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How To Do Critical Appraisal of Any Research Article

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ABSTRACT

In both biomedical research and medical academia, research publications serve a critical role. There are a huge number of research publications published all around the world. However, only a small percentage of them are good and have any research or academic worth. So, properly evaluating published publications has become vital in this circumstance. This article is intended with medical graduates and postgraduates in mind, in order to clarify them how to critically evaluate research publications. It may also be used to write published research articles in an indirect way. A collection of questions is supplied to cover all aspects of a published research paper. To assess the quality of an article, a score system based on the following questions can be established.

Keywords: Research article, critical appraisal, academics, quality

INTRODUCTION

Research articles play a very important role in biomedical research as well as in medical academics. There are an enormous number of research articles published worldwide. However, very few of them are good and actually have some value in research as well as academic. So, in this situation, it has become very important to critically appraise published articles. This article is written with a focus on medical graduates and postgraduates to help them learn how to critically appraise research articles. It is also indirectly useful for writing a research paper for publication. Here are sets of questions provided to cover the requirements of a published research article. A scoring system can be developed based on the following questions to rate the quality of an article.

Step 1. Choice of the article for reading

A. Consider the title:
   A.1. Is it interesting? Yes/No.
   A.2. Is it useful to your area of interest i.e., relevant? Yes/No

B. Go through the Abstract: Is conclusion useful to you in your area of interest? Yes/No

C. Go through the Material and Methods section, whether the particular settings or context are suitable for the settings or context in terms of
   C.1. Technologies available,
   C.2. Facilities,
   C.3. Demographic profile of the patient and
   C.4. Level of medical care in which the study was done (Yes/No)

If all the above 1.A, 1.B, 1.C are Yes, then read the article. [1-4]

Step 2. Evaluate the research questions of the author:

A. Is the research question fulfilling the below mentioned criteria?
   1. Feasible,
   2. Interesting
   3. Novel,
   4. Ethical,
   5. Relevant,

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Step 3: Is the objective of the research fulfil the below criteria?

1. Specific,
2. Measurable,
3. Achievable, and
4. Time bound?
5. Does it contribute in filling up some gaps in the already existing knowledge of that discipline or just a re-confirming the already well-established facts. (Yes/No)[5-13]

Step 3. Evaluate the accuracy

A. Did the authors clearly mention directly or indirectly:
   a. Total (target / accessible) population? Yes/No.
   b. Actual study population. Yes/No.

B. Is the actual study population
   a. Representative of total population/sampling technique, correct? Yes/No
   b. If no, then how the external validity/ generalizability will be restored?)

C. Is the study design correcting according to the nature of objectives and if an Analytical study:
   a. Is appropriate comparison group selected? Yes or not

D. Have the authors assured to nullify the role of chance:
   1. Calculated the sample size? Yes/No.
   2. Are the parameters specified, like:
      i. Type1 error,
      ii. Type 2 error,
      iii. Power of the study,
      iv. Allowable error,
      v. p- value,
      vi. OR,
      vii. RR,
      viii. Expected mean or proportions and Standard Deviation and
      ix. Acceptable deviation (as applicable to the various types of study designs. (Yes/No/Not applicable)
   3. If the parameters specified above are correct/ realistic: Yes/No.
   4. Is there any design effect, if clusters are used? Yes/ no

E. Did the authors clearly mentioned:
   1. The exposure variables (only for an analytical study design): Yes/No.
   2. The outcome variable for all type of study design: Yes/No.

F. Are the scales of measurement for outcome variable of the research question eg. (Continuous/ discrete,) correctly chosen as seen against the background of research question? Yes/No

G. Have the authority clearly mentioned possible potential confounding factors? Yes/No.

H. Did the author taken care of all possible potential confounding factors? Yes/No.
   1. While designing the study by matching, randomisation or restriction and
   2. While analysing by stratified analysis, standardisation, multivariate analysis or mathematical modelling?

I. Is there any possible potential confounding factor either not considered at all or if considered it is not controlled during design or analysis?

J. Did the authority clearly mention possible potential bias? Yes/no

K. Did the author taken care of all possible potential bias which he had mentioned? Yes/ no

L. Is there any possible potential bias is not considered at all or else not controlled during design for analysis by blinding ete which was possible to do in the study?

M. Did the authors mentioned the following items used by them in this study clearly?
   1. Instruments and Reagents? Yes/No/Not applicable.
   2. Questionnaire? Yes/No/Not applicable.
   3. Any other scale used for example psychological assessments scale? Yes/No/Not applicable.
   4. Various criteria and definitions of terms for various diseases etc? Yes/No/Not applicable

N. Did the authors describe the methods how s/he did standardization or validity of the following:
   1. Instruments: Yes/No/Not applicable.
   2. Questionnaires: Yes/No/Not applicable.
   3. Any other scales: Yes/No/Not applicable.
   4. Technique of using the physical instruments/ questionnaire/ scales and other data collecting these procedures: Yes/No/Not applicable.
   5. Quality control procedures regarding the regarding the data during the conduct of a study: Yes/No/Not applicable.[14-21]

O. Did any of the following biases have occurred in the study?

	Yes/No/Not applicable	**If Yes, briefly comment as to how**
1.Selection		
a. Referral		
b. Self-selection		
c. Berkesonian		
d. Survivorship		
e. Volunteer bias		
f. Exposure related		
2. Information		
a. Prevarication		
b. Recall /Reporting		
c. Detection		
d. Observer's		
e. Cross-over		
f. Co-intervention		
g. Attrition bias (Loss to follow-up)		
h. Contamination		

Step 4: Analysis:

1. Whether the data been presented in a simple and smart way? Yes/No.
2. Whether the statistical tests that are applied are correct for the type of variable being studied? Yes/No.
3. Did the author's work out for the measures of "effect" like OR/RR. (If it is applicable to the Research question)? Yes/No.
4. Did the authors work out for 95% confidence interval or 99% confidence interval of the various estimates? Yes/ usually/no
5. Did the authors able to adequately control for confounding during analysis? Yes/No/NA. If yes, how?
6. Did the authors assess the effect modifiers? Yes/No.

Step 5: Conclusion:

1. If the results are found to be statistically significant, are they also of clinical/ public health significance/relevance? Yes/mostly/few only/No.
2. If the results are found to be statistically not significant, then find out if there is possibility that a real effect may have been overlooked due to low study power as a consequence of low sample size. (Have the author back calculated the study power? In either, yes or no have you calculated it yourself? Yes/no.
3. Does the conclusions drawn by the author is based on the actual findings of the study? Yes/Some of them/No.
4. Do you accept the study passes the "if so, so what test"?
5. Would you like to take further clarification from the author? If yes, specify...

Step 6: Summary of critical appraisal:

Write down a briefed summary of the critical appraisal according to the above check list.one can use scoring system also for this.

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