Critical Appraisal and Positive Outcome Bias in Case Reports Published in Brazilian Dental Journals

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Abstract: The aim of this study was to carry out a critical appraisal to detect the occurrence of publication bias, specifically positive-outcome bias, in Brazilian dental journals. A convenience sample of twenty-eight dental journals published in Brazil between 1994 and 2003 was selected (564 issues containing 5,453 articles). Each article was classified according to methodological design; 1,064 were classified as case reports. A simple random sample of 435 articles comprised the final study sample and was submitted to a critical appraisal by previously trained raters. Although a great part of case reports achieve proper structural aspects, most authors did not consider important aspects that could help the decision making process, such as discussion of alternative approaches, limitation of the performed procedures, lack of long-term clinical follow-up, possible variations in treatment outcome, and failure to discuss limitations of study design. In addition, unanimous reports of successful outcomes of clinical interventions strongly suggest that publication of case reports was influenced by positive outcome bias, which may influence readers' clinical decision making process.

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Advances in clinical health sciences are largely disseminated by studies published in specialized journals in order to improve clinical practices according to a specific focus. Studies vary in their potential for influencing practice, depending on the strength of evidence of methodological design and quality of research methods. Strength of evidence is ultimately based on the notion of causation and the need to control bias.[1] Bias is defined by a nonintentional systematic error introduced in any phase of the study, caused by incorrect conceptual or methodological assumptions that are not resolved due to practical limitations or not identified in time.

Case reports are widely used in dentistry to investigate clinical aspects or procedures that are not well known or not properly documented. They are especially useful in reporting complications or adverse events in individual patients or to propose the hypothesis that a subgroup of patients may react differently to an intervention.[2] Case reports and case series of a novel treatment approach are studies that usually precede other more complex designs like well-conducted randomized clinical trials. Although they may be a good starting point to describe some clinical scenario, case reports are essentially qualitative and exploratory studies and are strongly subject to bias. The limited number of observations (a single patient), the lack of controls, and the subjectivity in interpreting outcomes usually minimize the validity of clinical inferences.

On the other hand, case reports have the potential to influence clinical decisions because they are patient-centered and deal with tangible outcomes (or benefits) that directly measure how a patient feels, functions, or survives.[3] Case reports and case series are often the first line of evidence and likely to account for the greatest part of discarded treatments in medicine.[4] Consequently, case reports have strong appeal to the dentist, particularly when clinical decision making is not aided by an evidence-based approach.

Scholey and Harrison[5] recently stated that dental researchers need to be aware of the potential problems that arise from a specific kind of bias:

publication, or positive-outcome, bias. That is defined as the tendency of investigators to submit, or reviewers and editors to accept, manuscripts based on the direction or strength of the study findings.[5,6] This definition is based on the fact that studies with the most positive outcomes (or most successful results) are more likely to be published, with the related assumption that negative results are obtained in poor quality studies.[7]

The main problem associated with positive-outcome bias is that positive findings may potentially affect clinical practice, by encouraging dental practitioners and opinion-makers to choose presumed successful treatments or procedures without evidence of the likelihood of negative outcomes to occur. Therefore, the aim of this study was to identify the occurrence of positive-outcome bias of case reports published in Brazilian dental journals and to make a critical appraisal to access the methodological quality of these articles.

Materials and Methods

A Brazilian database of national and international dental journals was used for selection of publications (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, CAPES, 2004). After excluding all journals published outside Brazil and those with interrupted circulation, ninety-five dental journals were initially screened. A convenience sample of journal titles was selected according to their immediate availability of original issues or electronic format. Original issues were obtained by hand-searching in three regional libraries: Federal University of Goias, Anapolis School of Dentistry, and Brazilian Dental Association of Goias.

A representative sample of twenty-eight dental journals and 564 issues of these journals was selected for the period of 1993 to 2003 (Table 1). The issues included 5,453 articles that were classified in relation to study design according to previously defined criteria.

Two independent and previously trained raters examined all articles, and when agreement was not achieved, divergences were solved by mutual consensus. Articles were classified as case reports when they met the following inclusion criteria: 1) investigation of a disease in a single patient or 2) report of treatment or intervention in a single patient, 3) report of complications or adverse effects of interventions in a single patient or 4) description of a new technique or new clinical procedure in a single patient.

After analysis, 1,064 (19.5 percent) of the original 5,453 articles were classified as case reports. A random sample of 50 percent of the screened articles that met inclusion criteria was selected (n=532). Those restricted to diagnostic procedures (n=97) were excluded because they usually do not achieve a clinical outcome as a result of an intervention. Hence, only interventional studies were included, resulting in a final sample of 435 case reports.

An evaluation instrument was constructed, and the 435 case reports were critically appraised by the same two raters using previously defined criteria, as follows:

- Title: must be appropriate, clear, concise, specific, and pertinent and must clearly indicate study design (case report) and scope of the study.
- Abstract: must 1) contain the central idea of the title and 2) be properly structured and provide the objective of the study, case description, methods, results, and conclusion.
- Introduction: must 1) clearly state a specific clinical problem, 2) report rationale derived from research or clinical experience that supports proposed intervention and conduct of the study, and 3) define an objective to be achieved or hypothesis to be tested.
- Case description: 1) description must include general information about the patient such as age, gender, and other relevant individual characteristics (socioeconomic, cultural, etc.); 2) description of clinical scenario must include chief complaint, detailed description of clinical problem, summary of dental and medical history, and other clinically relevant information; 3) clinical scenario must support the intervention adopted or within the presented context the intervention that was absolutely needed; 4) other realistic alternative approaches must be proposed and discussed, as well as 5) justification not to use other alternatives; 6) technical and clinical procedures must be properly described to allow reproduction; and there must be 7) a detailed description of outcomes, 8) a report of the impact of treatment on the clinical problem, and 9) the results of follow-up evaluation. Photographs must be adequate in number and clearly describe 10) the initial clinical scenario, 11) technical procedures, and 12) the final clinical scenario.
- Discussion: 1) limitations of study design and 2) potential variations on clinical outcomes must

Table 1. Brazilian dental journals included in the sample (n=28)

Journals*	Period of Evaluation (initial-final)	Number of Issues Included (n=564)**
Revista da ABO Nacional	1994-2003	54
Revista Brasileira de Odontologia	1993-2003	51
Revista de Associação Paulista de Cirurgiões Dentistas	1994-2003	45
RGO: Revista Gaúcha de Odontologia	1993-2003	40
JBP: Jornal Bras. de Odontopediatria e Odontol. do Bebê	1994-2003	30
PCL: Revista Brasileira de Prótese Clínica e Laboratorial	1999-2003	28
BCI: Revista Bras. de Cirurgia, Prótese e Implantodontia	1996-2002	25
ROBRAC: Revista de Odontologia de Brasil Central	1993-2003	25
JBO: Jornal Brasileiro de Ortodontia e Ortopedia Facial	1999-2003	24
Ortodontia: Sociedade Paulista de Ortodontia	1994-2002	24
Revista da Faculdade de Odontologia de Bauru	1993-2002	24
Brazillian Dental Journal	1994-2003	22
JBO: Jornal Brasileiro de Odontologia Clínica	1997-2003	22
Brazilian Oral Research (Pesquisa Odontológica Brasileira)	2000-2003	17
CROMG: Rev. Do Conselho Regional de Minas Gerais	1995-2001	16
Ciência Odontológica Brasileira	1998-2003	15
JBC: Jornal Bras. de Clínica e Estética em Odontologia	2001-2003	15
Revista de Faculdade de Odontologia de Lins	1993-2003	14
Revista de Odontologia da UFES	1998-2003	11
Arquivos em Odontologia (UFMG)	1997-2003	10
JBO: Jornal Bras. de Ortodontia e Ortopedia Maxilar	1996-2003	10
Revista Endo-Perio	2000-2003	9
Revista da Faculdade de Odontologia de Anápolis	1999-2003	9
Brazillian Journal of Oral Science	2002-2003	7
Rev. do Conselho Regional de Pernambuco	1998-2001	7
Revista da APCD Regional de Araçatuba	2002-2003	4
Revista da Faculdade de Odontologia da UFG	1997-1998	3
Revista Odonto Ciência	2001-2002	3

*All journals were published in Portuguese, except journals marked in italics, which contain some articles in English.
**Not all published issues in the period were evaluated.

be presented and/or discussed; 3) there must be cited literature that supports the intervention; and 4) restrictions to intervention must be properly presented and discussed.

- Conclusion: 1) must be clear and unbiased, and 2) based on clinical significance of outcomes.

A final question was included to detect a possible positive-outcome bias: "Does the case report clearly have a positive outcome, and was the intervention described as successful by the authors?"

All these items were distributed in twenty-five questions related to article title, abstract, introduction, case description, discussion, and conclusion. Three response categories were provided: 1) yes, 2) no, or 3) in part. Guidelines were also provided for each question to guide examiners' appraisal. Descriptive analysis of data was done using SPSS 10.0 software.

Results

A summary of the results of the critical appraisal is in Table 2. Analysis of data reveals that the formal structure of case reports described previously was followed in the majority of studies. Title, abstract, description of patient, clinical scenario and procedures, photographs, and conclusions were mostly appropriate or at least partially appropriate. On the other hand, some valuable information that might influence the decision making process of dental practitioners was often not provided.

Case reports often (94.7 percent) failed to discuss other realistic alternative approaches to the intervention, and reasonable reasons to reject alternatives to the intervention were omitted in 96.1 percent of them. Follow-up results were properly reported in 50 percent of the studies, and in approximately

Table 2. Frequency distribution of responses to critical appraisal of selected case reports (n=435)

	Question	n (%) Yes	No	In Part
01	Is the title appropriate?	245 (56.3)	1 (0.2)	189 (43.4)
02	Is the abstract matching the title?	429 (98.6)	5 (1.1)	1 (0.2)
03	Is the abstract properly structured?	32 (7.4)	32 (7.4)	371 (85.3)
04	Does introduction clearly state a specific clinical problem?	417 (95.9)	5 (1.1)	13 (3.0)
05	Is there a reasonable reason for conducting the study?	399 (91.7)	22 (5.1)	14 (3.2)
06	Does introduction explicitly state an objective to be achieved or hypothesis to be tested?	236 (54.3)	37 (8.5)	162 (37.2)
07	Are patient's characteristics properly described?	102 (23.4)	31 (7.1)	302 (69.4)
08	Is initial clinical scenario properly described?	428 (98.4)	4 (0.9)	3 (0.7)
09	Does clinical scenario supporting intervention adopted?	427 (98.2)	7 (1.6)	1 (0.2)
10	Are other realistic alternative approaches proposed and discussed?	19 (4.4)	412 (94.7)	4 (0.9)
11	Are there reasonable reasons to exclude alternative approaches?	13 (3.0)	418 (96.1)	4 (0.9)
12	Are technical and clinical procedures of intervention properly described?	373 (85.7)	18 (4.1)	44 (10.1)
13	Are there detailed descriptions of outcomes?	392 (90.1)	30 (6.9)	13 (3.0)
14	Is the impact of treatment on the clinical problem clearly reported?	353 (81.1)	57 (13.1)	25 (5.7)
15	Are follow-up results reported?	218 (50.1)	155 (35.6)	62 (14.3)
16	Are photographs sufficient and suitable to describe initial clinical scenario?	418 (95.9)	6 (1.4)	11 (2.5)
17	Are photographs sufficient and suitable to describe technical procedures?	297 (68.3)	48 (11.0)	90 (20.7)
18	Are photographs sufficient and suitable to describe final clinical scenario?	375 (86.2)	30 (6.9)	30 (6.9)
19	Are limitations of study design presented and/or discussed?	46 (10.6)	351 (80.7)	38 (8.7)
20	Are potential variations on clinical outcomes presented and/or discussed?	102 (23.4)	294 (67.6)	39 (9.0)
21	Are there evidences in the literature that support the intervention?	419 (96.3)	10 (2.3)	6 (1.4)
22	Are restrictions to intervention properly presented and/or discussed?	32 (7.4)	396 (84.8)	34 (7.8)
23	Are conclusions clear and unbiased?	295 (67.8)	31 (7.1)	109 (25.1)
24	Are conclusions based on clinical significance of outcomes?	394 (90.6)	30 (6.9)	11 (2.5)
25	Does the case report clearly have a positive outcome and the intervention was considered and described as successful by the authors?	431 (99.1)	0 (0,0)	4 (0.9)

36 percent of the studies no information about long-term performance of treatment was provided or even mentioned as being important.

Due to limitations of the study design, case reports must be carefully appraised when clinical inferences are made. However, 80.7 percent of the reviewed articles did not mention any methodological restriction of study design (10.6 percent, yes). No potential variation of clinical outcomes was presented or discussed in 67.6 percent of the studies (23.4 percent, yes), and no restrictions of intervention were presented or discussed in 84.8 percent of the studies.

Structure of abstracts was partially appropriate in 85.3 percent of studies, objectives were explicit in approximately half of the studies (54.3 percent, yes; 37.2 percent, in part), and the patient's description was adequate in 23.4 percent (69.4 percent, in part).

Considering the likelihood of positive-outcome bias, almost all studies reported favorable outcomes and successful interventions (99.1 percent). Only four studies (0.9 percent) did not reported successful outcomes after intervention. Patients abandoned treatment in two of these studies, and the outcome of the intervention was not described in the other two reports. It was observed that these four studies were not published intentionally to report negative outcomes because a positive outcome was assumed throughout the text. These findings strongly suggest that case reports are almost exclusively used by authors to report interventions with positive outcomes, which may be considered as a positive-outcome bias effect.

Discussion

Evidence-based clinical decisions require critical appraisal of available research evidence for validity and usefulness, mediated by clinical expertise and the patient's preferences, in order to maximize the

potential for successful patient care outcomes.[8] When considering a case report, dentists need to be aware of the strengths and weakness of the study design, to know how the study was conducted and reported, to understand factors that encourage publication of case reports, and to know how the publication process takes place. These indicators may help practitioners to judge the relevance and application of the evidence for a specific clinical problem or a question that needs to be answered.

There is currently little research on publication bias in dentistry, though other areas of health care research have been aware of the potential problems that arise from the development of a biased pool of evidence.[6,7,9,10] Assessments of publication rates of studies presented at scientific meetings have shown that positive outcome is one potential predictor of submission and publication of complete studies.[11,12] Dickersin et al.[13] observed in medical studies that investigations are more likely to be published when results are considered "significative" and null hypotheses rejected (OR=2.54; IC95%=1.63-3.94). Misakian and Bero[14] analyzed studies on passive smoking and detected that median time for publication was five years (CI 95%= 4-7 years) for non-significant outcomes ($p>0.05$) and three years (CI 95%=3-5 years) for significant outcomes ($p<0.05$). Littner et al.[15] verified that articles with negative results are more likely than articles with positive results to be published in journals with lower impact factors. Positive-outcome bias was also observed as a potential source of bias in systematic reviews and meta-analysis of randomized clinical trials.[16-18]

Publication bias has not been assessed in case reports except recently.[4] These authors observed that case reports and case series are well received and have significant influence on subsequent literature and possibly on clinical practice. Overall, there is a strong publication bias favoring positive results, and opportunity should be created for publication of follow-up reports in controlled clinical trials.[4]

In the present study, a positive-outcome bias was evident. There was almost unanimous reporting of intervention success, and most studies did not report any skepticism about the effectiveness of the intervention under study. One can therefore assume that patients often do not participate in clinical decisions and that they are not fully informed about treatment alternatives, limitations, and potential variations in outcome. Follow-up information, even in short-term studies, was frequently not reported, which may decrease confidence in inferences about the effectiveness of interventions. Although declaration of commercial funding by authors has not been studied, investigators who were funded by dental companies or equipment suppliers may have implicit conflicts of interest. Therefore, when not properly managed, commercial support could contribute to increasing the risk of positive-outcome bias in case reports.

Our findings strongly suggest that case reports are almost exclusively used by authors to report interventions that result in positive outcomes, or, alternatively, journal editors fail to publish negative outcomes reported in case reports. On the other hand, it can be argued that conceptually all clinical data are of value, provided that the study design and procedures underlying the conclusions are well controlled and valid. As pointed out by Ashley,[19] a negative outcome is only "negative" for the individual or organization that sponsored or had commercial interest in the investigation underlying the paper. If the study results in data that refutes an initial hypothesis, the publication of these data may not result in negative outcome for anyone. Indeed, the outcomes might be positive. Negative data can provide balance, indicate immaturity of knowledge, demonstrate that a line of research is not worth following, or reveal inadequate methodology, all of which are outcomes that the author and the publisher should be lauded for publishing.[19]

Our report does not intend to persuade dental practitioners and researchers to submit case reports with negative outcomes for publication. Journal editors should encourage reporting experiences of clinical success. However, poor reporting of important issues for clinical decision making may also dissuade readers from taking questioning postures on published studies. If authors have a deliberate intention of publishing only successful performances without considering multiple factors that can lead to failure, they might be contributing to a misleading notion of clinical success in dentistry.

Scientific journal reading is an important continuing educational activity. Finding and using published results to support professional decisions must be a systematic process, based on the principles of evidence-based practice. Therefore, how to decide whether to read and use an article that may be relevant to a clinical decision is part of continuing education for dental students and practitioners. The use of these strategies may improve the efficiency of readers for incorporating research results into their practice.

More studies are needed to assess the potential influence of positive-outcome bias on dental practi-

tioners' clinical decisions. Readers must be aware of this problem so they can critically judge the internal and external validity of studies and ultimately avoid exposure of patients to unnecessary and unjustified risks.

Conclusion

Case reports published in Brazilian dental journals usually fail to discuss important points that help readers assess the validity of the study and appropriateness of the intervention reported. Case reports exhibit a positive-outcome bias, which may have negative influence on dental practitioners' clinical decision making.

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