

Scientometric study of Literature output on Vitamin D Deficiency from 2015-2019.

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Abstract

The epidemic of vitamin D deficiency in India is probable to significantly make a contribution to the great burden at the healthcare device of India. Scientometric study of Literature output on Vitamin D Deficiency analyze the 1583 research articles, year wise growth of literature output, authorship pattern, collaborative Index, Degree of collaboration, Relative growth rate and doubling time, authors preferred language of publication shows in English language has contributed 1507 publications, United states of America has contributed 274 research articles , china has contributed 127 research articles and India has contributed 118 research articles. Core journal analysis by Bradford's law shows zone 1 consists of 32 journals with 512 research papers, in zone 2 reveals 113 journals contributed 496 research articles, and zone 3 consists of 467 journals, Author Nasser M Al-Daghri have contributed 9 research articles, the journal Nutrients has published 50 research articles, the Institution Cork Centre for Vitamin D and Nutrition Research, University College Cork, Cork, Ireland. Has contributed 9 research articles. vitamin D deficiency in adults results in osteomalacia, osteoporosis, muscle weakness and increased risk of falls, now a days both men and women are victims of Vitamin D deficiency, the government and funding agency should encourage the researchers to contribute their research work on vitamin D to eliminate the Deficiency from the world.

Keywords: Scientometric study, Vitamin D Deficiency, Authorship pattern, relative growth rate, Degree of collaboration, collaborative Index.

Introduction

Vitamin D deficiency is widespread at some stage in the world, and developing evidence helps a requirement for most beneficial nutrition D levels for healthy mind feature. Vitamin D deficiency has been related to a wide variety of neuropsychiatric problems and neurodegenerative sicknesses¹.

Vitamin D deficiency has been proven to impair insulin synthesis and secretion in human beings and in animal models of diabetes, suggesting a function inside the development of type 2 diabetes².

The epidemic of vitamin D deficiency in India is likely to significantly contribute to the enormous burden on the healthcare system of India. vitamin D deficiency in adults results in osteomalacia, osteoporosis, muscle weakness and increased risk of falls. Vitamin D plays important roles in immune function. One of the most common symptoms of deficiency is an increased risk of illness or infections.

Vitamin D is produced by skin exposed to ultraviolet B radiation or obtained from dietary sources, including supplements. Persons commonly at risk for vitamin D deficiency include those with inadequate sun exposure, limited oral intake, or impaired intestinal absorption. Vitamin D adequacy is best determined by measurement of the 25-hydroxyvitamin D concentration in the blood³.

Methodology

The data is collected from PubMed database from the year 2015-2019 using a key word 'Vitamin D Deficiency', the collected data is arranged in an excel format, and Analyzed for authorship pattern, relative growth rate, Collaborative Index, Degree of collaboration and finding of core journal using Bradford's Law.

Review of Literature

Gupta, R., Gupta, B. M., Baidwani, K., & Kaur, J. (2016)⁴ examined the 536 Indian publications on 'Vitamin D Deficiency during 2006-2015 by obtain data using Scopus database, and observed that most of the literatures are came from different countries. They analyzed the growth of literature output, most productive authors, the top 13 highly cited papers with 50 to 479 citations, and together contributed 1535 citations, author suggested to implement more R & D to scrutinize vitamin D.

Rekha, A. J., & Jayaprakash, M. (2019)⁵ analyzed the 3092 research publications on myopia during 2016-2018 by collecting data using Web of Science Database. They analyzed the data for year wise growth of an articles, citations, authorship pattern of articles, most productive countries and institutions and type of document published. There are 769 articles were contributed by United states of America.

Siva, N., Vivekanandhan, S., & Rajendran, P. (2019)⁶ examined the global publications output on Hepatitis C research from 2009-2018 by obtain the collected data from Scopus database. They analyzed 59926 research articles for year wise growth, Country wide contributions, document type, authors preferred language for contributing their research work, Citation analysis, Impact factor, Relative growth rate. They suggested that researchers must contribute more work on Hepatitis C.

Idhris, M., Peter, M., Pattukuthu, A., & Samuel, S. A. (2019)⁷. analyzed the 38750-literature output on Lupus Disease during 2010-2017 by collecting the data using Web of Science data base. They analyzed the year wise growth of literature, country wise productivity, document type, prolific author contribution, prolific subject contribution is analyzed.

Ramakrishnan, J., Sankar, G. R., & Thavamani, K. (2018)⁸ analyzed the literature of dengue in the MEDLINE data covered by PubMed database, the data analysis reveals that 41.4% articles are journal articles, and United states contributions are predominant, Indian contributions lies in Fourth Position, about 94.8% of research work was contributed in English Language, they also analyzed relative growth rate, doubling time and activity Index.

Objectives

To finds the year wise growth of a literature output on Vitamin D Deficiency.

To finds the authorship pattern

To finds the collaborative Index

To finds the degree of collaboration by Subramaniam formula.

To finds the relative growth rate and doubling time

To finds the core journal by using Bradford's law

To finds the Country Wide Contribution

To finds the Language wise Contribution

To finds the Prolific author Contribution

To finds the Prolific Journals Contributions

To finds the Prolific Institutions contributions.

Analysis

Table1 Year wise growth of Literature output on Vitamin D deficiency from 2015-2019.

| Year | Number of Articles | Cumulative | Percentage |
|-------|--------------------|------------|------------|
| 2015 | 196 | 196 | 12.38 |
| 2016 | 355 | 551 | 22.43 |
| 2017 | 356 | 907 | 22.49 |
| 2018 | 378 | 1285 | 23.88 |
| 2019 | 298 | 1583 | 18.82 |
| Total | 1583 | | 100 |

Table 1 shows that there are 1583 research articles were published during the study period, in the year 2018 attain the maximum of 378 research articles published, and least number of publications are recorded in the year 2015 as 196.

Table 2 Authorship pattern on contribution of Literature output on Vitamin D deficiency.

| Type of Author | 2015 | 2016 | 2017 | 2018 | 2019 | No. of authors | Total Authors |
|----------------|------|------|------|------|------|----------------|---------------|
| Single | 6 | 21 | 17 | 22 | 8 | 74 | 74 |
| Double | 16 | 35 | 37 | 37 | 37 | 162 | 324 |
| Triple | 15 | 31 | 33 | 36 | 39 | 154 | 462 |
| Four | 32 | 39 | 38 | 45 | 30 | 184 | 736 |
| Five | 26 | 48 | 46 | 45 | 27 | 192 | 960 |
| Six | 16 | 51 | 51 | 46 | 39 | 203 | 1218 |
| Seven | 23 | 26 | 33 | 35 | 27 | 144 | 1008 |
| Eight | 8 | 21 | 26 | 34 | 27 | 116 | 928 |
| Nine | 13 | 24 | 21 | 14 | 14 | 86 | 774 |
| Ten | 10 | 9 | 15 | 17 | 13 | 64 | 640 |
| Eleven | 15 | 15 | 10 | 13 | 8 | 61 | 671 |
| Twelve | 10 | 8 | 10 | 11 | 15 | 54 | 648 |
| Thirteen | 2 | 12 | 4 | 3 | 2 | 23 | 299 |
| Fourteen | 0 | 4 | 4 | 1 | 4 | 13 | 182 |

| | | | | | | | |
|-------------------------|-------|-------|-------|-------|-------|-----------|------------|
| Fifteen | 0 | 4 | 3 | 2 | 2 | 11 | 165 |
| Sixteen | 1 | 1 | 2 | 4 | 0 | 8 | 128 |
| Seventeen | 1 | 0 | 1 | 1 | 0 | 3 | 51 |
| Eighteen | 1 | 0 | 0 | 2 | 1 | 4 | 72 |
| Nineteen | 0 | 1 | 0 | 1 | 0 | 2 | 38 |
| Twenty | 0 | 0 | 2 | 0 | 2 | 4 | 80 |
| Twenty-one | 1 | 0 | 1 | 1 | 0 | 3 | 63 |
| Twenty-two | 0 | 1 | 0 | 2 | 0 | 3 | 66 |
| Twenty-three | 0 | 1 | 0 | 2 | 1 | 4 | 92 |
| Twenty-Four | 0 | 0 | 0 | 0 | 1 | 1 | 24 |
| Twenty- Six | 0 | 0 | 0 | 1 | 0 | 1 | 26 |
| Twenty – Seven | 0 | 0 | 1 | 1 | 0 | 2 | 54 |
| Thirty-Three | 0 | 2 | 0 | 0 | 0 | 2 | 66 |
| Thirty-Eight | 0 | 1 | 0 | 0 | 0 | 1 | 38 |
| Forty | 0 | 0 | 0 | 0 | 1 | 1 | 40 |
| Forty-Seven | 0 | 0 | 0 | 1 | 0 | 1 | 47 |
| Fifty-Six | 0 | 0 | 1 | 0 | 0 | 1 | 56 |
| Sixty | 0 | 0 | 0 | 1 | 0 | 1 | 60 |
| Total articles | 196 | 355 | 356 | 378 | 298 | 1583 | 10090 |
| Total authors | 1252 | 2259 | 2232 | 2463 | 1874 | | |
| Collaborative Index | 6.39 | 6.36 | 6.27 | 6.52 | 6.29 | Mean 6.37 | |
| Degree of Collaboration | 0.969 | 0.941 | 0.952 | 0.942 | 0.973 | | Mean=0.953 |

Table 2 shows the authorship pattern, it is found that 1583 research articles are contributed by 10090 authors, with mean collaborative index 6.37, and mean degree of collaboration 0.953.

Table 3. Relative Growth Rate (RGR) and Doubling Time (DT)

| Year | Number of articles | Cumulative number of articles | W1 | W2 | RGR | Mean of RGR | Doubling Time | Mean of DT |
|------|--------------------|-------------------------------|-------|-------|-------|-------------|---------------|------------|
| 2015 | 196 | 196 | | 5.278 | | 0.558 | | 1.512 |
| 2016 | 355 | 551 | 5.278 | 6.311 | 1.033 | | 0.670 | |
| 2017 | 356 | 907 | 6.311 | 6.810 | 0.499 | | 1.388 | |
| 2018 | 378 | 1285 | 6.810 | 7.159 | 1.051 | | 0.659 | |
| 2019 | 298 | 1583 | 7.159 | 7.367 | 0.208 | | 3.331 | |

Table 3 shows the mean relative growth rate of 0.558 and mean Doubling time 1.512.

Table 4. analyzing to find the core journal by Bradford Law of scattering

| Rank | No. of Journals | cumulative | Number of contributions | total |
|------|-----------------|------------|-------------------------|-------|
| 1 | 1 | 1 | 50 | 50 |
| 2 | 1 | 2 | 45 | 95 |

| | | | | |
|----|--------|-----|-----|------|
| 3 | 1 | 3 | 34 | 129 |
| 4 | 1 | 4 | 31 | 160 |
| 5 | 1 | 5 | 23 | 183 |
| 6 | 2(20) | 7 | 40 | 223 |
| 7 | 3(19) | 10 | 57 | 280 |
| 8 | 1 | 11 | 16 | 296 |
| 9 | 2(15) | 13 | 30 | 326 |
| 10 | 1 | 14 | 14 | 340 |
| 11 | 1 | 15 | 13 | 353 |
| 12 | 2(12) | 17 | 24 | 377 |
| 13 | 3(11) | 20 | 33 | 410 |
| 14 | 3(10) | 23 | 30 | 440 |
| 15 | 9(8) | 32 | 72 | 512 |
| 16 | 8(10) | 40 | 80 | 592 |
| 17 | 7(6) | 47 | 42 | 634 |
| 18 | 6(5) | 53 | 30 | 664 |
| 19 | 20(5) | 73 | 100 | 764 |
| 20 | 28(4) | 101 | 112 | 876 |
| 21 | 44(3) | 145 | 132 | 1008 |
| 22 | 108(2) | 253 | 216 | 1224 |
| 23 | 359(1) | 612 | 359 | 1583 |

Zones

| Zone | Number of Journals | Number of contributions |
|--------|--------------------|-------------------------|
| Zone1 | 32 | 512 |
| Zone 2 | 113 | 496 |
| Zone 3 | 467 | 575 |

the table 4 reveals that zone 1 consists of 32 journals with 512 research papers and in zone 2 reveals 113 journals contributed 496 research articles and zone 3 consists of 467 journals contributed 575 research articles. In the zone 1 journals are considered as the core journals on vitamin D Deficiency.

Table 5 Top 20 Country Wide Contributions

| S. No | Country | Number of Contributions | Rank |
|-------|-----------|-------------------------|------|
| 1 | USA | 274 | 1 |
| 2 | China | 127 | 2 |
| 3 | India | 118 | 3 |
| 4 | Turkey | 88 | 4 |
| 5 | UK | 82 | 5 |
| 6 | Canada | 64 | 6 |
| 7 | Australia | 50 | 7 |
| 8 | Italy | 50 | 7 |
| 9 | Iran | 46 | 8 |

| | | | |
|----|-----------------|----|----|
| 10 | Spain | 38 | 9 |
| 11 | Brazil | 36 | 10 |
| 12 | Germany. | 34 | 11 |
| 13 | Saudi Arabia | 34 | 11 |
| 14 | Egypt | 33 | 12 |
| 15 | French | 33 | 12 |
| 16 | The Netherlands | 30 | 13 |
| 17 | Korea | 29 | 14 |
| 18 | Denmark | 27 | 15 |
| 19 | Poland | 27 | 15 |
| 20 | Japan | 22 | 16 |

Table 5 shows the top 20 countries on vitamin D Deficiency, the United states has contributed 274 research articles occupy the 1 rank, China has contributed 127 research articles occupy the 2nd rank, India has contributed 118 research articles occupy the 3rd rank.

Table 6. Language wise Contribution

| Language | 2015 | 2016 | 2017 | 2018 | 2019 | total | Rank |
|----------|------|------|------|------|------|-------|------|
| English | 183 | 342 | 334 | 356 | 292 | 1507 | 1 |
| Spanish | 6 | 6 | 4 | 6 | 2 | 24 | 2 |
| French | 4 | 0 | 2 | 1 | 0 | 7 | 3 |
| Portugal | 2 | 0 | 1 | 2 | 0 | 5 | 4 |
| Chinese | 1 | 3 | 9 | 7 | 4 | 24 | 2 |
| Russia | 0 | 1 | 1 | 0 | 0 | 2 | 5 |
| Japan | 0 | 2 | 0 | 3 | 0 | 5 | 4 |
| German | 0 | 1 | 2 | 0 | 0 | 3 | 6 |
| Danish | 0 | 0 | 1 | 2 | 0 | 3 | 6 |
| Dutch | 0 | 0 | 1 | 0 | 0 | 1 | 7 |
| Iceland | 0 | 0 | 1 | 0 | 0 | 1 | 7 |
| Norway | 0 | 0 | 0 | 1 | 0 | 1 | 7 |
| Total | 196 | 355 | 356 | 378 | 298 | 1583 | |

Table 6 depicts the authors preferred language of presentation of an article, there are 1507 research articles are published in English language occupy the 1st rank, Spanish and Chinese each have contributed 24 research articles occupy the 2nd rank, French have contributed 7 research articles and occupy the 3rd rank.

Table 7. top 10 Author Contributions and Ranking the author

| S. No | Name of author | Total | Rank |
|-------|-----------------------|-------|------|
| 1 | Nasser M Al-Daghri | 9 | 1 |
| 2 | Daniel E Roth | 6 | 2 |
| 3 | Kevin D Cashman | 6 | 2 |
| 4 | Lalani L Munasinghe | 5 | 3 |
| 5 | Suresh Kumar Angurana | 5 | 3 |
| 6 | Tom D Thacher | 5 | 3 |
| 7 | Raman K Marwaha | 4 | 4 |

| | | | |
|----|---------------------|---|---|
| 8 | Raman Kumar Marwaha | 4 | 4 |
| 9 | Suma Uday | 4 | 4 |
| 10 | Teodoro Durá-Travé | 4 | 4 |

Table 7 shows the most contributed authors on vitamin D deficiency, Nasser M Al-Daghri has contributed 9 research articles occupy the 1st rank, Daniel E Roth and Kevin D Cashman have contributed 6 research articles occupy the second rank, Lalani L Munasinghe, Suresh Kumar Angurana and Tom D Thacher each have contributed 5 research articles occupy the 3rd rank.

Table 8 top 20 Journals

| S. No | Name of the Journal | Total | Rank |
|-------|---|-------|------|
| 1 | Nutrients | 50 | 1 |
| 2 | PLoS one | 45 | 2 |
| 3 | Journal of pediatric endocrinology & metabolism: JPEM | 34 | 3 |
| 4 | The Journal of steroid biochemistry and molecular biology | 31 | 4 |
| 5 | Indian pediatrics | 23 | 5 |
| 6 | The American journal of clinical nutrition | 20 | 6 |
| 7 | The Journal of clinical endocrinology and metabolism | 20 | 6 |
| 8 | Indian journal of pediatrics | 19 | 7 |
| 9 | Public health nutrition | 19 | 7 |
| 10 | The British journal of nutrition | 19 | 7 |
| 11 | Journal of clinical research in pediatric endocrinology | 16 | 8 |
| 12 | BMC pediatrics | 15 | 9 |
| 13 | Pediatric nephrology (Berlin, Germany) | 15 | 9 |
| 14 | Journal of pediatric gastroenterology and nutrition | 14 | 10 |
| 15 | Osteoporosis international: a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA | 13 | 11 |
| 16 | Italian journal of pediatrics | 12 | 12 |
| 17 | Medicine | 12 | 12 |
| 18 | European journal of clinical nutrition | 11 | 13 |
| 19 | Nutrition (Burbank, Los Angeles County, Calif.) | 11 | 13 |
| 20 | Scientific reports | 11 | 13 |

Table 8 shows that top 20 Journals with their contributions, Nutrients has published 50 research articles occupy the 1st rank, PLOS One has published 45 research articles occupy the 2nd rank, Journal of pediatric endocrinology & metabolism has published 34 research articles occupy the 3rd rank.

Table 9. Top 15 Affiliated Institutions Contributions on Vitamin D Deficiency

| S.No. | Name of the Institutions | Number of contributions | Rank |
|-------|---|-------------------------|------|
| 1 | Cork Centre for Vitamin D and Nutrition Research, University College Cork, Cork, Ireland. | 9 | 1 |
| 2 | Department of Pediatrics, All India Institute of Medical Sciences, New Delhi, India. | 5 | 2 |
| 3 | Prince Mutaib Chair for Biomarkers of Osteoporosis, King Saud University, Saudi Arabia; Biomarkers Research | 5 | 2 |

| | | | |
|----|--|---|---|
| | Program, Biochemistry Department, College of Science, King Saud University, Saudi Arabia. | | |
| 4 | Biomarkers Research Program, Biochemistry Department, College of Science, King Saud University, Riyadh, 11451, Saudi Arabia. | 4 | 3 |
| 5 | Centre for Health Research and Development, Society for Applied Studies, New Delhi, India | 4 | 3 |
| 6 | Department of Maternal, Child, and Adolescent Health, School of Public Health, Anhui Medical University, Hefei, China; | 4 | 3 |
| 7 | Department of Endocrinology and Diabetes, Birmingham Women's and Children's Hospital, Birmingham, UK. | 4 | 3 |
| 8 | School of Public Health and Institute of Health and Biomedical Innovation, Queensland University of Technology, Kelvin Grove, Australia; | 4 | 3 |
| 9 | Anhui Provincial Key Laboratory of Population Health and Aristogenics, Hefei, China; | 4 | 3 |
| 10 | Department of Pediatrics, David Geffen School of Medicine at UCLA, Los Angeles, California, USA. | 4 | 3 |
| 11 | Department of Pediatrics, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh, India. | 4 | 3 |
| 12 | , Children's Hospital Medical Center and University of Cincinnati College of Medicine, Cincinnati, OH, USA. | 4 | 3 |
| 13 | Nanjing Maternity and Child Health Care Institute, Nanjing, China | 4 | 3 |
| 14 | Queensland Brain Institute, University of Queensland, St. Lucia, Queensland, Australia. | 4 | 3 |
| 15 | The Generation R Study Group, Erasmus MC, University Medical Center, Rotterdam, The Netherlands. | 4 | 3 |

Tale 9 shows the top 15 institutions with maximum contributions, Cork Centre for Vitamin D and Nutrition Research, University College Cork, Cork, Ireland. Have contributed 9 research articles occupy the 1st rank, Department of Pediatrics, All India Institute of Medical Sciences, New Delhi, India and Prince Mutaib Chair for Biomarkers of Osteoporosis, King Saud University, Saudi Arabia; Biomarkers Research Program, Biochemistry Department, College of Science, King Saud University, Saudi Arabia. Each have contributed 5 research articles occupy the 2nd rank.

Conclusion

There are 1583 research articles were published during the study period, in the year 2018 attain the maximum of 378 research articles published, and the least number of publications are recorded in the year 2015 as 196. It is found that 1583 research articles are contributed by 10090 authors, with mean collaborative index 6.37, and mean degree of collaboration 0.953, the mean relative growth rate of 0.558 and mean Doubling time 1.512. Zone 1 consists of 32 Core journals with 512 research papers and in zone 2 reveals 113 journals contributed 496 research articles and zone 3 consists of 467 journals contributed 575 research articles, the United states of America has contributed 274 research articles occupy the 1 rank, China has contributed 127 research articles occupy the 2nd rank, India has contributed 118 research articles occupy the 3rd rank, there are 1507 research articles are published in English language occupy the 1st rank, Spanish and Chinese each have contributed 24 research articles occupy the 2nd rank, French have contributed 7 research articles and occupy the 3rd rank. The author Nasser M Al-Daghri has contributed 9 research articles occupy the 1st rank, Daniel E Roth and Kevin D Cashman have contributed 6 research articles

occupy the second rank, Lalani L Munasinghe, Suresh Kumar Angurana and Tom D Thacher each have contributed 5 research articles occupy the 3rd rank. Journal Nutrients has published 50 research articles occupy the 1st rank, PLOS One has published 45 research articles occupy the 2nd rank, Journal of pediatric endocrinology & metabolism has published 34 research articles occupy the 3rd rank. Affiliated Institutions, Cork Centre for Vitamin D and Nutrition Research, University College Cork, Cork, Ireland. Have contributed 9 research articles occupy the 1st rank, Department of Pediatrics, All India Institute of Medical Sciences, New Delhi, India and Prince Mutaib Chair for Biomarkers of Osteoporosis, King Saud University, Saudi Arabia; Biomarkers Research Program, Biochemistry Department, College of Science, King Saud University, Saudi Arabia. Each have contributed 5 research articles occupy the 2nd rank. Vitamin D is produced by skin exposed to ultraviolet B radiation or obtained from dietary sources, including supplements. Persons commonly at risk for vitamin D deficiency include those with inadequate sun exposure, limited oral intake, or impaired intestinal absorption.

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