Review Article

Is positive publication bias really a bias, or an intentionally created discrimination toward negative results?

ABSTRACT

Today in publish or perish era, where manuscripts and research with successfully proven hypothesis or positive results are given more importance by journals, editors, funders, and institutions. The publication of researches with negative or null results is on the verge of extinction, thus creating an intentional bias known as publication bias. This review aims to discuss the consequence of the undermined importance of negative results and problems associated with it and will elaborate the importance of reporting negative results. Under-reporting of negative results not only wastes other researchers time, money, and manpower on which their researchers will be based but also introduces bias in meta-analysis leading to distortion of the scientific literature and misleads researchers, doctors, and policymakers in their decision-making. Many such important studies with negative results remain unpublished and therefore unavailable to the scientific community for understanding their values. A large number of human studies with huge risk to life's are carried out with the assurance that the proposed study will be performed with the aim to benefit, and results will be dissipated to everyone concerned, non-publication of such studies with negative results will not only be morally wrong but will also have ethical obligations to deal with. Therefore, all journals and their editor along with researchers and stakeholders need to be generous in giving importance to disseminating negative and positive findings alike.

Key words: Editorial policies; peer review; publication bias; publishing; research

Introduction

In publish or perish era where winners are decided by the performance, and the impact of individual scientists is decided by the number of publications in high impact journals. Research institutions and organizations are no behind to increase their reputation and credibility by forcing the young researchers and academic staff for publishing a large number of research and increasing their cite score. This high-level pressure and expectation to keep head high in the scientific community has given rise to concerns regarding increased competition for fundraising and citations for getting established in the scientific community but had also made every researcher lure to rush toward making important discoveries for achieving these goals.[1]

Research manuscripts are written by scientists of various disciplines for a variety of motives such as dissemination of recent important findings, to solve ongoing problems related to community/patients, to gain reputation or accountability, and at last to gain promotions or research grants. This

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Hunny Sharma, Swati Verma[1]

Department of Public Health Dentistry, Triveni Institute of Dental Sciences, Hospital and Research Centre, Bilaspur,
[1]Department of Public Health Dentistry, Rungta College of Dental Sciences and Research, Kohka, Bhilai, Chhattisgarh, India

Address for correspondence: Dr. Hunny Sharma, MD 264, Phase 4, Near AIIMS Residential Complex, Kabir Nagar, Tatibandh Raipur - 492 099, Chhattisgarh, India. E-mail: smilerecoverydc@gmail.com

pressure to publish or perish has led bias to crawl in each step of biomedical research, one such bias is intentionally cooked up or selective publication of positive result.[2]

To state the significant findings with proud the medical and dental journals in the current era are flooded with importance given to *P* values and tests of hypothesis making it as common practice among researchers.[3] Researchers and manuscripts with positive findings and successfully proving the hypothesis are given more importance then study which fail to prove the hypothesis and are ultimately considered as studies with negative results.[4]

Bias in publication occurs when there is selective suppression or publication of research results according to the outcome or of personal benefits. These bias not only distorts the scientific process but also disrupts the self-correcting process of other bias in research.[5] Positive publication bias occurs when there is lack of interest of scientists toward negative and non-significant results because of high rejection rates in journals as it attracts fewer readers and gives less cite score or publish selective reporting of outcome for getting published in high impact journals known as outcome reporting bias.[6-8]

Why there is negativity toward negative results in publication?

Science is continuously evolving field build step by step on older building blocks of knowledge laid by the experienced researchers and by its inherent nature is a collaborative discipline. This makes it extremely important that negative results are also conveyed to fellow researcher and colleague by means of publication so they do not waste their time and resources on repeating the same findings.

However, in the current era where the worth of a research paper is judged by most of the journals on the basis of impact and citations, many researchers consider unworthy to construct the paper and survive the peer-review process of reputed indexed journals when a research paper with positive results can be published easily. Hence, although negative results hold a great value in biomedical field, they are equally important as positive results but are unfortunately given least importance to be considered for publication in reputed indexed journals.[9,10]

Importance of negative results in biomedical research

Negative results in a biomedical field act as a self-correcting phenomenon in biomedical literatures which, when published becomes extremely important and interesting when they contradict important proven facts or falsely claimed, but unfortunately ignored by most researchers and journals owing to self-centered thinking of less interest to readers. Continued discrimination toward negative results may result in flawed concept with non-productive outcome to gain attention from fellow researchers, agencies, and funder keeping away the desired attention from potentially more fruitful concepts and endeavors. Similarly, established scientific theories and concepts which are proven earlier are hard to overthrow until and unless researches publishing negative results or contradictory results are published to give a new understanding of the current situation. Hence, publishing negative results considering it as important as positive results; unique opportunity is provided to scientists and researcher's to become aware of the recent findings and reconsider their research plans and increase productivity.[11-13]

What is the impact of positive publication bias on scientific community?

Increased importance given by most of the institutions toward publications for giving promotion or increase of tenure in academic jobs had led to increased pressure on new emerging researchers and established scientists. Thus, deviating scientists to pursue paths of investigation that are not necessarily logical or hypothesis-driven and conduct research with results obviously deviated toward positive side. Most of the current researches lack reproducibility and has been associated with selective reporting of the results by the researchers to produce novel results, or to make analysis part of ease, or to acquire media and funders attention. Thus, publication bias declines the reliability of the biomedical research and interrupts the normal self-correcting principle of the biomedical research, which occurs in the form of negative results. Today positive publication bias had crept to such an extent in biomedical research that theoretical predictions are less accurate, methodologies less reliable, and true replications difficult to find, ultimately distorting biomedical science by increased rate of both false positives and false negatives.[10,12,14]

What we can do to tackle the problem of publication bias in meta-analysis?

There are many methods to estimate the extent of publication bias in biomedical research or in simpler terms to estimate the risk of publication bias in meta-analyses. One such method is "funnel plot" proposed by Light and Pillemer in 1984. A funnel plot is a visual representation of the estimated treatment effect versus the reciprocal of its standard error. A symmetric inverted funnel plot is a representation of lower likelihood of publication bias. The funnel plot approach is based on the proposition that bias can be identified in the relation of effect size to sample size, and hence a noticeable decrease in specific regions of the graph can be observed in the presence of selection bias which can be a direct adverse outcome of a selection mechanism in which the probability

of publication is a function of the observed *P*-value. Because every method has inherent limitations "funnel plots" also has an inherent limitation that sufficiently large number of studies with varying sizes is required and if relatively small number of studies are included the funnel plot will fail to detect funnel-plot asymmetry even if it existed. While several other factors may also lead to asymmetrical funnel plots even if a large number of studies are included. This may include publication bias related to delay in publication, difference in the language of publication across countries, citation bias and at last multiple publication bias. This majorly gets coupled up with problems like poor methodological design, inadequate analysis and chance.[15,16]

Another method use to assess publication bias in biomedical research, is the use of Duval and Tweedie's trim and fill technique that basically deals with publication bias in meta-analysis by adjusting pooled treatment effect estimates to account for funnel plot asymmetry and which the authors can helpfully convey. Hence, when heterogeneity in treatment effects across studies is suspected which is usually indicated by the I^2 statistic, a risk of publication bias should be suspected and dealt with.[17,18]

In addition, last and not the least is the most popular "fail-safe N method" or "Rosenthal analysis," which aims to identify and involves an additional number of negative studies that will be required to increase the P value in a meta-analysis to above 0.05. The popularity of the method is because of the simplicity of the method and ease to apply, but it inherently gives high importance on P value and its threshold (usually $P < 0.05$) instead of focusing on important measure of the estimated treatment effects and confidence intervals, which give considerable important information.[19,20]

What we can do to tackle the problem of positive publication bias in biomedical research?

Positive publication bias that had crept in almost all of the journals, making the papers with negative results less likely to be published in high impact journals. The unfortunate fate of not able to reproduce' a particular finding not only is considered a loss of funds but also makes the paper extremely difficult to publish.[21]

The only way to tackle this problem is to include a separate section in each journal to address these kind of research with negative, null, and unfavorable results after through peer reviewing process, so that all the researchers are encouraged to publish the research. This will not only help making researchers encouraged but also will help in establishing a platform to raise awareness of positive impact of publishing researchers with negative results.[22]

Other methods to curb the devils of positive publication bias can be a section for publication of the methodology before conducting the research known as "Pre-study publication of methodology" so that research methodology to be followed during the entire research are thoroughly peer reviewed to ensure the appropriateness for the particular research. In addition, once the study is concluded, the same journal publishing the methodology publishes the full peer review manuscript, keeping aside the nature of the findings, or the journals should include a separate section for openly stating the list of rejected manuscripts with possible reason or summary for the rejection of the submitted manuscript.[23,24]

A two-stage reviewing system is also devised to curb the publication bias in part of the journals. Here, in first stage, the researchers after completion of the study will submit their introduction and need of the study with appropriate methodology to be followed during the research. This entire introduction and methodology is peer reviewed and judged for quality and provisionally accepted by the journal, which then ask for the results and discussion for the review and publication of the derived results without giving importance to significance obtained and the nature of the results.[25,26]

Conclusion

It is clear from the above review that researches with negative or null results is considered the least for their publication because of less impact they make on readers of the journals. Ignoring the research with negative results and publishing research with positive findings will not only distort the biomedical science but will also lead to unproductive expenditure of time, money, and manpower for the research, which are from the findings of these biased researchers. Policy makers, fundraisers, and readers should be continuously made aware of such cooked up and so called positive research with non-reproducible results. It is recommended that journal editors and peer-reviewers should not be inclined toward publishing novel results but should be generous to publish research with negative results. Journals and editors should also take steps to include sections in their respective journals to include and give chance for publication of manuscript with negative results with high-quality methodology. At last researchers, journal editors, and funders need to become more generous in giving equal importance for disseminating negative and positive findings alike without any discrimination.

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Conflicts of interest

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