The level of evidence of published articles on orthodontics in PubMed journals from Iran during 2000-2015

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Original Article

Abstract

BACKGROUND AND AIM: Evidence-based dentistry (EBD), including orthodontics, needs the availability and use of the high-quality studies. The aim of this study was to identify the level of evidence (LOE) of Iranian articles on orthodontics published in PubMed.

METHODS: All the articles on orthodontics published from 2000 to 2015 in PubMed with Iran affiliations were extracted by typing orthodontics medical subject heading vocabulary in the PubMed search. Then, the study design of each article was determined followed by assigning LOE according to Oxford scale whereby systematic review and randomized clinical trial possess highest-LOE and expert opinion has lowest-LOE. Descriptive statistic indices were applied to summarize the results.

RESULTS: Of all the articles, 34.6% were in-vitro, 24.3% were cross-sectional and 8% were randomized controlled trials (RCT). In terms of LOE, just 5% were level 1, whereas 45.9% were non-evidence. The number of articles with high-LOE increased from 2009 to 2015.

CONCLUSION: The number of orthodontic articles published in PubMed from Iran has increased in recent years. Nonetheless, there are still deficiencies in high-LOE studies.

KEYWORDS: Evidence-Based Dentistry; Level of Evidence; Orthodontics

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Evidence-based dentistry (EBD) is "an approach to oral health care that requires the judicious integration of systematic assessment of clinically relevant scientific evidence, relating to the patient's treatment needs and preference" as defined by American Dental Association (ADA).[1] Evidence-based clinical decision-making needs the availability, access and use of large and high-quality studies.[2] According to the hierarchy in EBD, meta-analyses (MA), systematic reviews (SR), and randomized controlled trials (RCT) are rated as the highest-quality studies.[3] Some bibliometric studies that are the quantitative analysis of publications have been conducted in the field of orthodontics. Sun et al.[2] assayed the clinical orthodontic evidence on Medline from the year 1966 to 1999 and concluded the less number of articles were related to therapy, Hui et al.[4] analyzed the characteristics of 100 top-cited articles from 1975 to 2011, and Primo et al.[5] quantified the published orthodontic literatures in Brazilian and international publications from 1999 to 2009. Both reported that the majority of studies rarely possess high-quality scientific evidence.

The data resulting from bibliometric studies can reflect the scientific progress in a given field or country, but a few publications can provide clinically applicable information. Further assessment is needed to identify the level of evidence (LOE) of studies.[2,6] LOE was evaluated by Sackett for the first time and

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updated by the "Oxford Center for Evidence-based Medicine" in 2009 whereby the highest-LOE includes RCT, and the lowest LOE includes studies that detail expert opinion.[4]

In recent years, Iran has demonstrated notable growth in medical sciences, including dentistry.[7,8] Badri et al.[6] surveyed orthodontic research output from Iran in international and national journals and concluded that orthodontic research production in Iran has made significant progress during the recent years until 2012. Although some studies have been performed to quantify the availability of orthodontic literature,[2,4-6] there is not any study to show LOE in orthodontic articles.

The aim of this study was to assess the LOE in orthodontic articles published in PubMed-indexed journals from Iran during 2000 to 2015.

Methods

A PubMed search was conducted for all the published orthodontic articles in PubMed-indexed journals from Iran. We (M.Sh and A.Sh) typed "((orthodont*) OR (malocclusion*) OR (functional orthopedic*) OR (crossbite*) OR (open bite*) OR (deep bite*) OR (overbite*) OR (prognath*) OR (orthognath*) OR (retrognath*) OR (mandibular deficiency*) OR (Mandibular excess) OR (maxillary deficiency*) OR (maxillary excess) OR (growth modification) OR (dentofacial orthopedics) OR (maxillary growth) OR (mandibular growth) OR (molar relationship*) OR (occlusal problem*) OR (occlusal anomal*) OR (occlusal discrepancy*) OR (tooth problem*) OR (tooth anomal*) OR (tooth discrepancy*) OR (vertical excess) OR (vertical deficiency*) OR (tooth movement*) OR (tooth correction*) OR (teeth correction*) OR (tooth alignment*) OR (teeth alignment*) OR (distal movement*) OR (mesial movement*) OR (distalization) OR (mesialization) OR (functional appliance*) OR (removable appliance*) OR (fixed applianc*))"[9] in the "all fields" search box and the word "Iran" in the "affiliation" search box. We activated the "publication dates" from 1 January 2000 to 31 December 2015. First, we scanned all the titles and divided the articles into "related," "unrelated" and "uncertain," and then we reviewed the abstracts of all uncertain articles and excluded all "unrelated" articles. Data extraction included "year of publication," "study design," and "LOE." Identifying study design and LOE, we surveyed the abstracts (not relying on the title alone) as well as full-texts if they were indistinct.

Level categorization was conducted by the authors according to table 1 which is a modification of levels in accordance to "Center for Evidence-Based Medicine"[10] and "American Society of Plastic Surgeons"[11] and "Australian National Health and Medical Research Council."[12] LOE ranks studies according to the probability of bias and quality of studies, therefore, RCTs have the highest level because they are designed to be unbiased. On the other hand, a poorly designed RCT has the same level as a cohort study. An expert opinion is often biased by author and has lowest-LOE.[13] Articles including in-vitro study, animal study, review, letter, news, and tutorial were classified as non-evidence (LOE 0).

All the extracted data were entered in SPSS (version 18, SPSS Inc., Chicago, IL, USA) spreadsheet. Descriptive statistical indices were used to summarize the results.

Table 1. Level of evidence (LOE)

Level	Type of evidence
1	High-quality RCT, or SR of this studies
2	Non-randomized clinical trial, or prospective cohort, or SR of these studies
3	Retrospective cohort, or case-control study, or SR of these studies
4	Case-series, or cross-sectional study
5	Case report, or expert opinion

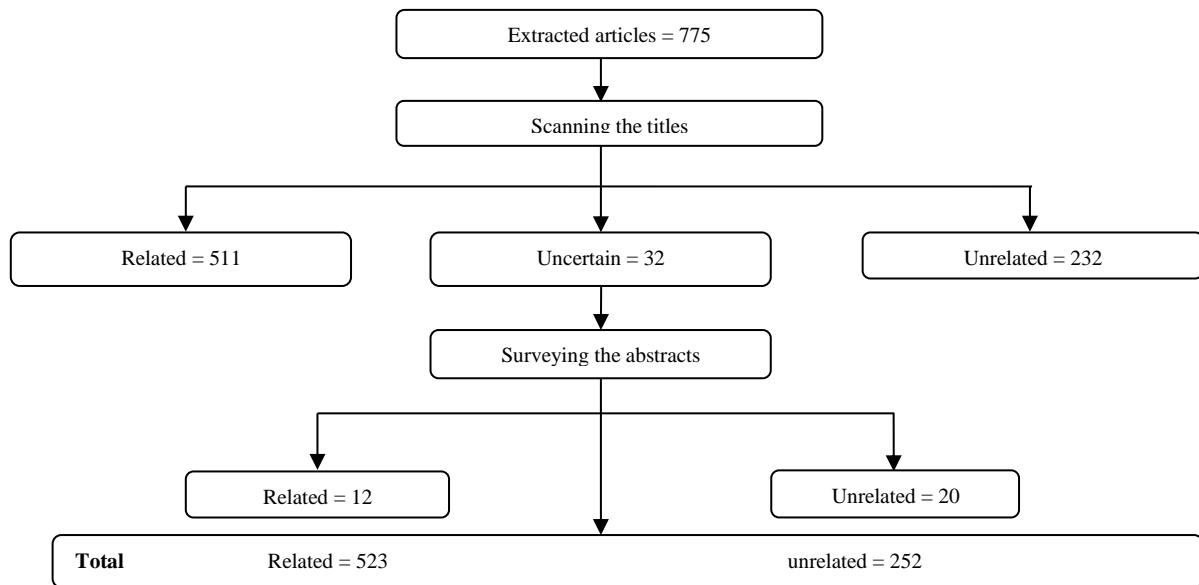RCT: Randomized controlled trials; SR: Systemic review

Figure 1. Flowchart of selected articles

Results

A total of 523 related articles were evaluated in this study (Figure 1). The number of published orthodontics articles from Iran and cited in PubMed per year from 2000 to 2015 is shown in figure 2.

Study designs of the articles are shown in figure 3. Most articles were in-vitro, followed by cross-sectional studies. Of all the articles, 42 were RCTs.

The distribution of articles based on their LOE is shown in figure 4. Of 523 articles, 240 (45.9%) were deemed non-evidence and just 26 (5.0%) were level 1.
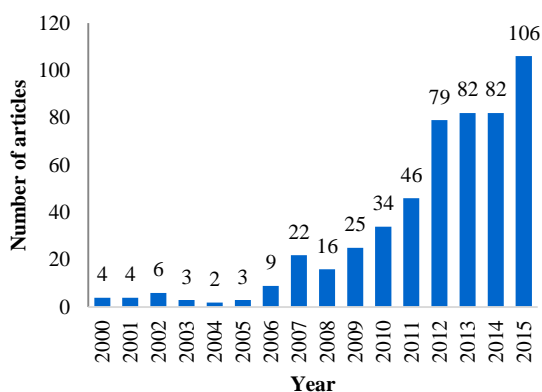

Figure 2. Number of articles per year

In terms of studies with LOE, there was not any level 1 evidence from 2000 to 2008. The number of articles with high LOE increased from 2009 to 2015, especially in 2015 (Figure 5).
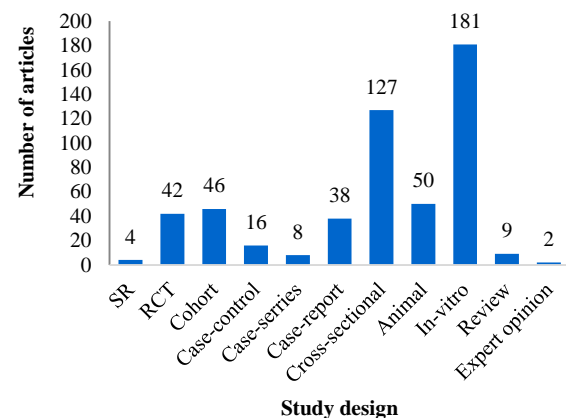

Figure 3. Frequencies of articles based on study design
RCT: Randomized controlled trials; SR: Systemic review

Discussion

Recently, there has been a tendency toward EBD,[14] including orthodontics. Orthodontics, as a biological science, uses many forms of evidence but evidence-based orthodontics is based on using the best information available; so it is critical to know what information is available.[15] In this regard MA, SR, and RCT possess the highest LOE.[3]
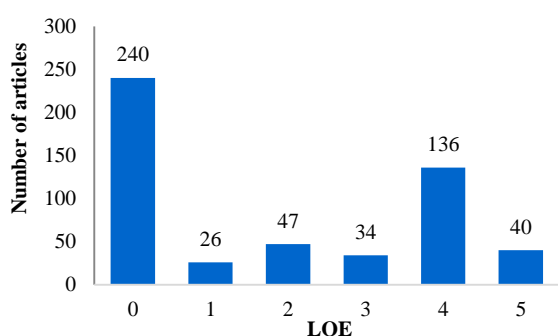
Figure 4. Number of articles in each level of evidence (LOE)

In this study, we found that just 5% of articles ranked as level 1 of evidence, whereas most of the articles (45.9%) were labeled as non-evidence, consistent with other studies.
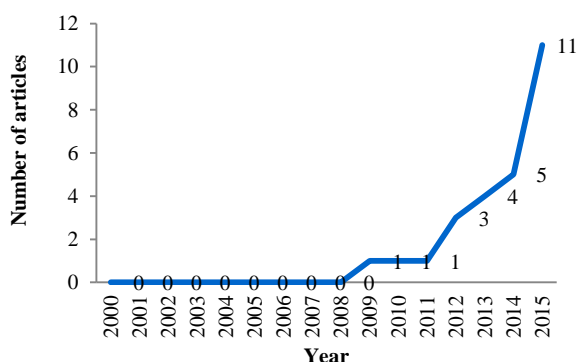

Figure 5. Trend of level 1 evidence per year

Paik et al.[16] and Torabinejad et al.[14] conducted studies to assign LOE for the outcome of endodontic retreatment and nonsurgical endodontic treatment, respectively, and both found that the majority of articles were low-LOE.

Shafiei and Shahravan[17] rated the LOE in two leading endodontic journals in 2012. They concluded that there is an increasing trend in the number of articles with high-LOE, but lack of articles that answer clinical questions can be felt.

Lau and Samman[18] assessed the LOE of four major journals in oral and maxillofacial surgery. None of the articles were level 1 whereas the majority of them were non-evidence.

Sadeghi et al.[8] evaluated the trend in dental research in Iranian publications from 1990 to 2009. The results showed that most Iranian dental articles have low potential to provide scientific evidence.

Lack of level 1 evidence is not surprising because there are difficulties in performing a standard RCT specially in orthodontics including: loss of follow-up because of trial length, difficulty to matching sample and control groups even in split-mouth design, variation in study designs, cost and many others,[19,20] but the main difficulties are related to randomization and random allocation.[14,18]

In-vitro studies constituted nearly one-third and animal studies formed almost one-tenth of studies which is consistent with Badri et al.[6] Both studies are categorized as non-evidence. Although most orthodontists look for evidence to use now, they have great regard for basic research (that can be defined as fundamental investigation) to advance scientific knowledge, without a specific application. Animal studies are sometimes prerequisites for clinical trials.[15,17]

The second most numerous articles were cross-sectional, comprising nearly a quarter of the articles which is consistent with Hui et al.[4] Cross-sectional studies take a short time to conduct; there is no loss in follow-ups. Although these studies cannot determine causal relationships, they can provide useful information for further research.[10,21]

Although RCTs comprised a small percentage, most of them were performed during 2013-2015. This finding shows that there has been a tendency among researchers to publish clinical trials recently. Other studies similarly showed this gradual increase in the number of high-LOE articles.[8,17,22]

We were aware that many papers from Iran are not indexed in PubMed; however, we used this source because of its open access and international visibility.[8]

Conclusion

Although the number of Iranian level 1

orthodontic articles indexed in PubMed has increased in recent years, it is not sufficient to answer the clinical questions in this field and it seems there is a long way to provide high-LOE research.

In addition to the number of articles, the quality of publication is also important; therefore, we suggest that further studies should be performed to critically appraise the articles.

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