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Publication Trends in Osteoporosis Treatment from 2001 to 2020

Journal:	<i>Journal of Orthopaedic Surgery</i>
Manuscript ID	OSJ-22-0019
Manuscript Type:	Review Article
Keywords:	bibliometric, publication trend, osteoporosis, treatment
Abstract:	<p>The prevalence of osteoporosis is continuing to escalate with the increasingly elderly population. The aim with this study was to investigate the profile of research articles on osteoporosis treatment published in the past two decades using bibliometric analysis. All publications about osteoporosis treatment published between 2001 and 2020 in Web of Science (WoS) index were downloaded and analyzed using bibliometric methods. In the Title search section in WoS, the documents with the keywords related to "osteoporosis treatment" were identified. The records extracted were analyzed for citation characteristics, including the distribution of publication years, languages, countries or regions, journals, articles, and authors. There were 29,738 publications, 26,085 of which were articles. There was a steady increase in the number of published articles from 2001 to 2020. The overall number of scientific publications in WoS increased 3.5-fold. The top 5 productive countries were the USA, China, Germany, England, and Japan. The University of California system was the largest contributor. The top productive journals were Osteoporosis International (1,679; 6.4%), Bone (832; 3.2%), and Journal of Bone and Mineral Research (727; 2.8%). The article that received the greatest number of citations was published in Journal of Clinical Endocrinology & Metabolism. This study provided a systematic overview of productivity and visibility of research work in osteoporosis treatment. In terms of the trend of previous years, an increasing number of literatures related to osteoporosis treatment will be published in the future. We believe that our study is a beneficial guide for clinicians and scientists about the global outputs of osteoporosis treatment.</p>

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1 **Publication Trends in Osteoporosis Treatment from 2001 to 2020**

3 **Abstract**

4 The prevalence of osteoporosis is continuing to escalate with the increasingly elderly
5 population. The aim with this study was to investigate the profile of research articles on
6 osteoporosis treatment published in the past two decades using bibliometric analysis. All
7 publications about osteoporosis treatment published between 2001 and 2020 in Web of
8 Science (WoS) index were downloaded and analyzed using bibliometric methods. In the Title
9 search section in WoS, the documents with the keywords related to “osteoporosis treatment”
10 were identified. The records extracted were analyzed for citation characteristics, including the
11 distribution of publication years, languages, countries or regions, journals, articles, and
12 authors. There were 29,738 publications, 26,085 of which were articles. There was a steady
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19 Endocrinology & Metabolism. This study provided a systematic overview of productivity and
20 visibility of research work in osteoporosis treatment. In terms of the trend of previous years,
21 an increasing number of literatures related to osteoporosis treatment will be published in the
22 future. We believe that our study is a beneficial guide for clinicians and scientists about the
23 global outputs of osteoporosis treatment.

24
25 **Keywords:** bibliometric; publication trend; osteoporosis; treatment

26 **Introduction**

27 Osteoporosis is the most common bone disease in humans, representing a major public health
28 problem. Currently, it has been estimated that more than 200 million people are suffering
29 from osteoporosis¹. According to recent statistics from the International Osteoporosis
30 Foundation, worldwide, 1 in 3 women over the age of 50 years and 1 in 5 men will
31 experience osteoporotic fractures in their lifetime¹. Since life expectancy is increasing
32 worldwide and the risk for osteoporosis increases with age, it's not surprising that
33 osteoporosis and its dangerous effects are increasing around the world. Because of the morbid
34 consequences of osteoporosis, the prevention of this disease and its associated fractures is
35 considered essential to the maintenance of health, quality of life, and independence in the
36 elderly population.

37 Nevertheless, to the best of our knowledge, the recent research status and future research
38 trends of osteoporosis treatment have not been well studied. In the context of the high profile
39 of osteoporosis treatment, it is particularly meaningful to understand the global status quo of
40 the field and predict future research trends. Bibliometrics is the statistical analysis of
41 scientific publications such as articles and books². With the wide availability of bibliometric
42 analytical software, there is a rapid proliferation of bibliometric studies on various medical
43 topics in recent years³. For example, bibliometric analyses have been utilized to profile the
44 trend of research on various diseases or interventions⁴. The importance of bibliometric studies
45 has been increasing thanks to the need for summarizing the research topics that particularly
46 have a high number of publications⁵. By providing a summary of the literature, bibliometric
47 studies help researchers to gain time in terms of literature review⁶. In addition, it enables
48 researchers to have new ideas by demonstrating past and current trends⁷. Recently, parallel to
49 the increase in the prevalence of osteoporosis and the increase in the development of the
50 countries, there has been an important increase in the number of publications and citations

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4 51 about osteoporosis treatment. However, few studies have specifically explored the
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6 52 bibliometric profile of osteoporosis treatment research.

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9 53 The current study used bibliometric analysis to study the profile of research articles on
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11 54 osteoporosis treatment published in the past two decades (2001–2020) and to identify
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14 55 promising research direction in the future of osteoporosis treatment.
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17 18 57 **Material and Methods**

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21 58 This study was exempted from review of institutional review board since it did not involve
22
23 59 any human subjects. There were no ethical questions about the data.
24

25 26 60 **Literature Search**

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28 61 The literature review was performed using the “osteoporosis treatment” key word in the Title
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30 62 search section. All publications on osteoporosis treatment with this search method were
31
32 63 downloaded from the Web of Science (WoS) database using bibliometric methods. The WoS
33
34 64 is recognized as the most suitable online database for bibliometric analysis^{8,9}. The database
35
36 65 included SCIE, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI, CCR-EXPANDED. Terms used
37
38 66 during the search were: Theme=((osteoporosis treatment) OR (treatment, osteoporosis) OR
39
40 67 (treatment for osteoporosis) OR (osteoporosis management) OR (osteoporosis medication)).
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44 68 The search was conducted on Nov 2, 2021. Document retrieval and export should be
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46 69 completed within 1 day to avoid bias caused by continuous database update. The publication
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48 70 period was limited to 20 years, 2001–2020. Original and review articles were selected for
49
50 71 further analyses because they accounted for the majority of document types that also included
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52 72 complete research ideas and results¹⁰. The exclusion criteria were as follows: editorials,
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54 73 letters, errata, meeting abstracts, conference papers, and duplicate printings. No language
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56 74 restriction was imposed in the search strategy. In our bibliometric analysis, there was no need
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4 75 to check for duplicate documents as all data are retrieved from one database. We also counted
5
6 76 the number of published papers according to the following medication classes:
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9 77 bisphosphonate, denosumab, selective estrogen receptor modulators (SERM), and teriparatide.
10
11 78 Multiple naming of different drugs within one paper was classified into each medication class.
12

13 79 **Data Extraction**

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15 80 All literature retrieval and data extraction were completed independently by two authors with
16
17 81 familiar literature retrieval background. When they disagree, the differences are fully
18
19 82 discussed until they reach an agreement. The records extracted were analyzed for citation
20
21 83 characteristics, including the distribution of publication years, languages, institutions,
22
23 84 countries or regions, journals, impact factor (as determined by its 2020 average published by
24
25 85 Journal Citation Reports), articles, growth rate, and authors. Growth rate was calculated using
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27 86 the following equation: Growth Rate = [(Frequency of Current Year-frequency of Last
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29 87 Year)/(Frequency of Last Year)]*100¹¹. In addition, total citations, average citations per item,
30
31 88 and h-index (Hirsch index) were extracted from the WoS citation report. The h-index is an
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33 89 author-level metric that attempts to measure both the productivity and citation impact of the
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35 90 publications of a scientist or scholar; an author has index h if his or her number of papers
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37 91 have at least h citations¹². And thus, the h-index reflects both the number of publications and
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39 92 the number of citations per publication. Particularly, h-index can be extended to describe
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41 93 publications of a country, a journal, or an organization¹³.
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48 94 **Statistical analysis**

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50 95 The data downloaded from the WoS were analyzed quantitatively and qualitatively by
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52 96 Microsoft Excel 2016 (Microsoft Corp, Redmond, WA). We performed a quantitative
53
54 97 description of time distribution, country of origin, institution, number of studies by author,
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56 98 and frequency of citation by country through the bibliometric approach. Linear regression
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58 99 analyses were performed to estimate the number of publications in the following years.
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4 100 Wilcoxon Signed Rank test was used to determine any significant differences between the
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6 101 groups in terms of continuous variables. SPSS (version 22.0, SPSS Inc., Chicago, IL) was
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9 102 used for statistical analysis. Statistical analysis was performed by an independent statistician
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11 103 blinded to group allocations. Significance was reported at the 95% confidence level ($p <$
12
13 104 0.05).

105

106 **Results**

107 **Search results and studies included**

108 The literature review retrieved 29,738 publications on osteoporosis treatment published
109 between 2001 and 2020. Of all these publications, 21,556 (72.5%) were articles, 4,529
110 (15.2%) were reviews, 764 (2.6%) were proceedings papers, 45 (0.2%) were book chapters,
111 and 55 (0.2%) were other (retracted publications, and early access) (Fig. 1).
112 Bibliometric analyses were performed on 26085 (articles and review articles) out of 29,738
113 publications. 24604 (94.3%) were identified from SCIE, 1350 (5.2%) were identified from
114 ESCI and 1263 (4.8%) were identified from SSCI and 917 (3.5%) were identified from
115 others. Twenty-seven languages of publication were identified in the 26085 articles retrieved.
116 The three predominant languages were English ($n = 24751$; 94.9%), German ($n = 608$; 2.3%)
117 and Spanish ($n = 193$; 0.7%). All other languages including French, Turkish, Russian,
118 Portuguese, Polish, Czech, Italian, Japanese, Korean, Hungarian and Chinese amounted to
119 less than 2%.

120 **Development of publications**

121 640 articles were published in 2001, increasing to 2222 in 2020. The mean number of articles
122 published over the period is 1304.3 per year. Fig. 2A indicates that the number of articles
123 increased steadily during the 20-year period. The overall number of scientific publications in
124 WoS increased 3.5-fold. The largest growth in publications since 2001 was between 2004 and

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4 125 2005, from 717 to 910 publications, an annual growth rate of 26.9%. The year 2020 (2222
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6 126 papers) was the peak of the number of literatures. Of the 26085 articles, 17084 (65.5%) were
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8 127 published in the last decade, compared with 9001 (34.5%) in the decade prior. The average
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10 128 growth rate of the literature related to osteoporosis treatment was 6.65% over the last 20
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12 129 years.

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15 130 Using the cumulative number of publications, we calculated the linear adjustment and found
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17 131 $y = 80.7586x - 161061$ with $r^2 = 0.974$ (Fig. 2B). It is predicted that the number of
18
19 132 publications will reach 2475 by 2025 according to the curve model.

133 **Distribution of the countries and active authors**

134 Authors from a total of 133 countries or regions contributed to the 26085 published articles.
135 The distribution of the top productive world countries is demonstrated in Table 1. The USA
136 has the largest number of publications. The top productive countries were the USA, China,
137 Germany, England, and Japan. The top three countries accounted for 49.5% of all articles.
138 Publications from the USA had the highest h-index (234, citations per article =49.87),
139 followed by those from the England (h-index= 144; citations per article = 53.98) and those
140 from Canada (h-index = 120; citations per article = 53.78).

141 The top active 5 authors who had the highest number of publications on this issue were
142 Reginster JY (259), Cooper C (220), Kanis JA (210), Eastell R (154), and Lewiecki EM
143 (142).

144 **Highly contributive institutions**

145 The top active 5 universities that had the highest number of publications on this issue were
146 University of California System (906, 3.5%), Harvard university (676, 2.6%), Institut
147 National de la Santé et de la Recherché Medicale (521, 2.0%), University of Sheffield (486,
148 1.8%), and University of California San Francisco (447, 1.7%). Thus, although there is no
149 doubt that USA currently has the most powerful impact on the field with respect to both

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4 150 productivity and contribution, European institutions also play an outstanding role. Institutions
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6 151 from Asia, South America, and Africa were not among the top 10. Table 2 shows the 10
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9 152 organizations that have contributed the most in the field of osteoporosis treatment.

11 153 **Active research areas and active journals**

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13 154 Based on the JCR categories, the publication output data was distributed into subject
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16 155 categories. Quite logically the most frequent category was by far Endocrinology Metabolism
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18 156 (6834, 26.2%) followed by Pharmacology Pharmacy (2521, 9.7%), Orthopedics (2428, 9.3%),
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20 157 Medicine General Internal (2139, 8.2%), and Medicine Research Experimental (1738, 6.7%).
21
22 158 The top 10 journals that had the highest number of publications about osteoporosis treatment
23
24 159 and the total number of citations are listed in Table 3. Osteoporosis International (IF: 4.507)
25
26 160 was the highest-ranking journal. The top 3 journals that had the highest number of
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28 161 publications were Osteoporosis International (1,679; 6.4%), Bone (832, 3.2%), and Journal of
29
30 162 Bone and Mineral Research (727; 2.8%), accounting for 12.4% of all published literature
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32 163 relating to the field. The New England Journal of Medicine, which had the highest 2020
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34 164 impact factor (91.245) among all of these journals, published 36 articles.

38 165 **Citation analysis**

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40 166 Table 4 shows the top-cited 10 articles that were analyzed bibliometrically according to the
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42 167 total number of citations in the 2001 to 2020 period. The last column of Table 4 shows the
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44 168 average number of citations of the articles per year. The highest number of citations of a
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46 169 single article belonged to Holick MF of the Boston University (4728 citations), which was
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48 170 published in Journal of Clinical Endocrinology & Metabolism. According to our analysis of
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50 171 the WoS database, all highly cited articles (151) related to osteoporosis treatment had been
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52 172 cited 46916 times since 2001 (46671 times without self-citations). The cited frequency per
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54 173 paper was 310.7 times.

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6 176 **Drug classes**

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9 177 In terms of drug classes, the anti-osteoporosis medication most frequently researched were
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11 178 bisphosphonate (9997), followed by SERM (3801), denosumab (2820), and teriparatide (2051).
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13 179 The increase in number of publications on each drug was consistent and stable in general, but
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15 180 the number of publications related to SERM has fluctuated slightly over the past 20 years.
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17 181 Figure 3 shows that the relative supremacy of the bisphosphonate and SERM has declined
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19 182 over the recent 5 years. On the contrary, increasing trends are observed for denosumab and
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21 183 teriparatide during the last two decades (Fig. 3). The increase in publications on denosumab
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23 184 jumped significantly between 2016–2017 (growth rate = 26%). There was a statistically
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25 185 significant difference in the rate of increase of all publications on denosumab and teriparatide
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27 186 compared to all publications on osteoporosis treatment over the study period ($p=0.001$ and
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29 187 $p=0.019$, respectively). All articles related to currently licensed romosozumab were
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31 188 published between 2014 and 2020.
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39 190 **Discussion**

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41 191 Bibliometrics is increasingly used to assess the quantity and quality of scientific research
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43 192 output in many research fields worldwide. Very little information on publication trends has so
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45 193 far been published in the osteoporosis treatment field. In this bibliometric study, we present
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47 194 the results of publication on the topic of osteoporosis treatment published between 2001 and
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49 195 2020. We analyzed countries, institutions, journals, and authors that have made high
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51 196 contributions to this field and have discovered the direction of rapid development that may
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53 197 become future trends to attract scholars, which will provide convenience and shortcuts for
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55 198 later research.
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4 199 Bibliometric studies have progressed in many scientific fields, including cardiovascular
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6 200 disease¹⁴, respiratory medicine¹⁵, gastrointestinal diseases¹⁶, diabetes¹⁷, and ophthalmic
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8 201 studies¹⁸. In recent years, a large volume of literature has become available to practitioners
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10
11 202 prescribing anti-osteoporosis medication. According to our study, over the past 20 years, the
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13 203 number of articles about osteoporosis treatment has shown an increasing trend in general.
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15 204 This may be due to the rapid increase in the number of patients with osteoporosis with the
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17 205 aging of the population, and the continuous penetration of the concept of “fracture
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19 206 prevention” has prompted an increasing number of physicians, surgeons and patients to have
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22 207 an interest in osteoporosis treatment. This in turn stimulates the research and development of
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24 208 alternate therapies by academic institutes as well as pharmaceutical companies for
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26 209 establishing novel osteoporosis treatment strategies with high potency and low complication
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28 210 compared to conventional modalities. Given the situation of ageing populations in most
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30 211 developing countries, the number of patients with osteoporosis is expected to increase in the
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32 212 coming years¹⁹. We predict that the trend in the next 5 years or even 10 years will have an
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34 213 even more significant growth.
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37 214 The increase in the number of high-quality research studies can be an indicator of rapid
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39 215 improvement in the country’s level of education, service delivery, and shift from a
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41 216 production-based economy to a knowledge-based economy²⁰. The USA is by far the most
42
43 217 productive country and is responsible for the greatest of number of citations, suggesting that
44
45 218 there were both quality and quantity in their publications regarding osteoporosis treatment
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47 219 research. This is mainly attributed to the USA having the most advanced medical research
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49 220 level and the strongest economic strength around the world. China also has had many
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51 221 publications regarding osteoporosis treatment in the recent years. China ranked second in
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53 222 total number of articles, but seventh in citation frequency and tenth in h-index. This
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55 223 suggested that the quality of articles from China still required improvements.
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4 224 The results of this study may be helpful for all those involved in worldwide osteoporosis
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6 225 treatment research. Fellows and researchers choosing an institution for advanced work may
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8
9 226 be interested in such an analysis. Governments and policy makers can also ascertain the most
10
11 227 effective countries and institutions in the world in this field, and this analysis may assist them
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13 228 to apprehend and predict the dynamic directions of osteoporosis research and to target
14
15 229 resources so that further developments can be encouraged, supported and monitored.
16
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18 230 According to our study, Osteoporosis International, Bone, and Journal of Bone and Mineral
19
20 231 Research are the top three productive journals on osteoporosis treatment, indicating that there
21
22 232 will be more studies on this topic to be published on these journals. Given its reliable content,
23
24 233 we can expect future breakthroughs in this field to be published there, and authors interested
25
26 234 in osteoporosis treatment should pay more attention to these journals. We believe that our
27
28 235 study can help clinicians and researchers better understand osteoporosis research worldwide
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30 236 and be useful, for example, in choosing appropriate journals for publication and
31
32 237 collaborations. Journals can determine where they stand in relation to other journals in
33
34 238 publishing articles related to osteoporosis treatment. Impact factors have been extensively
35
36 239 used to evaluate the quality of a journal²¹. In our study, we presented the top ten journals with
37
38 240 the highest number of articles and their impact factors, but further analysis and discussion are
39
40 241 required. Journals with high impact factors occasionally publish low-quality articles, and
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42 242 doubts about the importance of impact factors may remain²².
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44 243 A large volume of literature has concurrently become available to practitioners prescribing
45
46 244 various anti-osteoporosis medications. However, the quality of this literature varies
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48 245 substantially, making it challenging for clinicians attempting to utilize the best available
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50 246 evidence. A bibliometric analysis is one of the methods used to quantitatively examine a
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52 247 research field. Describing the utilization and scope of the most influential anti-osteoporosis
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54 248 medication literature is useful in explaining the current research landscape and helps to direct

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4 249 future research relevant to the community for osteoporosis treatment. According to the
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6 250 present study, bisphosphonate was the most studied drug for osteoporosis treatment. However,
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9 251 fewer papers have been published on bisphosphonates over the last years. This is not
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11 252 surprising as bisphosphonates had been a hot research topic between 2010 and 2015. The
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13 253 plateauing and subsequent decline in the use of bisphosphonates is noted from 2015 to 2020,
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15 254 which follows reports of safety concerns in popular media despite consensus reports
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18 255 documenting their safety in the scientific literature²³. On the contrary, many of the
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20 256 publications related to denosumab have shaped the current research and clinical landscape.
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22 257 Several factors may have contributed to the switch from traditional bisphosphonates to
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24 258 denosumab in the outpatient management of osteoporosis. Hadji et al²⁴ recently described
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26 259 that the 2-year persistence of denosumab was 39.8%, which was 1.5-2 times higher than that
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28 260 for bisphosphonates, and that risk of discontinuation was significantly lower for denosumab
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30 261 than for bisphosphonates. Patient preference to 6-monthly denosumab injections versus daily
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32 262 oral tablets or quarterly bisphosphonates was not surprising in relation to the more acceptable
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34 263 route of administration (subcutaneously) and the less frequent dosing regimen of the 6-
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36 264 monthly treatment option. This study presents data related to currently licensed anti-
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39 265 osteoporosis medications, and newer drugs are constantly under development. During the
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41 266 study period, romosozumab received regulatory approval for the treatment of severe
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43 267 osteoporosis. Concurrently, many of the studies related to currently licensed romosozumab
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45 268 show superiority compared with older classes of anti-osteoporosis medications²⁵.
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48 269 There are some limitations to this study. First, we only utilize WoS to formulate our literature
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50 270 search, not the Medline or Embase database, and therefore it is plausible some studies about
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52 271 osteoporosis treatment not included in this search engine were excluded. Although relatively
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54 272 objective and comprehensive, our conclusions may not be generalizable. However, it appears
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56 273 that no perfect medical database exists, and WoS represents the largest bibliometric database
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4 274 currently available^{5, 26}. Second, bibliometric data are changing over time, there may have

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6 275 different conclusion with the time passes by. So this study should be updated in the future.

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9 276 Another significant limitation is the search terms that were used, which may not have

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11 277 identified all the publications related to the subject of the study completely.

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13 278 In conclusion, there has been a consistent increase in the volume of published articles on

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15 279 osteoporosis treatment by the scientific community over the 20-year period. This study

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17 280 identified which journals in this field published more articles about osteoporosis treatment

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19 281 and which articles in these journals received more citations. Publication trends in

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21 282 osteoporosis treatment are useful to monitor publication output per country or continent, to

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23 283 monitor research interests in drug classes, and to see applications of new methods to the field.

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25 284 We believe that our study provides a systematic analysis of osteoporosis treatment and could

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27 285 be a beneficial guide for clinicians and scientists.

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34 288 **Declaration of conflicting interests**

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37 289 The author(s) declared no potential conflicts of interest with respect to the research,

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39 290 authorship, and/or publication of this article.

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52 296 **REFERENCE**

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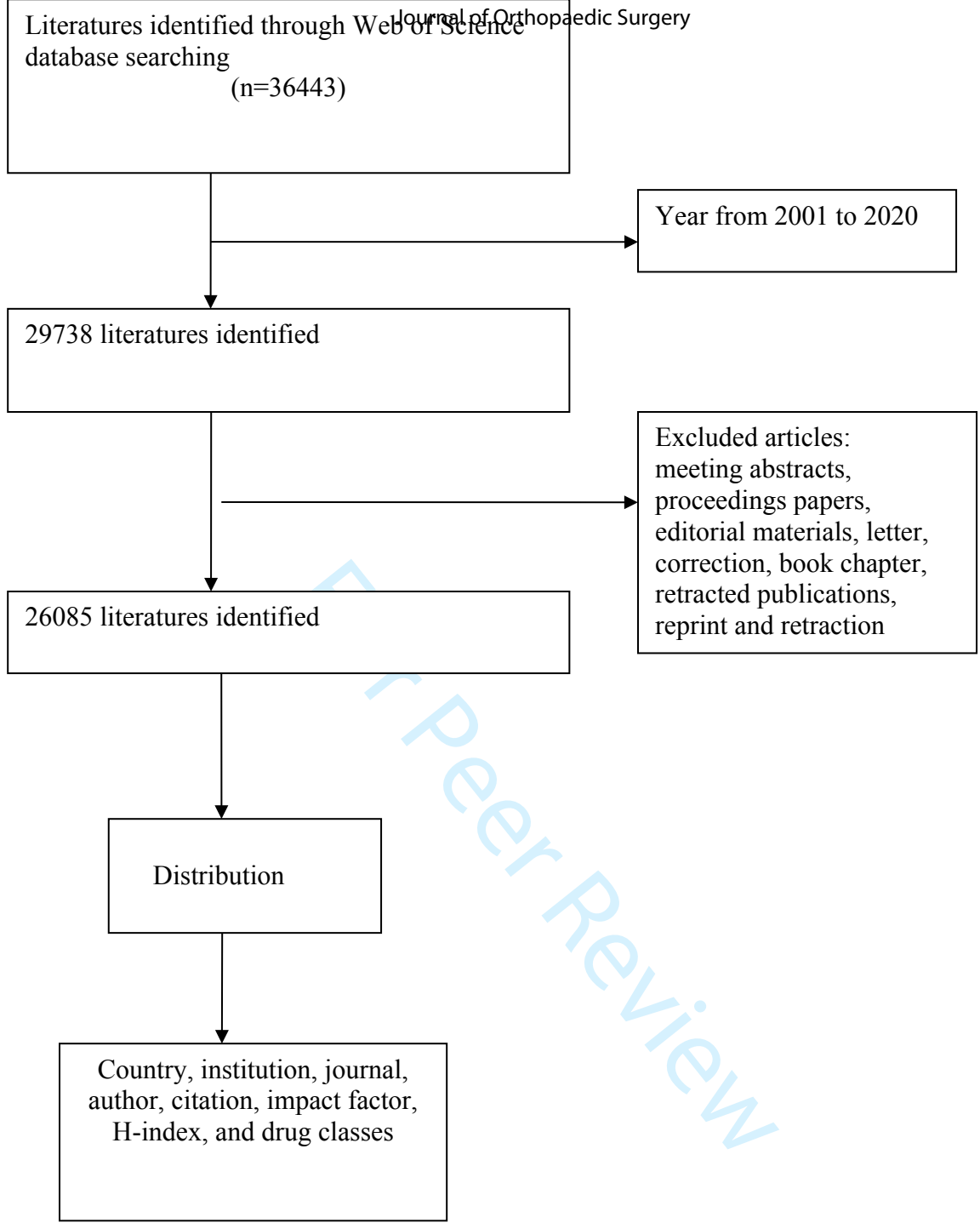


Figure 1. Flow chart of literature filtering included in this study

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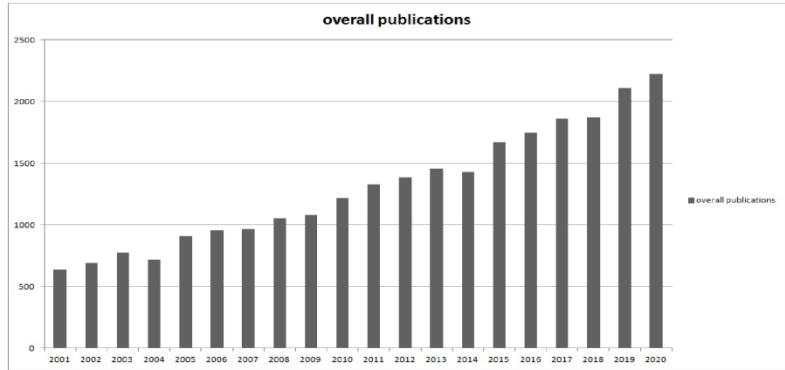
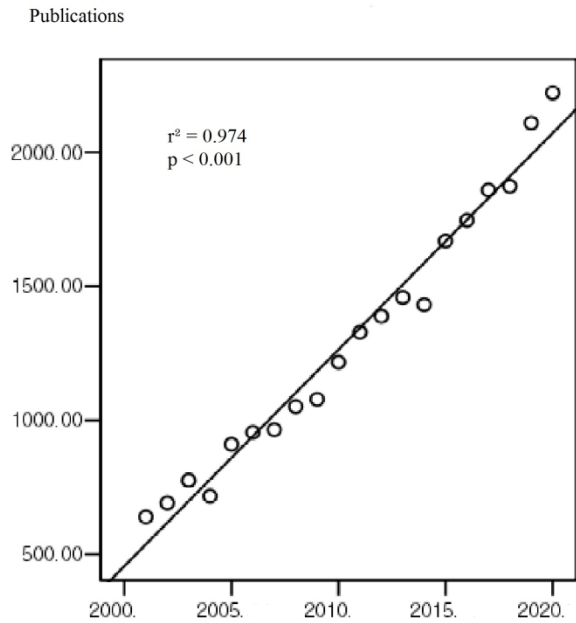


Figure 2. (A) Distribution of yearly publications on osteoporosis treatment from 2001 to 2020

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(B) The model-fitting curve for the growth tendency of osteoporosis treatment-related publications.

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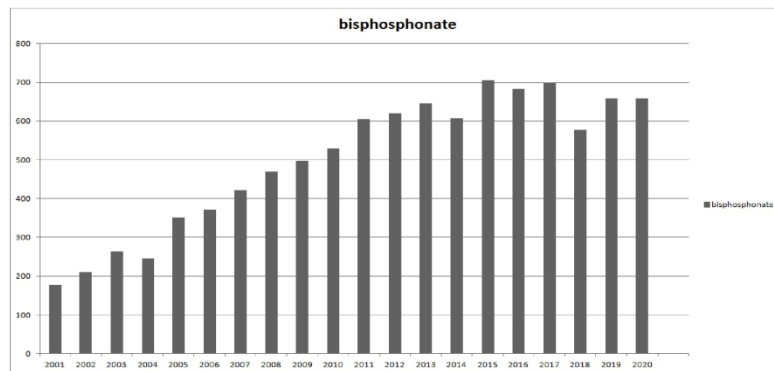
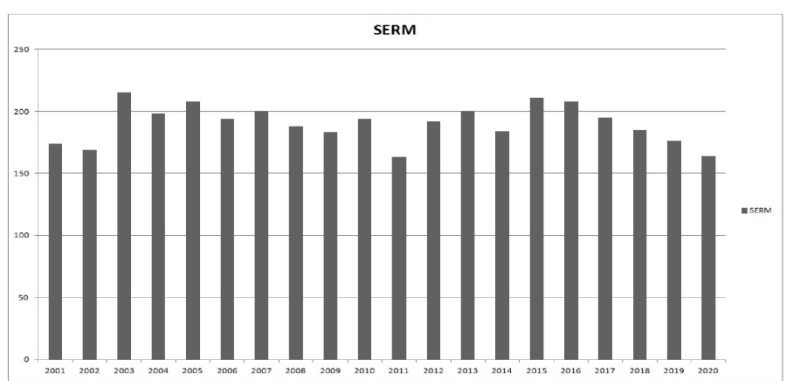


Figure 3. Distribution of yearly publications on each anti-osteoporosis medication (A) bisphosphonate

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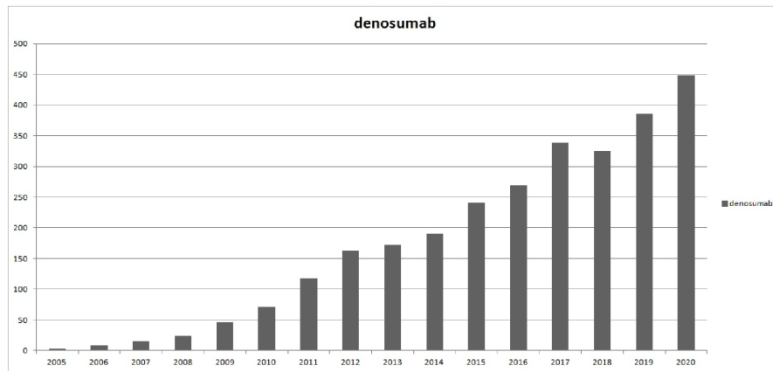
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(B) selective estrogen receptor modulators

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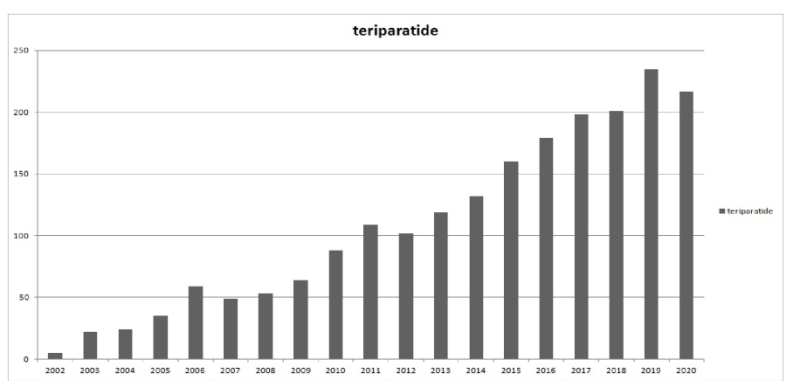
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(C) denosumab

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(D) teriparatide

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Table 1. Distribution of publications in the top 10 countries

Rank	Country	Number of publications	Percentage of total (%)	Total citations	Average citations	h-index
1	USA	7504	28.8	374187	49.87	234
2	China	3389	12.9	58952	17.4	83
3	Germany	2030	7.8	66171	32.6	109
4	England	2023	7.7	109354	53.98	144
5	Japan	1809	6.9	41133	22.74	84
6	Italy	1627	6.2	63095	38.78	106
7	Canada	1451	5.6	78192	53.78	120
8	France	1187	4.6	62554	52.7	120
9	Australia	1066	4.0	55716	52.27	104
10	Spain	986	3.8	31731	32.18	86

Table 2. Top 10 institutions contributing to publications on osteoporosis treatment

Rank	Institute	Number of publications	Percentage of total (%)	Total citations	h-index
1	University of California System	906	3.5	70755	123
2	Harvard university	676	2.6	53613	105
3	Institut National de la Santé et de la Recherché Medicale	521	2.0	33397	95
4	University of Sheffield	486	1.8	37167	94
5	University of California San Francisco	447	1.7	41796	93
6	US Department of Veterans Affairs	408	1.6	24522	81
7	Veterans Health Administration	397	1.5	24364	81
8	Assistance publique-Hopitaux de Paris	385	1.5	22370	77
9	Columbia University	385	1.5	28440	86
10	University of Toronto	376	1.4	18741	68

Table 3. Top 10 active journals on osteoporosis treatment

Rank	Journal	Number of publications	Percentage of total (%)	Number of citations	Impact factor
1	Osteoporosis International	1679	6.4	65039	4.507
2	Bone	832	3.2	34061	4.147
3	Journal of Bone and Mineral Research	727	2.8	50427	6.741
4	Calcified Tissue International	362	1.4	10948	3.86
5	Journal of Bone and Mineral Metabolism	331	1.3	6185	2.626
6	Journal of Clinical Endocrinology and Metabolism	312	1.2	31344	5.958
7	Archives of Osteoporosis	281	1.1	3836	2.017
8	PLOS ONE	238	0.9	5042	3.240
9	Journal of Clinical Densitometry	216	0.8	4133	2.617
10	Current Osteoporosis Reports	207	0.8	3512	4.69

Table 4. Top 10 most cited articles from 2001 to 2020.

Rank	Title	Year	Journal	Total citations	Average citations
1	Evaluation, Treatment, and Prevention of Vitamin D Deficiency: an Endocrine Society Clinical Practice Guideline	2011	JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM	4728	429.82
2	Clinician's Guide to Prevention and Treatment of Osteoporosis	2014	OSTEOPOROSIS INTERNATIONAL	1424	178
3	Osteoporosis: now and the future	2011	LANCET	1298	118
4	WNT signaling in bone homeostasis and disease: from human mutations to treatments	2013	NATURE MEDICINE	1109	123.22
5	Osteoporosis in the European Union: medical management, epidemiology and economic burden	2013	ARCHIVES OF OSTEOPOROSIS	941	104.56
6	Lack of Exercise Is a Major Cause of Chronic Diseases	2012	COMPREHENSIVE PHYSIOLOGY	927	92.7
7	European guidance for the diagnosis and management of osteoporosis in postmenopausal women	2013	OSTEOPOROSIS INTERNATIONAL	852	94.67
8	Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases	2015	SCANDINAVIAN JOURNAL OF MEDICINE & SCIENCE IN SPORTS	801	114.43
9	Genome-wide meta-analysis identifies 56 bone mineral density loci and reveals 14 loci associated with risk of fracture	2012	NATURE GENETICS	766	76.6
10	The Achilles' heel of senescent cells: from transcriptome to senolytic drugs	2015	AGING CELL	736	105.14