	The relation between dermatoglyphics and mesiodistal width of the deciduous second molar and permanent first molar [45]	Ramagoni NK et al.,	India	Journal of Clinical and Diagnostic Research	2017	2	0.40	General dentistry
41	Dermatoglyphics and malocclusion [47]	Baswaraj H et al.,	India	Journal of International Oral Health	2016	2	0.33	Malocclusion
42	Relationship between dental arch form and dermtoglyphics [49]	Subramanian SK et al.,	India	Journal of Pharmacy and Bioallied Sciences	2019	2	0.67	Malocclusion

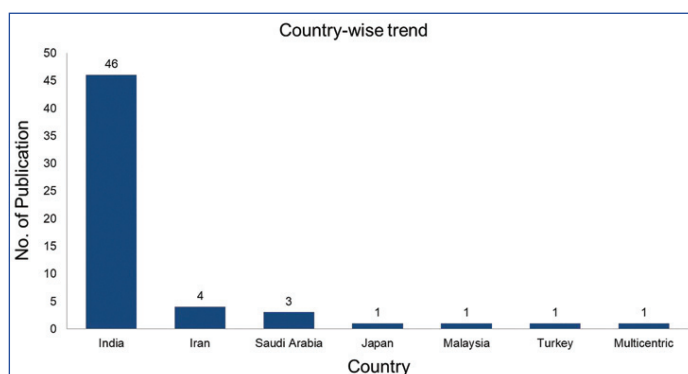
43	Comparative reliability of rugoscopy and dactyloscopy for the predilection of malocclusion and dental caries in children: A cohort study [51]	Cheeli S et al.,	India	Pesquisa Brasileira em Odontopediatria e Clinica Integrada	2017	2	0.40	Malocclusion, Dental caries
44	Evaluation of digital palmar dermatoglyphics in oral submucous fibrosis and leukoplakia: A prospective comparative clinical study [48]	Samudrawar R et al.,	India	Journal of Maxillofacial and Oral Surgery	2022	2	2.00	Potentially malignant disorders and oral squamous cell carcinoma
45	Correlation of dental caries and dermatoglyphic patterns: A study in paediatric population [56]	Nezam S et al.,	India	Journal of Family Medicine and Primary Care	2020	1	0.50	Dental caries
46	Evaluation of the relationship between dental caries and dermatoglyphics in 3 to 6 years old Iranian children [59]	Mokhtari S et al.,	Iran	Nigerian Journal of Clinical Practice	2021	1	1.00	Dental caries
47	Association between dermatoglyphics and early childhood caries among preschool children: A pilot study [60]	Uma E et al.,	Malaysia	International Journal of Applied and Basic Medical Research	2021	1	1.00	Dental caries
48	Comparative study to analyse the correlation between dermatoglyphics and impacted teeth [58]	Ramesh DNS et al.,	India	Journal of Indian Academy of Oral Medicine and Radiology	2020	1	0.50	Impaction
49	Dermatoglyphics: A non invasive diagnostic tool in predicting class III skeletal malocclusion in children [9]	Belludi AC et al.,	India	International Journal of Clinical Paediatric Dentistry	2021	1	1.00	Malocclusion
50	Dermatoglyphic analysis in parents with cleft children: A comparative study [54]	Harika DJ et al.,	India	Contemporary Clinical Dentistry	2018	1	0.25	Orofacial cleft
51	Genetic association in chronic periodontitis through dermatoglyphics: An unsolved link? [57]	Astekar S et al.,	India	Journal of Indian Academy of Oral Medicine and Radiology	2017	1	0.20	Periodontitis
52	GSTM1 null polymorphism and palmar dermatoglyphics in oral leukoplakia [55]	Yogesh L and Aswath N	India	Indian Journal of Dental Research	2021	1	1.00	Potentially malignant disorders and oral squamous cell carcinoma
53	Cheiloscopy and dactyloscopy as behaviour assessment tool in dental settings: A cross-sectional study [62]	Navit S et al.,	India	International Journal of Clinical Paediatric Dentistry	2021	0	0.00	Behavioural science
54	Associaton of dermatoglyphic patterns and salivary pH with DMFT index of patients in Riyadh [65]	Lingam AS	Saudi Arabia	Nigerian Journal of Clinical Practice	2022	0	0.00	Dental caries
55	Association between dermatoglyphic patterns and growth patterns of subjects with skeletal class I relation: A cross-sectional study [61]	Shashidhar K et al.,	India	F1000Research	2022	0	0.00	Malocclusion
56	Lip prints and dermal prints as a tool to detect the skeletal malocclusion: A clinical study [63]	Vatchala Rani RM et al.,	India	Journal of Pharmacy and Bioallied Sciences	2022	0	0.00	Malocclusion
57	Investigating the relationship between fingerprint pattern and development of oral squamous cell carcinoma [64]	Tonkaboni A et al.,	Iran	Journal of Dentistry	2022	0	0.00	Potentially malignant disorders and oral squamous cell carcinoma

[Table/Fig-1]: List of included articles in descending number of total citations [6,9-11,13-65].

published in the Journal of Clinical and Diagnostic Research (2013) [13]. It was followed by publications by Jindal G et al., (cited 38 times), Sharma A et al (cited 31 times), Matsuyama N and Ito Y (cited 31 times) and Singh E et al., (cited 25 times) [14-17]. The citation density ranged from 5.43-0, with a mean of 2.7. The publication by Jindal G et al., had the highest citation density (5.43). The article was published in the Saudi Dental Journal in the year 2015 [14].

All the publications were in the English language. India had the maximum number of publications (n=46), followed by Iran (n=4), and Saudi Arabia (n=3). Japan, Malaysia, and Turkey had one publication each [Table/Fig-2]. The study by Neiswanger K et al., was a multicentric trial conducted across four nations, Hungary, the USA, Spain, and Argentina [33]. The first article on the application of dermatoglyphics in dentistry was published by Atasu M in the year 1998 (cited 25 times) [19]. The years from 2012-2022 were the most active in publishing these papers, with 52 articles being published in this decade. The maximum number of publications (n=8) was seen in the year 2021 [Table/Fig-3].

The included publications consisted of cross-sectional studies (n=26), case-control studies (n=11), comparative studies (n=7), in-vivo studies (n=4), randomised control trials (n=3), and pilot studies (n=2). Additionally, there was one review, a retrospective cohort study, and a multicentric study [Table/Fig-4].

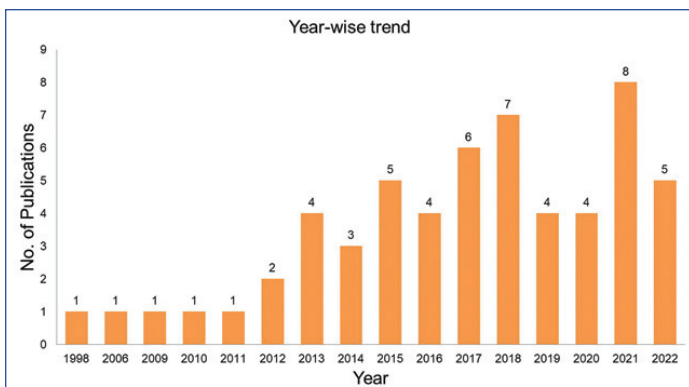


[Table/Fig-2]: Country of origin of the included studies [Total N=57].

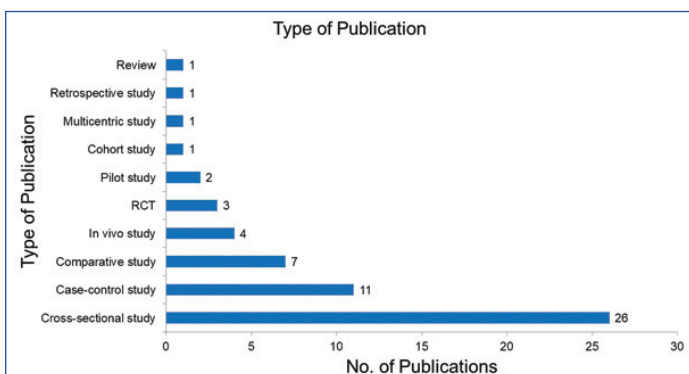
Most of the published articles were focused on application of dermatoglyphics for the diagnosis of dental caries (n=21) followed by malocclusion (n=14). [Table/Fig-5] depicts the various applications of dermatoglyphics in dentistry.

Author Analysis

A total of 254 researchers contributed 5 articles that were included in this review. The analysis also revealed that the included articles had a minimum of one author (n=4) and a maximum of eleven



[Table/Fig-3]: Year-wise trend of the included studies [Total N=57].



[Table/Fig-4]: The type of publication of included studies [Total N=57].

Application	No. of publications
Behavioural sciences	2
Dental caries	21
General dentistry	2
Genetic disorders	2
Growth patterns	1
Impaction	1
Malocclusion	14
Orofacial cleft	5
Periodontitis	2
Potentially malignant disorders and oral squamous cell carcinoma	6
Tobacco habit	1

[Table/Fig-5]: Applications of dermatoglyphics in dentistry [Total N=57].

authors (n=1). Six publications were authored by a single author, six had two authors, and forty-five publications had three or more authors. Eleven authors had contributed more than one publication in the field. Three authors (Dawasaz AA, Syed S, and Togoo RA) had three publications each. Eight authors contributed two publications each [Table/Fig-6].

Authors	Number of publications
Dawasaz AA	3
Syed S	3
Togoo RA	3
Alshahrani	2
Annamalai	2
Konde S	2
Aswath N	2
Prasad MG	2
Ibrahim M	2
Mokhtari	2
Navit S	2

[Table/Fig-6]: List of authors with more than one publication.

Journal Analysis

A total of 33 journals published articles on the application of dermatoglyphics in dentistry. Among these, eleven journals published more than one article [Table/Fig-7]. A thorough examination of the journals revealed that the maximum number of articles was published in three journals, namely the Indian Journal of Dental Research, the International Journal of Clinical Paediatric Dentistry, and the Journal of the Indian Society of Pedodontics and Preventive Dentistry. These three journals contributed to fifteen publications among the included articles. Twenty-two journals had contributed solitary publication in the list of included articles.

Journal	No. of publications
Indian Journal of Dental Research	5
International Journal of Clinical Paediatric Dentistry	5
Journal of Indian Society of Pedodontics and Preventive Dentistry	5
Journal of Indian Academy of Oral Medicine and Radiology	4
Contemporary Clinical Dentistry	3
Journal of Clinical and Diagnostic Research	3
Journal of Contemporary Dental Practice	2
Journal of Family Medicine and Primary Care	2
Journal of Oral and Maxillofacial Pathology	2
Journal of Pharmacy and Bioallied Sciences	2
Nigerian Journal of Clinical Practice	2

[Table/Fig-7]: List of journals with more than one publication.

DISCUSSION

A bibliographic analysis is the best way to identify the most influential articles in different avenues of research. The number of times an article has been cited denotes the scientific value of that publication [66]. Such analysis help in providing a holistic view of existing literature on a particular topic, highlights the existing voids in research, and paves the way for future research and development in the particular topic [67]. Dermatoglyphics has found multiple applications in dentistry as a tool to unveil oral diseases like dental caries, malocclusion, oral cancer, periodontal disease, cleft lip cleft palate, and forensic odontology [6]. A good citation number is generally indicative of the quality of the publication [68]. In the present analysis, an article titled “A comparative study of dermatoglyphics in individuals with normal occlusions and malocclusions” authored by Reddy BRM et al., in 2013 had the maximum number of citations [13].

In terms of the period of publication, the majority of the articles were published between 2012 and 2022 (n=52). It is well established that time is directly proportional to the citation count [68]. The older publications have an advantage of time and are thus ranked higher. In contrast, newer innovative research with good scientific content may have a lower citation number [69]. A period of 6-15 years is needed for an article to receive a sufficient number of citations [70]. This could be the reason that none of the recently published articles top the list of most cited articles in the present analysis. However, facilitates like social media networking, journals with the electronic format, online-first option, and open access features can have a positive impact on the citation score of newly published articles [71]. Among the studies analysed, 98.2% of the studies were original research projects. However, the majority of them had a low level of evidence, as most of them were cross-sectional studies, case-control studies, comparative studies, and in-vivo studies. Only three studies were randomised control trials [20,43,49], which have a high level of evidence. The level of evidence emphasises the impact of the article, its quality, and its relevance to further research [72].

A majority of publications on the application of dermatoglyphics were published by researchers and institutions from India (n=46). This can be attributed to the vast population, focus on health

sciences and research, and promotion of health research through the availability of government funding [73]. In recent years, India has grown by leaps and bounds in terms of medical research and development [74].

Although a thorough and systematic approach was used for the identification and analysis of all the articles published on the applications of dermatoglyphics in dentistry, this bibliographic review does have some possible limitations. Using "Title-specific" criteria in the search process, the authors have captured all possible relevant articles. Using a different database and search engine like Embase or Wiley Online Library with different combinations of keywords and search definitions could have resulted in a different list of the most-cited manuscripts. Another limitation is that it was difficult to determine the primary author in many of the publications, and the first author was assumed to be the primary author. Additionally, author details were missing in some of the publications. Also, newer articles take time to get a high citation rate and older papers may become less cited with time as they become irrelevant. Older articles have the time effect to get higher citations, which seems unfair for the recent studies, therefore the average citations per year was also calculated.

This bibliographic analysis depicts the evolution of research pertaining to applications of dermatoglyphics in dentistry. Using the data presented here, the authors hope that the lacunae in research are identified and future research is promoted.

CONCLUSION(S)

The present bibliometric analysis identifies and analyses the most-cited articles on applications of dermatoglyphics in dentistry. The list includes many landmark publications by leaders in the field that has revolutionised research and development in this domain. The findings of this review not only provide insight into the scientific evolution in the field but also reveal trends in further research and clinical practice. Hereby, the authors believe that the articles presented herein will be an important source of information for researchers and clinicians.

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PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Public Health Dentistry, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pune, Maharashtra, India.
2. Assistant Professor, Department of Oral Pathology and Microbiology, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pune, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Rahul Mohandas,
Sant Tukaram Nagar, Pimpri, Pune, Maharashtra, India.
E-mail: rahuldas1192@gmail.com

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