Scientific Paper Production by Iranian Dental Schools Between 2015 and 2019

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Abstract

Background: Journal articles published by Iranian dental school faculty members have followed an upward trend Since 2000, based on: (1) the global growth rate; (2) the increase in the number of country's dental schools and their relatively higher number of faculty members; and (3) the health ministry's emphasis on research and scientific publications. Hence, it is important to keep ourselves up to date about the trend of scientific articles published by Iranian dental schools.

Objectives: This study aimed to extract the number and quantitative value of articles authored by faculty members of Iranian dental schools that are indexed in three databases of SCOPUS, PubMed, and the Web of Science (WoS/ISI) from 2015 to 2019.

Methods: A five-year cross-sectional study was conducted on the above-mentioned databases, using a similar strategy for all databases. Words "Iran" and "dent*" were searched in affiliations. The obtained results were investigated in-depth. The details of search results were checked out one by one. Only those articles with at least one author genuinely affiliated to an Iranian dental school were included for further assessment. The "number of articles" authored by at least one author and those with the "first author" affiliated to an Iranian dental school were counted. Then, the "quantitative value" or share of each author was calculated by dividing one by the number of authors of the article. The three variables were compared among databases, dental schools, and study years.

Results: A total of 3922, 2473, and 2345 articles were retrieved from SCOPUS, PubMed, and WoS, respectively. Concerning SCOPUS and WoS databased, all three study variables had an increasing trend from 2015 to 2018 but decreased in 2019. In PubMed, however, the decline started from the beginning of the study period.

Conclusions: The observed decline in the number of scientific papers produced or published at the end of the study period is worrying. The novel variable of "quantitative value" that was calculated in this study can be regarded as an appropriate and feasible indicator to determine the number of scientific papers published by individuals, dental schools, and the whole country's dental research society, compared to other variables. Policymakers should rethink facilitating publication in accredited journals, especially those indexed in PubMed.

Keywords: Iran, Manuscript, Dental Schools

1. Background

The dramatic global growth in the scientific publication has flagged the issue of science production and measurement of scientific data in the scientific community of Iran in recent years (1-4), which has resulted in the formation of a comparative environment between different Iranian universities, schools, and even researchers and faculty members (5-7). Dental schools are not an exemption, neither internationally (8) nor in Iran (9, 10). Special emphasis has been placed on the production of science in the field of dentistry in Iranian dental schools, forcing faculty

members, postgraduate students, and even undergraduate students to publish papers as a compulsion for their promotion or graduation (11, 12).

Systematic scientometrics reviews can provide important evidence for program designers and policymakers, particularly when huge budgets and resources are allocated (13, 14). Moreover, some studies reported that the efficiency of oral health care, and even the human development and economic productivity of a country, are linearly correlated with dental research productivity (8). A study that investigated dental articles with at least one Iranian author published in journals indexed in PubMed showed

a remarkable increase in the number of articles in years leading to 2015 (9). Based on the Web of Science database, dentistry-related scientific articles produced by Iranian authors experienced a growth rate of 5.68% from 2000 to 2009 (10).

2. Objectives

The aim of this paper is to present the number, first-authored, and quantitative value of scientific papers published by authors affiliated to one of the Iranian dental schools between 2015 and 2019. In this regard, those papers published in journals indexed in the three main internationally known databases (i.e., Pubmed, WoS, and SCOPUS) were assessed. In addition, dental schools are compared in terms of study variables.

3. Methods

Three main internationally well-known scientific databases-SCOPUS, Pubmed, and the Web of Science (WoS, previously well known as ISI)-were surveyed in a researcher-constructed five-year cross-sectional study. All articles indexed in those three databases from the beginning of 2015 until the end of 2019 were assessed. Each database was searched by its search engine using the terms "Iran" and "Dent*" in combination with the author's affiliation. The term "Dent*", with a superscript asterisk, was meant to cover all words that start with "Dent", including Dental and Dentistry. Therefore, two elements were used in the advanced search or in filters: the author's affiliation with the abovementioned terms and year of publication.

For all eligible articles, year of publication, article title, journal name, and name of authors and their affiliations were retrieved and registered into three separate EXCEL sheets. All articles were evaluated carefully. It is worth noting that all articles with at least one author affiliated to an Iranian dental school were kept, and the rest were removed. For all eligible studies, names and affiliations of the first ten authors were registered in separate columns of an excel sheet. Affiliations were corrected and harmonized as many different ways were used to present Farsi affiliations in English format. For authors with unclear affiliations, the websites of medical universities and/or dental schools were searched to ensure correctness of affiliations. In some doubtful cases, phone calls were made. It is worth noting that only the first given affiliation of each

author was used. Three variables of article count, first author count, and quantitative value were calculated. To calculate the first one, the number of articles in which at least one author was affiliated to a dental school was counted. It should be emphasized that only those articles that the first author was affiliated to a dental school were counted. To calculate the quantitative value (or share), the number of authors of an article affiliated to a dental school was divided by the number of all authors of that article. For instance, for an article with five authors that one of them, say the third one, is affiliated to Shiraz Dental School, the article count for Shiraz dental school is 1, the first author count is 0, and the quantitative value is 0.2.

4. Results

Most of the identified articles (n = 3922) were retrieved from the Scopus database, followed by Pubmed (n = 2473) and WoS (2345) (Table 1). While the total number of articles indexed in these three databases had increased during the study period (2015 to 2018), it experienced a remarkable decline in 2019. A similar pattern was observed for SCOPUS and WoS databases. However, the findings revealed an overall difference and a decreasing pattern throughout the study period for the Pubmed database (Table 1). Tables 2 to 4 present the three investigated variables (number of articles with at least one author affiliated to dentistry schools, number of authors with a first author affiliated to dentistry schools, and quantitative value/share of authors affiliated to one of Iranian state dental schools) separated by dental school and year of investigation (from 2015 until 2019) for SCOPUS (Table 2), WoS (Table 3), and Pubmed (Table 4) databases.

For the SCOPUS database, Shahid Beheshti Dental School, with a total of 1715 indexed articles, had the highest number of articles, followed by Tehran Dental School (n = 1654), Tabriz (n = 1221), and Shiraz (n = 1010). The dental school of the Iran University of Medical Sciences, located in the city of Tehran, is a recently established school with no graduated student at the time of writing this article. It had the lowest article count (n = 6) behind Bushehr (n = 8) and Yasuj (n = 10) Dental Schools (Table 2).

Shahid Beheshti (448), Tehran (408), and Shiraz (291) Dental Schools had the highest first-authored articles. No author with an affiliation related to the Shahrekord Dental School was the first author of an article. In addition, 18 schools had less than 10 articles with the first author affiliated to them. Concerning the quantitative value of articles indexed in the SCOPUS database, Shahid Beheshti Dental School (392.3) and Tehran Dental School (362.9) had the

Table 1. Number of Articles with at Least One Author, Number of Articles with the First Author, and Quantitative Value of Articles Affiliated to Iranian Dental Schools

Database	Variables	2015	2016	2017	2018	2019	Sum
SCOPUS	Article count	660	809	835	857	761	3922
	First author count	491	600	616	658	531	2896
	Quantitative value	462.4	523.35	526.8	552.57	441.2	2506.32
WoS	Article count	318	432	502	565	528	2345
	First author count	258	337	408	457	415	1875
	Quantitative value	211.05	288.5	347.5	387.6	348.56	1583.56
Pubmed	Article count	579	508	537	479	370	2473
	First author count	469	434	459	401	304	2067
	Quantitative value	403.99	376.93	386.91	335.07	262.95	1765.85
Added together[a]	Article count	1557	1749	1874	1901	1659	8740
	First author count	1218	1371	1483	1516	1250	6838
	Quantitative value	1077.44	1189.13	1261.21	1275.24	1052.71	5855.73

[a]Consider that some articles are indexed in more than one database; hence, this is an estimation of articles indexed in the three databases and is just produced for comparative purposes.

highest value. Shiraz Dental School was ranked as the third in terms of quantitative value (i.e., 251.8). Again, Iran Dental School was ranked as the last, behind the Bushehr and Yasuj Dental Schools. In total, there were 15 dental schools with a quantitative value of less than 10 during the study period, which means that each of them produced less than two SCOPUS indexed articles each year (Table 2). As shown in Table 2, some new schools had no or a few indexed articles at the beginning of the study period. The findings also revealed a considerable gap between Shahid Beheshti and Tehran Dentistry Schools with other schools. For all three study variables, a considerable decline was observed for about half of the studied schools (19 out of 38) in 2019 compared to the previous years.

Similar patterns were observed for the WoS database. For instance, again, the highest number of indexed articles was for 2018 (n = 565). While all three variables have increased from 2015 to 2018, a considerable decline has happened in 2019. As of SCOPUS, Shahid Beheshti and Tehran Dental Schools were ranked as top schools, with significant distance from other schools. Nevertheless, for the WoS database, Tehran was ranked as the first with an article count of 1299, 344 first author articles, and a quantitative value of 289.9. The second rank was for Shahid Beheshti, with 1195 article count, 305 first author articles, and a quantitative value of 269.3. These two schools accounted

for a quantitative value of 559.2, equal to more than 35% of all Iranian dental schools. Shiraz Dental School had the third place with just 633 articles, about half the number of the first two. Concerning the WoS database, Kordestan (n = 1), Iran (n = 7), and Hormozgan (n = 9), and Ilam (n = 9) were ranked as the last schools (Table 3). The trend was slightly different in the case of articles indexed in Pubmed. The highest number of articles related to Iranian dental schools indexed in PubMed was observed in 2015 (N = 579) followed by a decrease in 2016 (n = 508), an increase in 2017 (n = 537), and a dramatic decline in the following years (Table 1).

During the study period, Tehran Dental School had the highest article count (1296) in Pubmed. In addition, it had 332 articles with the first author affiliated to it and a quantitative value equal to 289.62 articles. Shahid Beheshti had 1039 articles, of which in 293 articles, the first author was affiliated to the Shahid Beheshti, and the quantitative value was 241.08. Shiraz had third place in terms of article count with 928 articles and 267 first-authored articles; Also, it was ranked as the second in terms of quantitative value, with a value of 241.34, and was ranked slightly higher than Shahid Beheshti. Iran, Bushehr, and Yasuj Dental Schools had one, six, and eight published articles indexed in Pubmed, respectively, and were the only schools with less than 10 publications.

Table 2. Number of Articles with at Least One Author (Number of Articles with the First Author) [Quantitative Value/Share of Authors] Affiliated to Each Iranian State Dental School Indexed in SCOPUS from 2015 to 2019

ID	School	2015	2016	2017	2018	2019	SUM
1	Ahwaz	24 (7) [5.58]	54 (13) [11.45]	57 (12) [9.6]	42 (7) [7.27]	63 (15) [14.6]	230 (54) [48.5]
2	Alborz	2 (1) [0.5]	2 (2) [1.3]	3 (1) [0.5]	6 (1) [1.2]	17 (4) [3.2]	35 (9) [6.7]
3	Arak	0 (0) [0]	2 (0) [0.4]	14 (4) [2.7]	10 (0) [1.4]	14 (4) [2.9]	40 (8) [7.4]
4	Ardabil	3 (0) [0.6]	1 (0) [0.1]	7 (1) [1.4]	7 (3) [1.9]	12 (2) [2.1]	30 (6) [6.1]
5	Artesh	6 (3) [1.42]	13 (6) [2.95]	15 (8) [3.55]	21 (8) [6.33]	15 (7) [5.3]	70 (32) [19.55]
6	Babol	73 (22) [16]	69 (20) [15.2]	76 (24) [16.2]	93 (27) [20.1]	29 (9) [6.5]	340 (102) [74]
7	Birjand	11 (1) [1.9]	9 (1) [2.4]	14 (2) [3.4]	12 (3) [3.4]	1 (1) [0.1]	47 (8) [11.2]
8	Bushehr	1 (0) [0.2]	0 (0) [0]	3 (0) [0.8]	1 (0) [0.3]	3 (2) [0.5]	8 (2) [1.8]
9	Gilan	21 (5) [47]	17 (4) [4.6]	32 (8) [8.1]	44 (12) [11.5]	29 (7) [6.8]	143 (36) [78]
10	Golestan	3 (0) [0.56]	10 (1) [1.9]	9 (0) [1.8]	11 (2) [3.5]	4 (0) [0.5]	37 (3) [8.26]
11	Hamadan	68 (21) [14.7]	103 (34) [27.3]	81 (27) [19.2]	112 (39) [25]	115 (33) [4.9]	479 (154) [91.1]
12	Hormozgan	5 (1) [1]	0 (0) [0]	6 (2) [1.9]	5 (0) [1]	1 (0) [0.2]	17 (3) [1.4]
13	Ilam	3 (2) [0.91]	5 (1) [1]	15 (0) [3.6]	3 (2) [1.1]	8 (0) [1.8]	34 (5) [8.41]
14	Iran	0 (0) [0]	0 (0) [0]	1 (0) [0.1]	1 (1) [0.1]	4 (1) [0.9]	6 (2) [1.1]
15	Isfahan	238 (64) [59]	178 (42) [42.9]	176 (45) [43]	198 (61) [51.8]	132 (29) [33.3]	922 (241) [230]
16	Kashan	0 (0) [0]	4 (1) [1.1]	3 (0) [0.5]	5 (1) [1]	5 (1) [1.1]	17 (3) [3.7]
17	Kerman	82 (29) [20]	63 (18) [14.8]	75 (19) [16.5]	72 (21) [18]	52 (15) [12.3]	344 (102) [81.6]
18	Kermanshah	20 (4) [4.2]	53 (11) [11.9]	42 (11) [9.7]	59 (19) [12.7]	122 (28) [23.3]	296 (73) [61.8]
19	Kordestan	1 (0) [0.3]	2 (0) [0.5]	1 (0) [0.2]	6 (2) [1.2]	4 (3) [1.8]	14 (5) [4.9]
20	Lorestan	2 (0) [0.39]	6 (2) [1.9]	5 (3) [0.9]	5 (0) [1.1]	4 (0) [0.6]	22 (5) [4.89]
21	Mashhad	239 (71) [59.8]	201 (60) [49.1]	158 (46) [39.2]	174 (48) [43.2]	160 (44) [37.4]	929 (269) [228.7]
22	Mazandaran	19 (6) [5]	52 (17) [14]	35 (11) [9.5]	46 (13) [7.7]	49 (13) [9.2]	201 (60) [45.4]
23	North Khorasan	1 (0) [0.16]	15 (3) [2.5]	8 (1) [1.5]	4 (2) [0.9]	2 (0) [0.5]	30 (6) [5.56]
24	Qazvin	16 (5) [4.2]	42 (8) [10.2]	49 (15) [11.4]	45 (16) [11.5]	21 (5) [4.3]	173 (49) [41.6]
25	Qom	6 (0) [1.2]	7 (1) [1.5]	9 (1) [1.2]	8 (1) [1.5]	5 (1) [1.1]	35 (4) [7.4]
26	Rafsanjan	9 (1) [2.5]	7 (3) [2.1]	7 (3) [2.2]	8 (2) [1.9]	2 (1) [0.6]	33 (10) [9.3]
27	Semnan	3 (0) [2.5]	3 (0) [0.6]	9 (2) [2]	9 (2) [1.9]	14 (2) [2.8]	38 (6) [9.8]
28	Shahed	13 (6) [3.4]	46 (16) [11.4]	51 (13) [11.8]	51 (17) [12.8]	55 (10) [10.8]	216 (62) [50.2]
29	Shahid Beheshti	303 (80) [69.1]	382 (98) [88.4]	428 (113) [94.8]	327 (82) [77.7]	275 (75) [62.3]	1715 (448) [392.3]
30	Shahrekord	4 (0) [1.1]	3 (0) [0.8]	1 (0) [0.2]	6 (0) [1.3]	5 (0) [1]	19 (0) [4.4]
31	Shiraz	174 (50) [44.6]	179 (52) [42.8]	206 (54) [51]	213 (63) [53]	238 (72) [60.4]	1010 (291) [251.8]
32	Tabriz	159 (32) [27.5]	318 (690) [59.6]	306 (69) [60.4]	254 (57) [50.2]	184 (41) [34.4]	1221 (268) [232.1]
33	Tehran	231 (54) [49.5]	314 (76) [66.6]	318 (82) [72.1]	446 (116) [97.7]	345 (79) [77]	1654 (407) [362.9]
34	Urmia	1 (0) [0.1]	1 (0) [0.2]	8 (2) [2.1]	11 (2) [2.4]	13 (2) [2.2]	34 (6) [7]
35	Yasuj	2 (0) [0.6]	3 (2) [0.5]	0 (0) [0]	2 (0) [0.2]	3 (0) [0.5]	10 (2) [1.8]
36	Yazd	38 (11) [8.6]	61 (15) [15]	52 (18) [12.1]	38 (10) [10]	33 (8) [7.7]	222 (62) [53.4]
37	Zahedan	33 (14) [7.4]	66 (220) [16.9]	50 (18) [12.8]	32 (11) [9.7]	33 (12) [8.4]	214 (77) [55.2]
38	Zanjan	8 (1) [2.3]	11 (2) [2.4]	5 (1) [1.5]	18 (7) [4.5]	15 (50) [3.2]	57 (16) [13.9]

5. Discussion

The increase in the number of scientific publications of Iranian dental schools from 2015 to 2018, especially in journals indexed in SCOPUS and WoS, is in line with the findings of some other studies performed before 2015 (10, 15, 16). It should be considered that the number of Pubmed indexed publications of Iranian dental schools has also followed an increasing trend in years towards 2015 (9); a trend that did not happen after 2015, based on the findings of the current study. In the present study, each database was searched using its particular search engine and affiliations provided by the authors themselves. However, we investigated all identified articles one by one to correct or harmonize the affiliations. Several ways are available to translate affiliations from Persian to English, which translates into different spelling. The necessity of informing faculty members on how to write their affiliation was clearly sensed.

In Iran, almost all dentistry schools are administered

Table 3. Number of Articles with at Least One Author (Number of Articles with the First Author) [Quantitative Value/Share of Authors] Affiliated to Each Iranian State Dental School Indexed in WoS from 2015 to 2019

ID	School	2015	2016	2017	2018	2019	SUM
1	Ahwaz	6 (1) [1.31]	19 (8) [4.75]	51 (16) [12.36]	78 (18) [17.03]	50 (14) [11.01]	204 (57) [46.46]
2	Alborz	0 (0) [0]	6 (2) [1.2]	4 (0) [0.9]	1 (0) [0.1]	7 (2) [1.5]	18 (4) [3.7]
3	Arak	0 (0) [0]	1 (0) [0.2]	3 (2) [0.7]	1 (0) [0.2]	12 (5) [2.6]	17 (7) [3.7]
4	Ardabil	5 (1) [1.2]	1 (0) [0.2]	2 (0) [0.5]	9 (2) [2.3]	6 (1) [1.1]	23 (6) [5.3]
5	Artesh	6 (2) [1.24]	6 (1) [1.3]	13 (4) [3.34]	19 (6) [6.37]	16 (6) [5.45]	60 (19) [17.7]
6	Babol	23 (7) [4.8]	37 (12) [8.9]	37 (7) [7.2]	28 (9) [5.1]	8 (3) [1.7]	133 (38) [27.7]
7	Birjand	1 (0) [0.1]	9 (1) [2.5]	3 (1) [0.7]	6 (1) [1.7]	1 (1) [0.1]	20 (4) [5.1]
8	Bushehr	0 (0) [0]	1 (0) [0.3]	7 (1) [1.2]	1 (0) [0.3]	3 (2) [0.5]	12 (3) [2.3]
9	Gilan	15 (4) [3]	10 (3) [3.2]	34 (7) [7.8]	26 (9) [7.9]	24 (8) [6.3]	109 (31) [28.2]
10	Golestan	1 (0) [0.2]	4 (1) [0]	5 (0) [0.9]	5 (2) [1.9]	4 (0) [0.6]	19 (3) [3.6]
11	Hamadan	37 (12) [8]	34 (10) [8.3]	71 (24) [16.3]	100 (33) [22.6]	124 (37) [26]	366 (116) [81.2]
12	Hormozgan	2 (0) [0.3]	2 (1) [0.5]	3 (1) [0.7]	0 (0) [0]	2 (0) [0.3]	9 (2) [1.8]
13	Ilam	0 (0) [0]	1 (0) [0.2]	2 (1) [0.5]	0 (0) [0]	6 (1) [1.3]	9 (2) [2]
14	Iran	1 (0) [0.1]	0 (0) [0]	1 (0) [0.2]	0 (0) [0]	5 (0) [0.7]	7 (0) [1]
15	Isfahan	116 (29) [27.9]	84 (25) [20.9]	126 (35) [30.5]	138 (44) [16.7]	73 (20) [19.6]	537 (153) [135.6]
16	Kashan	0 (0) [0]	1 (0) [0.2]	1 (1) [0.2]	2 (0) [0.5]	8 (1) [2.1]	12 (2) [3]
17	Kerman	46 (16) [11]	90 (28) [23.7]	91 (30) [22.2]	115 (31) [29.4]	82 (22) [19.5]	424 (127) [105.8]
18	Kermanshah	10 (2) [1.8]	32 (7) [7.7]	32 (10) [8]	67 (21) [14.8]	92 (24) [17.1]	233 (73) [49.4]
19	Kordestan	0 (0) [0]	0 (0) [0]	1 (0) [0.2]	0 (0) [0]	0 (0) [0]	1 (0) [0.2]
20	Lorestan	1 (0) [0.1]	3 (2) [0.9]	5 (3) [0.9]	4 (0) [0.9]	3 (0) [0.4]	16 (5) [3.2]
21	Mashhad	113 (37) [30.7]	136 (40) [33.8]	116 (33) [27.2]	128 (36) [31.5]	120 (30) [16.6]	613 (176) [149.8]
22	Mazandaran	5 (1) [1.4]	19 (1) [3.6]	11 (3) [2.2]	40 (8) [6.5]	6 (1) [1.3]	81 (14) [15]
23	Norh Khorasan	0 (0) [0]	6 (3) [1]	4 (1) [0.8]	4 (2) [0.9]	2 (0) [0.5]	16 (6) [3.2]
24	Qazvin	11 (2) [1.7]	12 (3) [2.7]	16 (2) [3]	18 (5) [4.5]	11 (2) [2.7]	68 (14) [14.6]
25	Qom	5 (0) [0.9]	6 (0) [1.5]	13 (3) [3.5]	3 (1) [0.5]	8 (2) [1.5]	35 (6) [7.9]
26	Rafsanjan	2 (0) [0.4]	3 (2) [1.2]	3 (0) [0.5]	5 (1) [0.8]	3 (1) [1.3]	16 (4) [4.2]
27	Semnan	0 (0) [0]	2 (0) [0.4]	5 (1) [1.3]	1 (0) [0.2]	16 (4) [3]	24 (5) [4.9]
28	Shahed	3 (0) [1]	13 (4) [3]	29 (9) [5.7]	39 (9) [7]	25 (4) [4.8]	109 (26) [21.5]
29	Shahid Bheshti	166 (44) [35.4]	222 (60) [52.7]	346 (83) [77.2]	213 (50) [47.7]	248 (68) [56.2]	1195 (305) [269.2]
30	Shahrkord	1 (0) [0.1]	2 (0) [0.5]	0 (0) [0]	6 (1) [1.2]	2 (0) [0.5]	11 (1) [2.3]
31	Shiraz	119 (39) [31.1]	123 (41) [32.7]	134 (43) [36.9]	133 (40) [33.2]	124 (39) [32]	633 (202) [165.9]
32	Tabriz	16 (4) [2.5]	53 (9) [8.5]	43 (9) [9.5]	50 (9) [9.7]	65 (14) [11.6]	227 (45) [41.8]
33	Tehran	171 (43) [35.3]	209 (55) [44.5]	226 (61) [51.6]	371 (103) [83.6]	322 (82) [74.7]	1299 (344) [289.7]
34	Urmia	0 (0) [0]	0 (0) [0]	2 (1) [0.6]	6 (2) [2.1]	7 (1) [1]	15 (4) [3.7]
35	Yasuj	2 (0) [0.6]	2 (1) [2.8]	2 (1) [0.7]	2 (1) [0.6]	3 (0) [0.5]	11 (3) [5.2]
36	Yazd	10 (5) [2.1]	12 (3) [2.8]	32 (9) [8]	16 (4) [3.9]	21 (8) [4.7]	91 (29) [21.5]
37	Zahedan	21 (8) [5.1]	27 (13) [8.6]	17 (5) [3.3]	20 (7) [5.7]	21 (8) [5.6]	106 (41) [28.3]
38	Zanjan	5 (1) [1.7]	13 (4) [3.6]	1 (0) [0.2]	2 (1) [0.2]	11 (4) [2.2]	32 (10) [7.9]

by the state, except for a few schools affiliated to the Islamic Azad University. However, although they are located in different cities and are independent of each other, their authors can not be distinguished based on the given affiliations. Therefore, they were excluded. Articles published by authors affiliated to Baqyatallah Dental School were also excluded because this school did not exist during the study period. Special attention should be paid to the sharp decline observed in 2019. The related factors should be investigated, and some changes should be made at the policy level to compensate for the declining level of factors in the future, including not accepting articles submitted by Iranian researchers to accredited journals. In addition, Iranian authors, apart from problems related to expanding their international collaborations, are faced difficulties in paying the publication fees (17-19).

The worst pattern was observed for journals indexed in the PubMed database, which the observed decline had

Table 4. Number of Articles with at Least One Author (Number of Articles with the First Author) [Quantitative Value/Share of Authors] Affiliated to Each Iranian State Dental School Indexed in Pubmed from 2015 to 2019

ID	School	2015	2016	2017	2018	2019	SUM
1	Ahwaz	25 (6) [5.34]	16 (3) [3.12]	26 (6) [5.44]	14 (3) [2.55]	26 (10) [6.73]	107 (28) [23.18]
1	Alborz	4 (0) [0.74]	8 (1) [1.75]	2 (1) [0.50]	3 (0) [0.48]	1 (1) [0.25]	18 (3) [3.72]
3	Arak	3 (0) [0.42]	6 (1) [1.48]	9 (1) [1.9]	5 (0) [0.98]	9 (2) [1.79]	32 (4) [6.57]
4	Ardabil	2 (1) [0.39]	8 (1) [1.66]	9 (2) [1.91]	6 (2) [1.79]	9 (2) [2.07]	34 (8) [7.82]
5	Artesh	3 (2) [0.83]	7 (1) [1.76]	2 (0) [0.58]	13 (4) [3.54]	13 (3) [3.43]	38 (9) [10.14]
6	Babol	68 (20) [14.73]	78 (27) [17.13]	77 (26) [15.94]	50 (13) [10.28]	26 (7) [5.65]	299 (93) [63.73]
7	Birjand	6 (0) [0.99]	6 (1) [1.64]	12 (3) [3.1]	7 (2) [2]	0 (0) [0]	31 (6) [7.73]
8	Bushehr	2 (0) [0.53]	2 (1) [0.45]	1 (0) [0.25]	0 (0) [0]	1 (0) [0.33]	6 (1) [1.56]
9	Gilan	24 (7) [5.43]	26 (7) [6.19]	22 (4) [5.55]	32 (8) [3]	13 (4) [3.95]	117 (30) [24.12]
10	Golestan	4 (2) [1.03]	6 (0) [1.33]	3 (0) [0.68]	9 (2) [2.2]	4 (1) [0.84]	26 (5) [6.08]
11	Hamadan	62 (19) [13.76]	37 (14) [9.63]	50 (16) [10.85]	72 (23) [15.22]	42 (9) [9.98]	263 (81) [59.44]
12	Hormozgan	9 (2) [1.97]	2 (0) [0.45]	1 (0) [0.25]	3 (0) [0.68]	0 (0) [0]	15 (2) [3.35]
13	Ilam	7 (2) [1.32]	6 (0) [1.18]	6 (0) [1.52]	2 (1) [0.7]	4 (0) [1.03]	25 (3) [5.75]
14	Iran	0 (0) [0]	0 (0) [0]	0 (0) [0]	1 (1) [0.17]	0 (0) [0]	1 (1) [0.17]
15	Isfahan	183 (48) 43.09]	135 (37) [34.93]	116 (31) [28.68]	134 (41) [36.38]	71 (18) [17.60]	639 (175) [160.68]
16	Kashan	0 (0) [0]	3 (0) [1.08]	3 (1) [0.81]	3 (1) [0.57]	2 (0) [0.50]	11 (2) [2.96]
17	Kerman	74 (21) [0.25]	53 (16) [12.39]	53 (14) [11.47]	43 (15) [11.37]	33 (12) [8.19]	256 (78) [43.67]
18	Kermanshah	7 (1) [1.65]	26 (6) [5.27]	21 (6) [4.74]	45 (14) [9.10]	68 (16) [13.12]	167 (43) [33.88]
19	Kordestan	3 (0) [0.73]	4 (0) [1.12]	1 (0) [0.20]	4 (1) [0.93]	0 (0) [0]	12 (1) [2.98]
20	Lorestan	1 (0) [1.32]	8 (2) [2.25]	3 (1) [0.70]	4 (0) [0.95]	2 (0) [0.50]	18 (3) [5.72]
21	Mashhad	228 (71) [55.82]	130 (37) [31.60]	130 (33) [30.13]	84 (25) [20.62]	53 (17) [14.84]	625 (183) [153.02]
22	Mazandaran	19 (0) [4.42]	27 (7) [5.17]	16 (5) [3.38]	23 (9) [4.44]	16 (7) [2.46]	101 (28) [19.87]
23	North Khorasan	4 (0) [0.66]	2 (1) [0.37]	7 (0) [1.14]	2 (1) [0.45]	0 (0) [0]	15 (2) [2.62]
24	Qazvin	16 (7) [3.83]	17 (1) [3.40]	39 (14) [9.32]	27 (10) [6.40]	2 (1) [0.67]	101 (33) [23.62]
25	Qom	5 (0) [1.03]	7 (0) [1.29]	3 (0) [0.83]	5 (0) [0.98]	3 (1) [0.54]	23 (1) [4.64]
26	Rafsanjan	8 (1) [2.12]	4 (2) [1.58]	5 (3) [1.42]	3 (0) [0.70]	3 (1) [1]	23 (7) [6.82]
27	Semnan	7 (4) [1.24]	4 (0) [0.85]	3 (1) [0.83]	3 (0) [0.78]	6 (1) [1.24]	23 (6) [4.94]
28	Shahed	32 (1) [8.62]	24 (9) [5.6]	27 (8) [6.80]	15 (7) [4.18]	10 (1) [2.35]	108 (26) [27.55]
29	Shahid Beheshti	262 (73) [57.42]	211 (59) [50.05]	234 (69) [54.68]	194 (54) [47.49]	135 (38) [33.43]	1036 (293) [241.07]
30	Shahrekord	1 (0) [0.5]	1 (0) [0.2]	3 (0) [0.57]	7 (0) [1.79]	3 (0) [0.53]	15 (0) [3.59]
31	Shiraz	234 (68) [60.94]	197 (53) [50.67]	190 (57) [49.44]	152 (45) [38.76]	155 (44) [41.52]	928 (267) [241.07]
32	Tabriz	156 (34) [28.56]	202 (48) [39.62]	264 (61) [51.01]	112 (25) [23.36]	120 (34) [24.69]	854 (202) [167.24]
33	Tehran	235 (54) [51.3]	268 (69) [56.73]	260 (70) [60.89]	297 (79) [67.54]	236 (60) [53.16]	1296 (332) [289.62]
34	Urmia	3 (0) [0.51]	3 (0) [0.57]	8 (1) [1.87]	5 (0) [0.90]	6 (1) [1.19]	25 (2) [5.04]
35	Yasuj	0 (0) [0]	3 (2) [0.62]	3 (0) [0.87]	2 (0) [0.29]	0 (0) [0]	8 (2) [1.78]
36	Yazd	92 (12) [23.9]	57 (14) [13.85]	54 (17) [12.55]	25 (8) [6.73]	29 (6) [5.48]	257 (57) [62.51]
37	Zahedan	25 (12) [6.57]	36 (13) [9.33]	23 (8) [5.79]	18 (5) [5.52]	15 (6) [3.91]	117 (44) [3.91]
38	Zanjan	7 (1) [2.03]	3 (1) [0.62]	2 (0) [0.32]	6 (2) [1.27]	8 (2) [1.98]	26 (6) [6.22]

been initiated long before than the other two databases. It is worth noting that most Iranian dental journals are indexed in PubMed. In addition, the transition from emphasizing indexing journals in PubMed towards other databases such as SCOPUS, ISC, SID, and ICI, which is made by the Ministry of Health and Medical Education, can be considered as one of the major reasons for this decline. It can be argued that this policy, which its underlying reasons are still unknown, has created more problems for dental health researchers. PubMed is the first choice of several medical and dental researchers worldwide. Hence, although not assessed in this study, the transition from PubMed Indexed journals can have a negative influence on citations to articles published by Iranian dental schools ([20], [21]). According to the best knowledge of the authors, this study, for the first time, revealed the true contribution share of authors affiliated to Iranian dental schools in publications related to this field using a "quantitative value"

variable. Using this variable, an author could get the credit only for his/her share calculated by one divided by the number of authors. For instance, consider an article with six authors that three of them are affiliated to a particular dental school. In this case, that school would get the credit for one published article. That would add to the number of publications and would exaggerate the amount of scientific production by each dental school. In the current study, however, the above-exampled school would get a 0.5 credit (three divided by six) as the quantitative value. As shown in Table 1, for about 74, 80, and 84% of articles indexed in SCOPUS, WoS, and PubMed, respectively, the first author is affiliated to an Iranian dental school. A simple calculation also reveals that the quantitative values or shares of authors affiliated to an Iranian dental school were about 64%, 68%, and 71% of indexed articles in SCOPUS, WoS, and PubMed databases, respectively. These findings prove the relatively good inter-sector research collaboration between Iranian dental schools with other sectors.

It is necessary to mention some limitations and biases of our study. Firstly, not calculating the number of citations of each published article. However, it was not possible due to various reasons, including the fact that the investigated articles are published in different years, which means different time intervals to be read by others. Hence, future studies should use a follow-up design to address this problem. For instance, by evaluating citations made to each article two years after its publication. Moreover, policymakers should pay special attention to factors that caused the observed decline during the last years of the study period. In addition, they should consider inequalities between dental schools in near future. The quality of produced articles is another crucial attribute that should be investigated.

5.1. Conclusions

All three variables have increased from 2015 to 2018, followed by a considerable decline in 2019 for both SCOPUS and WoS databases. On the other hand, since the first year of the study period, the number of published articles followed a declining trend in the PubMed database. Furthermore, there was a significant difference between the dental schools concerning the number of published articles, which should be considered seriously.

Footnotes

Authors' Contribution: Study concept and design: HH, AS, and AG. Data collection: HH and AS. Analysis and interpretation of data: HH, MV, and STH. Drafting of the manuscript: HH and AG. Final revision of the manuscript for important intellectual content: All authors.

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