Supplementary material: regression analysis

Linear regression analysis was used to investigate the relation between the number of citations (dependent variable) and the publication characteristics “year of publication”, “continent”, “type of study”, “type of scientific journal”, “topic reported” and “IF” (independent variables). Both univariate regression analyses (between the dependent variable and each independent variable individually) as well as multivariate regression analysis (including all independent variables simultaneously) were carried out.

We performed regression diagnostics by checking for normal distribution of residuals using standardized normal probability plots and by examining homoscedasticity of residuals using standardized errors versus fitted plots. As information about the impact factor was missing for eleven articles, analyses were based on 289 observations.

Regression analysis results

Univariate analysis

In the univariate analysis the study type narrative review (93.40, CI: 22.28, 164.53) was significantly associated with a higher number of citations in comparison to the baseline subgroup randomized controlled trial (RCT) as the number of citations of narrative reviews exceeds the number of citations of RCTs by 93.40 citations on average. Also the report of an in-vitro study (186.86, CI: 46.58, 327.14) or a case-control study (319.53, CI: 280.15, 358.90) show significantly higher numbers of citations when compared to the baseline subgroup RCT whereas systematic reviews with meta-analysis (-59.97, CI: -99.86, -20.08) and systematic reviews without meta-analysis (-69.97, CI: -109.40, -30.54) were significantly associated with a lower number of citations compared to RCTs.

Regarding the characteristic topic reported in the articles, the categorical subgroups non-surgical therapy of periodontitis (-146.40, CI: -232.44, -60.37), surgical therapy (resective) of periodontitis (-146.41, CI: -248.85, -44.00), basic biology (-143.67, CI: -230.30, -57.06) and epidemiology (-144.73, CI: -232.62, -56.83) were significantly associated with a lower number of citations compared to the baseline subgroup detection of bacteria. Moreover, a highly significant difference in number of citations occurred if the first author was located in Asia/Australia (-91.32, CI: -145.95, -36.68), that is on average 91.32 (CI: 36.68; 145.95) fewer citations than the baseline (America).

Multivariate analysis

This negative effect for the category Asia/Australia (-142.984, CI: -244.70, -40.98) remains significant in the multivariate analysis but the size of the effect increases. The multivariate regression model also shows significant differences in number of citations for the
topic categories *basic biology* (-132.88, CI: -228.76, -37.00) and *prevention/ treatment of gingivitis* (833.46, CI: 77.40, 1589.52) compared to the baseline (*detection of bacteria*).

Moreover, the study types *retrospective/ prospective cohort* (171.30 CI: 25.07, 317.53), *case-control* (432.40, CI: 259.41, 605.39), *cross-sectional* (222.61, CI: 35.45, 409.78), *case-series* (150.68, CI: 11.62, 289.73), *narrative review* (233.87, CI: 75.99, 391.76), *animal study* (210.92, CI: 69.35, 352.50) and *in-vitro study* (313.94, CI: 103.98, 523.90) exceed the number of citations of *RCT* studies (baseline category) significantly. The regression analyses results did not show a relevant effect of the citable time (categories of years of publication) on the number of citations. The complete results of the univariate and multivariate linear regression are reported in Table 1.

**Regression model**

The linear regression model allowed to explore significant linear relationships between several paper characteristics and the number of citations. Although a number of assumptions were necessary to conduct regression analysis and this might have influenced the accuracy of standard errors, the T test of the multivariate regression indicates that the chosen specification predicts the dependent variable reliably. We used heteroscedasticity-robust standard errors for all regression analyses. No collinearity was observed for the independent predictors in the multivariate model. The R² value of the multivariate model was 0.3, indicating that the independent variable “number of citations” is also influenced by other variables not included in the model. However, the p value associated with the F value is very small (0.0000). Hence, the independent variables included in the multivariate model are considered to sensibly predict the dependent variable. Moreover, the F values for the univariate regression models “continent”, “topic reported” and “type of study” are significant.

It is important to emphasize that the regression analyses results cannot be extrapolated to other articles than those included in the regression analyses, because they may have unique features. Nevertheless, these results are important to better understand the pattern of association between the dependent variable (number of citations) and the characteristics of the most-cited articles published in periodontology.
Table 1. Univariate and multivariate linear regression with number of citations as dependent variable (N=289)

<table>
<thead>
<tr>
<th>Predictor variables</th>
<th>Category</th>
<th>Univariate analysis</th>
<th>Multivariate analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>β</td>
<td>95% CI</td>
</tr>
<tr>
<td>Journals</td>
<td>Medical</td>
<td>Baseline (reference)</td>
<td>0.03</td>
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<tr>
<td></td>
<td>General dental</td>
<td>104.66</td>
<td>-133.75, 343.07</td>
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<tr>
<td></td>
<td>Periodontology</td>
<td>-72.91</td>
<td>-156.01, 10.18</td>
</tr>
<tr>
<td>Continent§</td>
<td>America</td>
<td>Baseline (reference)</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Europe</td>
<td>55.69</td>
<td>-56.73, 168.12</td>
</tr>
<tr>
<td></td>
<td>Asia/ Australia</td>
<td>-91.32**</td>
<td>-145.95, -36.68</td>
</tr>
<tr>
<td></td>
<td>Unclear</td>
<td>41.22</td>
<td>-52.09, 134.52</td>
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<tr>
<td>Years</td>
<td>Before 1983</td>
<td>Baseline (reference)</td>
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<tr>
<td></td>
<td>1983-1995</td>
<td>-104.30</td>
<td>-208.94, 0.34</td>
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<tr>
<td></td>
<td>1996-2012</td>
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<td>-172.14, 59.34</td>
</tr>
<tr>
<td>Topic reported</td>
<td>Detection of bacteria</td>
<td>Baseline (reference)</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Non-surgical therapy of periodontitis</td>
<td>-146.40**</td>
<td>-232.44, -60.37</td>
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<tr>
<td></td>
<td>Surgical therapy (resective) of periodontitis</td>
<td>-146.41**</td>
<td>-248.82, -44.00</td>
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<tr>
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<td>Surgical therapy (regenerative) of periodontitis</td>
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<td>-218.05, 5.43</td>
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<td>Root coverage procedures</td>
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<td>-162.61, 132.52</td>
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<tr>
<td>Prevention/ treatment of gingivitis</td>
<td>Basic biology</td>
<td>Diagnostic</td>
<td>Epidemiology</td>
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<td>-----------------------------------</td>
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<tr>
<td>699.40</td>
<td>-143.67**</td>
<td>-44.17</td>
<td>-144.73**</td>
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<td></td>
<td>-230.30, -57.06</td>
<td>-146.15, 57.81</td>
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<td></td>
<td>-132.88**</td>
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<td></td>
<td>-228.76, -37.00</td>
<td>-111.13, 84.50</td>
<td>-190.62, 14.35</td>
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<td><strong>Type of study</strong></td>
<td><strong>Baseline (reference)</strong></td>
<td><strong>Baseline (reference)</strong></td>
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<tr>
<td>Randomized controlled trial (RCT)</td>
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<td>Baseline (reference)</td>
<td></td>
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<tr>
<td>Controlled (clinical) trial (CCT)</td>
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<td>Baseline (reference)</td>
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<tr>
<td>Retrospective/ prospective cohort</td>
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<td>Baseline (reference)</td>
<td></td>
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<td>Case-control</td>
<td>319.53**</td>
<td>280.15, 358.90</td>
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<td>Cross-sectional</td>
<td>110.50</td>
<td>-10.03, 231.03</td>
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<td>Case-series</td>
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<td>Case-report</td>
<td>117.19</td>
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<tr>
<td>Systematic review with meta-analysis</td>
<td>-59.97**</td>
<td>-99.86, -20.08</td>
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</tr>
<tr>
<td>Systematic review without meta-analysis</td>
<td>-69.97**</td>
<td>-109.40, -30.54</td>
<td></td>
</tr>
<tr>
<td>Narrative review</td>
<td>93.40**</td>
<td>22.28, 164.53</td>
<td></td>
</tr>
<tr>
<td>Animal study</td>
<td>32.05</td>
<td>-22.98, 87.07</td>
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</tr>
<tr>
<td>In-vitro study</td>
<td>186.86**</td>
<td>46.58, 327.14</td>
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</tr>
<tr>
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<td></td>
<td><strong>833.46</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>77.40, 1589.52</td>
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<tr>
<td>Impact Factor</td>
<td>2.16</td>
<td>-3.02, 7.33</td>
<td>0.003</td>
</tr>
</tbody>
</table>

+-*P=0.05, **P<0.01

§ Affiliation of the first author of the article
Supplementary material: list of the 300 most-cited articles in periodontology


68. Huang GT, Gronthos S, Shi S. Mesenchymal stem cells derived from dental tissues vs. those from other sources: their biology and role in regenerative medicine. *J Dent Res* 2009;88:792-806. 386 citations


98. Baer PN. The case for periodontosis as a clinical entity. *J Periodontol* 1971;42:516-520. 324 citations


101. Fujihara K, Kotaki M, Ramakrishna S. Guided bone regeneration membrane made of polycaprolactone/calcium carbonate composite nano-fibers. *Biomaterials* 2005;26:4139-4147. 316 citations


140. Mealey BL, Oates TW. Diabetes mellitus and periodontal diseases. J Periodontol 2006;77:1289-1303. 269 citations


162. Waerhaug J. Healing of the dento-epithelial junction following subgingival plaque control. II: As observed on extracted teeth. *J Periodontol* 1978;49:119-134. 253 citations


174. Lopez NJ, Smith PC, Gutierrez J. Periodontal therapy may reduce the risk of preterm low birth weight in women with periodontal disease: a randomized controlled trial. *J Periodontol* 2002;73:911-924. 245 citations


