Original Research Article

Evaluation of the methodology in publications describing epidemiological design for dental research: a critical analysis

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Abstract

Introduction and objective: To describe, analyze, and critically review the methodology employed in dental epidemiological research available on electronic databases, evaluating their structures according to Strobe and Consort initiative. **Material and methods:** ISI Web of knowledge, Scopus, and Pubmed electronic databases were selected for literature research, gathering publications in dental epidemiological area using the following designs: cross-sectional, cohort, case-control, descriptive, experimental, and quasi-experimental. Subsequently, five specific dentistry journals were selected and had their abstracts content analyzed under Strobe and Consort statement criterion. **Results:** From a universe of 10,160 articles from Pubmed (the greatest number), only 3,198 could be classified according to their epidemiological design by the electronic database searching tool. The most common designs were cross-sectional, cohort, case-control, descriptive, experimental and quasi-experimental publications, showing a tendency towards occurring bias and confounding factors in literature research due to missing words in papers structure. Even though Consort and

Strobe initiatives have been accomplished since 2001 and 2004 respectively, some publications are not suitable for their checklist. **Conclusion:** Consort and Strobe statements must be strengthened by dental journals, editors and reviewers to improve the quality of the studies, attempting to avoid any sort of bias or confounding factors in the literature research performed by electronic database.

Introduction

Epidemiology is a basic science responsible for several research designs rather common in health science area, adopted in the university environment as well as health governmental and non-governmental institutions, all over the world. It is a matter of concern, worldwide, that the epidemiological data should be produced and shared with other investigators and international institutions in order to serve the public interest [1].

Sharing epidemiological data has many advantages for governmental and non-governmental organizations, once it supports the principle of openness for scientific enquiry, providing opportunities to confirm results of previous researches and supplying official data for several health departments in many nations as the United Nations World Health Organization.

Epidemiological data is also important in experimental studies, leading to the creation of new medicines, vaccines, biocompatible materials, and cosmetic products in general. By either testing hypothesis or setting inferences, epidemiological approach is a well-known scientific valid methodology.

It plays also a unique role worldwide in the Centers for Disease Control and Prevention, responsible for morbidity and mortality rate surveillance, attempting to control epidemic and pandemic outbreaks [1].

Epidemiological observational studies are responsible for much of the research on the disease's cause relying on descriptive, cohort, case-control and cross-sectional designs. These play, altogether, an important role in the benefits and harms of dental interventions, once controlled trials cannot answer all important questions about a given intervention [9].

The difference among observational studies has been previously described by authors into a dichotomy classification, as claimed by Levy and Stolte [6], classifying the designs as either analytic or experimental, cohort, case-control and cross-sectional. Articles not classified as analytic were considered descriptive or polemic in nature. On the other hand, the Strengthening the Reporting of Observational Studies in Epidemiology Statement – Strobe – initiative, has clearly defined observational studies as a distinguished area from randomized controlled trials, evaluation or diagnostic studies [9], and thus recognize only descriptive and analytical studies.

In contrast to observational study designs, interventional studies manipulate the clinical care to evaluate the treatment effects' outcome and therefore are considered experimental designs. According to the Consolidated Standards of Reporting Trials Statement – Consort –, interventional studies may accept two classifications: true experimental and quasi-experimental designs [5, 6].

Epidemiology data are currently available in several international databases, especially electronic ones, as well as institutional websites, making literature research easier than ever. However, some differences in reporting data may arise when comparing data from different sources regarding their epidemiological classification.

Encouraged by the Strobe and Consort initiative this present study was carried out in order to contribute to the International Epidemiological Association for determining further critical validation criteria on reporting epidemiologic studies as well as to divulge the dentistry epidemiological research status worldwide. Therefore, we analyze the publication standards described in abstracts of the 5 most cited international journals in dentistry selected through electronic database literature research.

Materials and methods

This present critical review research was carried out through selecting every publication on epidemiology from 3 electronic databases: ISI Web of knowledge, Scopus, and Pubmed. This was performed through using the dentistry filter available at each electronic database, since their outset, searching for epidemiological observational and experimental publications. As eligibly inclusion criteria, the following keywords were used: epidemiology; dentistry; and either cross-sectional or case-control, cohort, experimental, quasi-

experimental, and descriptive studies. Exclusion criteria comprise any medical or veterinary papers, which were not relevant for dental practice or present general medical issues as their main research subject. A dentistry filter was adopted for ISI Web of knowledge and Scopus, whereas a specific dental journal filter was adopted for Pubmed database.

The epidemiological studies present, however, a controversial classification according their design. In many cases, the adopted designs are not mentioned in the title, abstract, or keywords, consequently, they are not found by the electronic literature research. In table I, below, the six epidemiological designs adopted in this present study are described in order to establish the available criteria.

Table I – Classification adopted by the authors, according to international epidemiological design criteria

Observational	Descriptive		A simple description of facts without setting inferences to be able to perform specific analysis
	Analytical	Cross-sectional	The presence or not of either disease or risk factor simultaneously for allocating the subjects
		Case-control	The presence or not of disease for allocating the subjects
		Cohort	The presence or not of risk factor for allocating the subjects
Randomized Trials	Quasi-experimental		The presence of a non-randomized intervention to compare before and after the effects of an intervention.
	Experimental		The presence of intervention on the subjects in a randomized controlled trial sample.

Therefore, the designs were ranked according to the number of publications at each electronic database. Following, the 5 most cited journals were selected according to Scopus database citation, since the journal provided the number of epidemiological publications on dentistry per each analyzed design. When comparing the epidemiological data to one of the six specific epidemiological aforementioned designs, the profile of the journals changed considerably. Although some traditional journals appeared leading the rank, the addition of specific keywords in this search (e.g., epidemiological design) substantially changed the final classification.

Subsequently, 100 epidemiological dentistry design abstracts from these 5 most cited journals (20 abstracts of each journal published in the year of 2008 and 2007) were randomly selected and evaluated according to the Strobe and Consort criteria for title, abstracts, and keywords. This aimed to identify the feasible lack of prior information on publishing epidemiological designs.

It is well known that the titles, abstracts, and keywords are important components in literature research, once the majority of electronic database research lies on its content: matching words present in title, abstract, and keywords. Thus, the adopting standard criteria created by Strobe and Consort would probably improve the quality of information yielded by these publications.

The Consort statement, proposed in 2001, rules the experimental designs by asking the authors to describe how patients were allocated into the intervention, in the abstract content [5]. Following the same principle, the Strobe statement, proposed in 2004, recommends that every observational publication should describe the study design with commonly used terms in the title or abstracts, providing an informative and balanced summary of what was done and found in the observational designs [9].

Results

When the words "epidemiology" and "dentistry" were used in the literature research, over 10,160 articles were found in Pubmed database. Pubmed was the greatest provider database, comparing to ISI of knowledge (1,337 articles) and Scopus (729 articles). Adopting one of the six epidemiological design keywords previously described, added to the words "dentistry" and "epidemiology", the results were much smaller than the use of only "general epidemiology", as shown in table II. For Pubmed

searching, a special filter available in the website was used for selecting only dental journals. In Scopus and ISI database was also an available filter for dentistry publications.

Table II – Epidemiological studies gathered from the 3 electronic databases available at the time of the literature research, according to the epidemiological dental design. Accessed in June 5th, 2008

Designs Database	Cross-sectional	Case-control	Cohort	Experimental	Quasi-experimental	Descriptive
ISI (dentistry*)	90 36.4%	35 14.2%	68 27.5%	23 9.4%	0	31 12.5%
Scopus (dentistry*)	341 42.7%	121 15.1%	222 27.8%	59 7.4%	0	56 7%
Pubmed (dental journal*)	1122 47.6%	318 13.5%	629 26.7%	121 5.1%	4 0.1%	165 7%

* Filter adopted at each one of them

Regarding the countries responsible by the publications, they were counted according to the total number of papers in a sample of 100 abstracts gathered from Pubmed. Then, we classified the five leading countries: USA, U.K, Germany, Italy, and Brazil, as seen in table III.

Table III – Number of the five leading countries, considering the number of publications in the last 2 years (2007-2008), from a sample of 100 abstracts gathered from Pubmed

	USA	UK	Germany	Italy	Brazil
Total	42%	16%	15%	7%	7%

The selected journals in this present research were: Community Dentistry and Oral Epidemiology, Journal of Public Health Dentistry, Journal of Clinical Periodontology, Journal of Periodontology, and Swedish Dental Journal. The adopted inclusion criteria were the total number of specific epidemiological design cited on literature research per journal, available in Scopus electronic database.

Discussion

Two interesting points should be addressed here. First, the omitted words regarding the type of epidemiological research design adopted by the authors before starting the study may not contribute to find the epidemiological studies in literature research. Second, why Strobe and Consort criteria had been forgotten by editors and reviewers in their journal.

About 6,962 epidemiological articles were not classified according to the six different designs proposed by this paper, neither experimental nor observational. This results in another sort of epidemiological methodology in addition to that adopted by this present paper. Occasionally, these studies may be classified as evaluation, comparative or validation study, according to the Pubmed classification, available at the website, on section "type of articles".

ISI Web of Knowledge database was created by Dr. Eugene Garfield, in 1955, providing ever since publications in science, social science, arts, and humanities. It covers back to 1945, including cross and cited reference searching, and full-text linking tools. It is accessed by over 3,200 institutions, 20 million researchers, in 90 countries, displaying an access average of 150,000 visits per day, being sponsored by Thompson Corporation [3].

Scopus is an abstract website, a citation database of research literature offering 15,000 peer-reviewed journals from more than 4,000 publishers, 33 million abstracts including references back to 1996 and some to 1841. Its tools are able to find, refine, and quickly identify results from literature research. In this website,

the data refined from the most cited source titles is available, according to the searching keywords employed [4].

Pubmed is a U.S National Library of Medicine database and provides over 17 million citations from Medline and other biomedical journals back to 1950. In its website is worth noting that there are tools for searching from the past 10 years and it is also available a filter for publications on dental journals. In the section "type of article", however, the searching for epidemiological designs is not available. Notwithstanding, Pubmed displays the options for controlled clinical trial, randomized controlled trial, meta-analysis, case report, and many others [8].

It can be seen that when the word "epidemiology" was omitted at the three electronic database described above, the amount and profile of publications changed drastically, resulting in dentistry experimental studies as the leading design. This same result was found for ISI and Scopus as well. On the other hand, when the "epidemiology" keyword was added, cross-sectional studies were the leading design founded in the three electronic databases.

As it might be seen, there is a large difference in the publication profile when the keyword "epidemiology" was omitted. Consequently, most of the publications yielded in dentistry, since these databases outset, pointed out to experimental research designs. Accordingly, researchers may wonder if any of those selected articles would belong or not to epidemiological designs.

Another good question to be answered is why analyzing the title, abstracts, and keywords instead of the whole paper. Currently, the literature research is mainly performed through database searching, in which is essential to choose keywords related to the main subject question. The database website searching tools, in general, seek for papers in which the keyword adopted by the researcher is present or not in either the title and abstract, or the cited keyword itself. From this point of view, figure 1 to 3 shows the dilemma of some words that had not been adopted, as eligible criteria, for many journals, websites, reviewers, or editors before publishing the manuscript, causing a bias or acting as confounding factors during the literature research at epidemiological dental area.
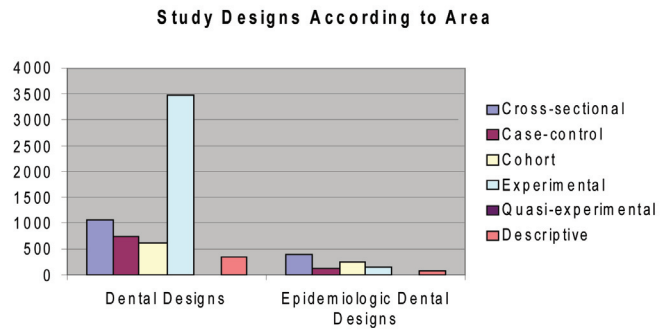

Figure 1 – Profile of publications in which the "epidemiology" keyword was set or omitted in the 3 electronic databases searching tool. The results represent the mean among them. The experimental design leads the rank of dental designs, whereas the cross-sectional leads the rank of epidemiological designs
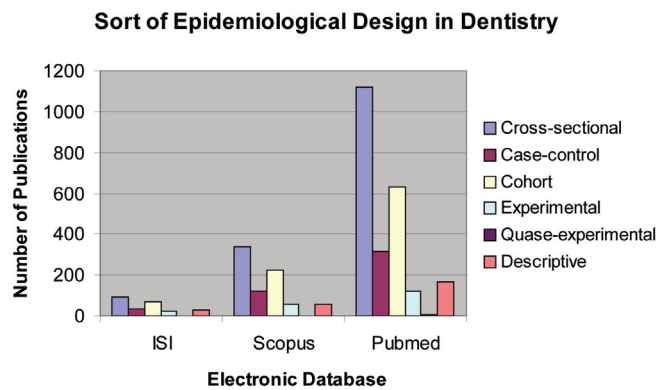

Figure 2 – Profile of epidemiological design found in the electronic databases since their outset. It is worth noting that the cross-sectional design leads the rank
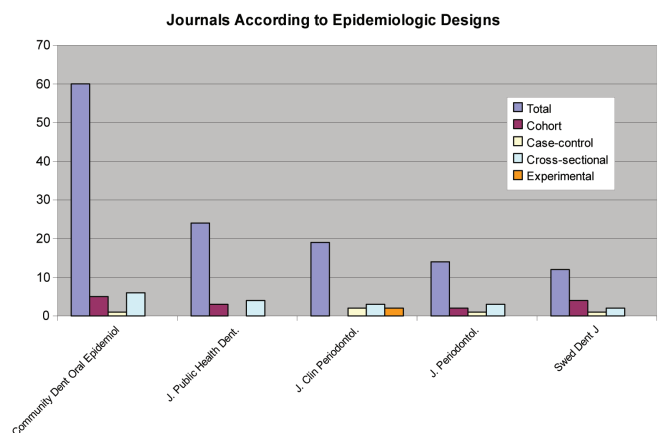

Figure 3 – Most cited journals by Scopus, when searching for epidemiological designs and type of epidemiological design (Scopus, 2008)

Consort [7] and Strobe [10] international initiatives have been created, aiming to clarify this issue in order to standardize publications

parameters, making possible to compare or search results from any research performed under different conditions at different locations. Both initiatives adopted in this paper claim the need of mentioning the epidemiological design adopted by the authors in the title, abstracts, or keywords. This attempts to validate the reliability of every research. By doing so, this also aids the website tools in the searching of papers related to any epidemiological design, avoiding any sort of bias during literature research.

Quasi-experimental studies are often conducted where there are practical and ethical barriers for conducting randomized controlled trials – RCTs. Normally, they are divided into three sorts: uncontrolled before and after study; time series design; and controlled before and after study [6]. Few quasi-experimental studies were found in this present research, demonstrating that this sort of epidemiological design is not clearly adopted or understood by the researchers, editors, reviewers, and international initiatives on classifying epidemiological designs.

Conclusion

Consort and Strobe statement must be strengthened by journals, editors, and reviewers in order to improve the quality of the study methodology and as well as to attempt avoiding any sort of bias or confounding factors in literature research performed by electronic database.

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