How to write an Original Article

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How to write an Original Article

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"A scientific experiment, no matter how spectacular the results, is not completed until the results are published" (Robert A. Day)

This chapter provides manuscript-writing guidelines about every aspect of the manuscript for all researchers but specifically for the beginners who are entering in the scientific fraternity. Although ''publish or perish'' is an old maxim, but it is still valid in this competitive technological era. Original articles are the largest quantity of manuscripts, which get published because every good peer-reviewed biomedical journal is interested to publish original research work. Writing an original article has a standard format that needs to be followed. Usually, a cogent and well-written manuscript has bright chances for acceptance in a good journal.[1]

Few General Tips

In scientific literature, the use of active voice is preferred; it is more succinct and crisp. If the most of text is written in passive voice, the manuscript is verbose and dull to read.[1,2] Avoid excessive use of phrases such as ''there is,'' ''there are,'' ''that were,'' ''it is,'' and ''it was.''[2] E.g., There is a high prevalence of myocardial infarction cases among young people at Karachi that was reported by Khalid.

Correction: High prevalence of myocardial infarction cases among young people at Karachi that was reported by Khalid. (Passive voice)

Better: Khalid reported high prevalence of myocardial infarction cases among young people at Karachi. (Active voice)

Wenzel et al., (2016) suggested 3000 words are good enough to explain the most research. Thus, a manuscript that breaches the "worth the space" instruction indicates that the authors are overly captivated by their effort.[3] For 3000 words article, 25-30 references are adequate.

Authors should avoid claiming priority like "Our study is the first one to ----------."[3,4] It is possible that few studies because of their research design need to be designated "the first." Even then they should show the originality by describing how the study design differs from already published studies.[4] E.g., Numerous literature available about the significance of pro-BNP in heart failure patients but ours was done on such patients who had mildly reduced ejection fraction (40-49%). Then describe why you have chosen such patients.

Always use an electronic spell-checker after completing the manuscript. Wrong spellings are a symbol of slackness, and considered a grave mistake and impair the overall impact of the manuscript.

Strictly follow the instructions for authors provided by the journal.

Always consult a statistician before the start of the study.

''Good writing is rewriting'' (Truman Capote). Read your manuscript like a reviewer at least twice after gaps of few days and moreover, get it checked by your senior colleague for clarity of the scientific content, the flow of language, grammar, and spelling.

Essential Components

The following are the essential components of an original article:

1. Abstract 2. Introduction 3. Methods 4. Results
5. Discussion

Majority of the medical journals follow the "IMRAD" format, i.e., introduction, methods or methodology, results, and discussion.[5]

Organizing the manuscript

While organizing the manuscript, one should simply answer the following few questions, and the manuscript will be ready.[6]

1. **Why and what did you do? It will give you the objective of the study and introduction.**
2. **How did you do? This will give you the details of methods or methodology.**
3. **What did you find? It will provide you the results.**
4. **What do your results mean and what is its relevance? This will provide you the material for discussion.**
5. **What is the message? That is the conclusion.**

TITLE

"The title of a paper is a label."[7] The title of an article serves various purposes: Firstly, it is the introduction of the research. Secondly, it creates interest in readers mind and reader decides either to read abstract/full text or proceed. Thirdly, it supplies keywords to the indexing services and that help in retrieving that article.

A title should not be too short because it would be unable to communicate the real idea of the research to the reader. Generally, the short titles are non-specific and unfocused. Title length should be 150 characters.[8] Several journals mention the length of the title in terms of words or characters such as PLOS ONE allows maximum 250 characters. A good title should provide clear information about the focus of the study.

Titles play an imperative role in the citations and downloading of the article. Usually, the title of the study would be read by thousands of the people but only a few would read the research article. The title of the article attracts the readers' attention.

Types of title

Out of several types of the title, there are three broad types.

1. Declarative title.
2. Descriptive or neutral title.
3. Interrogative (question) titles.

Please, the check details of the title selection on a separate article "Choosing the Right Title and Keywords for the Scientific Article" at page no.125.

ABSTRACT

"The Abstract is an opening summary of the story, and the Title gives the story a name."[9] The abstract provides a short description of each of the major segments of the manuscript.[7]

Commonly, the majority of the journals need a structured abstract along with a restricted number of words, extending from 150 to 300.[8] The instructions for authors are important to read about the word count of the abstract.

The content of an unstructured abstract is same like the structured abstract, but it is devoid of any organized subheadings such as objectives, methods, results, and conclusions.[8,10]

A good abstract should contain four parts.

(a) ***Objective/s:*** state briefly the purpose of the study.

(b) ***Methodology:*** describe concisely how the study was carried out.

(c) ***Results:*** describe the gist of the outcomes.

(d) ***Conclusion/s:*** describe the importance of main results.[10]

Avoid the abbreviations in the abstract; however, if it is indispensable then one need to explain it. The abstract should be able to stand alone in abstracting publications.[4,11] Abstract should be written in the past tense because it represents the work that has been done.[5,7] In manuscript writing, although the abstract appears at the beginning, actually it is the last part to be written.[12,13]

INTRODUCTION

"The beginning is perhaps more difficult than anything else, but keep heart, it will turn out all right." (Vincent van Gogh).

The aim of the introduction should be to provide adequate contextual evidence to ensure the readers comprehend and appraise the present study outcomes without consulting to the earlier published literature on the subject.[7]

Introduction section should be concise and focused, including about three paragraphs in one page (double-spaced typed page).[2,3] The first paragraph should describe **what is already known** by providing a concise background to create framework, significance, or nature of the problem. The second paragraph should explain **what is unknown** by describing the importance of the problem and undecided issues (gaps in the knowledge). The final paragraph should define **why the study was done** by giving the rationale, hypothesis, and main objective.[2,8]

Eslava-Schmalbach, et al. (2013) also stressed on the identification of the knowledge gap that the study is expected to cover.[14] It is recommended to write the considerable part of the introduction in the present tense and objective in the past tense.[7]

It is extremely important that one is able to select only relevant references and information after doing the proper literature search. Give latest and relevant references.[3] Generally, one-third of the total number of references should be given in the introduction part of the manuscript. One or two references to support a statement are good enough. Always prefer latest references pertaining to the last five years.

Example: "Whether Vitamin D will prevent osteoporosis?" Do not explain what osteoporosis and Vitamin D is? However, do add the prevalence figures, hospital admissions, the cost to the Nation, etc.

Journals do not ask for the word limit in the introduction. However, it is better to limit it to <10%–15% of the total word count of the manuscript.[15]

METHODS

"The method of scientific investigation is nothing but the expression of the necessary mode of working of the human mind" (Thomas Henry Huxley). The section aims to provide the details of the experimental design of the study so that any researcher of the same field can replicate the experiment.[5,7] Most of the readers usually skip methodology section but it has prime importance and researcher must write this section very cautiously. If the results of the research are not reproducible then that "paper does not represent good science."[7]

Few journals need the material methods should be described in subheadings.

Previously, it always used to be written as Material and Methods. However, the correct version is that if the study is in patients, write Patients and Methods. If it is on healthy subjects, write Subjects and Methods but if it is on some laboratory material, then write Material and Methods. In order to simplify all this, the word methods or methodology is used these days, which covers everything and it also saves the authors from any confusion.

While writing this section, one has to answer the following important questions:

1. How was the study designed?
2. How was it carried out?
3. When and where the study was conducted?

Materials

There is need to write the precise technical description and amounts and source or technique of preparation. Try to use the chemical or generic names. Investigational microbes, animals, and plants should be described precisely. Give accurate details of the material used, exact drug dosage, form, i.e., liquid/tablet/capsules, the exact form of treatment. In case the study is a complex one, it is advisable to add a flow diagram, which will be helpful.[10] If the study required preparation of some solution;

give complete details how this solution was prepared. Apparatus used must be described in sufficient detail to allow readers to be confident of the results. Calibration of the instrument used is also important.

Methods

This section should begin by stating the study design (prospective/retrospective, randomized or non-randomized, double-blind…).[5] Then need to describe the study population (animals, human subjects, cells…), if the human subjects are included then need to describe the inclusion and exclusion details. Indicate what disease states have been excluded. How the diseases were defined and diagnosed. What medications lead to the exclusion from the study? In the last describe the methods employed to measure all the main parameters documented in the study.[5]

It is also important that one knows the various guidelines for ensuring correct reporting such as "Consolidated Standards of Reporting Trials (CONSORT) for clinical trials," and others. Methods, which are uncommon or unique should be described fully but if a method is a standard one, just give its name and proper reference.

At the end of methodology section, there is a need to give detailed information of the statistical tests by describing the selection of appropriate test according to the type of the data[10] and give the name of the statistical software. Avoid writing that the data was analyzed using SPSS 20 without giving any details about the statistical tests.

The ethical aspect of the research is imperative. Always mention the name of the ethics committee that has approved the research proposal (or if not, explain why). Moreover, the process of consent is very important, need to mention when and how the consent was obtained.[10]

It is always better to calculate the sample size before beginning the research. It is considered an important part of the study design. The calculated sample size refers to the number of patients required in a study, and it denotes to the number

of patients who finished the trial, rather than the number who begin it. Therefore, it is desirable to add 10% dropout rate.[4] In case of randomized clinical trials; it is essential to describe randomization. In case of double-blind studies, there is need to specify the blinding technique.[4] If you have done any intervention, give its details in this section. Refrain from overplaying the significance of your results. Usually, reviewers focus special attention on the methodology, and several papers are rejected because of the poor methodology. Methods should be written in past tense [5,7] and comprise of less than 1,000 words.[3]

RESULTS

"Quality is never an accident. It is always the result of intelligent effort." (John Ruskin)

The main purpose of the results is to portray what you observed, without discussing that.[5] The results should focus on objectives set out in the introduction without any interpretation.[5,14]

The description of the results should synchronize with the methodology. Begin by explaining your study subjects: how many patients and controls, how many subjects left the study, the characteristics of the study groups, etc. After that represent the result of the primary variable followed by the secondary variable.[3]

The results section is the imperative component of the manuscript, but it is the briefest part.[7] We should avoid the verbosity while describing the results. Our study results constituent new knowledge that we intend to add in the existing in the literature. For accuracy and clarification of the result, there should be the comparative control group. Statistics that is used in the result should be meaningful.

Gastel and Day have described that give the data in a table, or in a figure, or in the text. Avoid portraying the same data in more than one way.[7] Avoid repetitions of the results in the text that already shown in the table. The text should emphasize the important observations and describe the main findings first.[4]

E.g., As Table-I presents, the mean ± SD of serum leptin levels was 4.3 ng/mL ±1.1 in the infertile male group and 9.3 ng/mL ± 2.3 in the fertile group ($P < 0.01$).

Better: Infertile male patients had significantly higher serum leptin levels than did fertile group ($P < 0.01$) (Table-I).

Usually, tables are used for presenting data like baseline characteristics, treatments, and outcomes of the same variables for two or more groups. Figures are used when the data is either too intricate for the report or difficult to interpret. Relationships and trends may be represented by graphical presentation in figures.[5]

It is advisable to address one topic in one paragraph, start from the most important to the least important. Begin with those results, which directly answer the question posed. Emphasize important results by omitting data from the text. State the results directly and then cite Figure, Tables after mentioning relevant information.

While writing the results, use past tense as it had occurred in the past. **E.g.,** Drug A failed to reduce the blood pressure. Avoid using qualitative words like "markedly" or "significantly." These are vague words, and the readers cannot judge it. Tables and illustrations must have a strong visual impact, must be informative, and easy to comprehend. Tables and figures should be "self-explanatory," and the reader should not be compelled to consult text for understanding the table and figures.[3] The tables and figures should have informative titles and footnotes and these tables and illustrations should appear in a sequence to the text to tell the story. Adding a separate column for p-value is not beneficial because symbols have greater value and impact and make the table body less bulky. While using photographs of the patients, it is essential that one should take permission and informed consent from the patients. It is advisable to cover the facial features whenever possible. If you wish to republish some figures, professional ethics demand that one should take permission from the copyright holder, i.e., the publishers.

1. Fundamental elements of a title, abstract, introduction, methods, results and discussion.

	Title	*Abstract*	*Introduction*	*Methods*	*Results*	*Discussion*
Purpose	Reflect objective /study design/ result Acts as a label	Provide summary of the whole story	Provide nature and scope of the topic	Describe what was done, and how it was carried out?	Represent researcher's observation without interpretation.	Provide interpretations of results, implications and importance of findings
Structure and layout	Succinct and focused	Structured / unstructured Four segments, (objective, methods, results, conclusion)	Three paragraphs, Context of study, knowledge gap, rationale and objective	When, where and how the study was conducted? Clear and reproducible	Simple and clear, focus on important results	5-7 paragraphs, results discussion, limitations and conclusion
Length	150-250 characters	150 -300 words	Not more than one page	<1000 words	Brief and focused	Up to 1000 words
Avoid	Waste word, confirmatory statement and question mark	References and abbreviations	Excessive references, (contain 1/3 of the total references)	Ambiguity	Repetition of same data given in the table/figure	Ignoring the negative results and conflicting literature
Tense	Not a complete sentence	Past tense	Present tense & past tense.	Past tense	Past tense	Past tense.

DISCUSSION

"If you can't explain it simply, you don't understand it well enough." (Albert Einstein)

The main objective of the discussion segment is to elucidate the significance of the results.[12] The discussion is usually considered the hardest part of the manuscript.[1,7] The discussion should be brief, clear, and crispy. If the researcher has several observations to discuss, then begin with the most important, continue with the next significant, and so on.[4] The lengthy discussion does not explain the excellence nevertheless it may cause misperception.[16] We should not forget that the DNA discovery was summed up and published as a one-page letter.

The main function of the discussion is to express the connection between noticed facts.

Gastel and Day (2016) have stated few fundamental characteristics of an effective discussion. [7]

* Discuss the principles, association, and generalizations of the study results.
* Discuss your results don't summarize your results.
* Mention any exemption or any absence of the relationship, and state unresolved fact.
* Discuss how the results and their interpretations are agreed or disagreed with already published literature.
* Describe the theoretical inferences and possible practical application of your work, if any.
* Describe conclusions lucidly.

Vitse and Poland (2017) have described that discussion is a critical part and it composed of few paragraphs. In the first paragraph summarize the main results by relating these with the objective of the study. In the second paragraph interpret the results by providing appropriate references in favor and against your results. Also, explain what your study adds to the literature. In paragraph three and four discuss the probable mechanisms

that explicate your study results. The strengths and limitations of the study should be mentioned in paragraph five. In next paragraph (sixth paragraph) need to mention likely disputes (if any) caused by your study. In the last paragraph, describe the conclusion of the study by providing the implications of the study and further research perspective.[8]

Few authors deliberately ignore the contradicting findings. It is important to discuss the similarities and differences and need to interpret the conflicting results.[1,4] In case of conflicting results, scientific and clinical clarification must be provided with a convincing reference if possible.[1,17]

Each paragraph should start with a key sentence followed by subsidiary sentences, which should put flesh on bones. Do not repeat what has already been stated in the introduction and results. The discussion should be in the past tense[5,7] and desirably comprise of about one thousand words or less.[5] Most of the references in a manuscript come in the discussion.

Limitations of the study: No study is perfect. Therefore, it is essential to mention the limitations of the study.[3] There are several "confounding and uncontrolled variables" in the research. Almost all researches have some limitations either in the method the research was carried out or the ways of interpretation. [13,15] It can be described at the end of discussion just before conclusion in a paragraph.

Conclusion: It can be described in the last paragraph of discussion with or without a sub-heading. It should reflect the main message that has been considered in the manuscript. It should be concise and focused without mentioning something that has not been described previously in the text. Avoid giving any reference to the conclusion.[17]

Acknowledgements: Always acknowledge those who have helped you in conducting this study. It could be individuals, institutions or organizations. ICMJE Guidelines are very useful for this.

Source of Funding: Declare source of funding if any.

An ideal manuscript: An ideal manuscript should be original, prospective, ethical, accurate, relevant and interesting. However, it does not minimize the importance of retrospective studies, which are extremely useful for clinical audit.

Gastel and Day (2016) say that "the simplest statements evoke the most wisdom; verbose language and fancy technical words are used to convey shallow thoughts."[7]

REFERENCES

The reference section serves the purpose that how the study results relate to previously published literature.[3] For reference writing, it is recommended to use EndNote or Reference Manager or similar reference managing software. These are easy to use and manage references in a short time. There are several referencing styles such as Vancouver, Harvard, APA, AMA, etc. However, the majority of the medical journals use Vancouver referencing style. Therefore, below few examples of Vancouver styles are given.[18]

Reference from Journal articles: While writing references one has to list the name of the authors first, followed by the title of the manuscript, the name of the Journal in abbreviation form, Year, Volume No. and then page numbers. As per latest guidelines of International Committee of Medical Journal Editors (ICMJE), one has to list up to six authors and then write et al.

Example: Baig M, Gazzaz ZJ, Gari MA, Al-Attallah HG, Al-Jedaani KS, Mesawa ATA, et al. Prevalence of obesity and hypertension among University students' and their knowledge and attitude towards risk factors of Cardiovascular Disease (CVD) in Jeddah, Saudi Arabia. Pak J Med Sci 2015;31(4):816-820. doi: http://dx.doi.org/10.12669/pjms.314.7953

At the end of this reference, you will notice the addition of DOI number which is required by some journals but not by all.

Below are the instructions for writing book and book chapters' reference with their punctuation marks.

Book Reference:

Author/Editor (if it is an editorial ways put (editor/s.) after the name). Title (this should be in italics). Series title and number (if part of a series). Edition (if not the first edition). Place of publication (if there is more than one place listed, use the first named): Publisher; Year of publication.

Watkins PJ. *ABC of Diabetes*. 5th ed. London: Blackwell Publishing; 2003.

Book chapter in an edited book

Author of the chapter (surname initials). Title of chapter. Followed by In: Editor's surname initials (always put (editor) after the name). Title of book (this should be in italics). Series title and number (if part of a series). Edition (if not the first edition). Place of publication (if there is more than one place listed, use the first named): Publisher; Year of publication. Page numbers (use'p.' before single and multiple page numbers)

Blaxter M. Social class and health inequalities. In: Carter C, Peel J. (editors.) Equalities and inequalities in health. London: Academic Press;1976. p. 369–380.

Reference of multicenter study or trial: The reference should be given as Name of the Group or study, the exact title of the study, full results or partial results, Name of the Journal, Volume and Number, pages and the year.

Example: TIMI Study Group: Comparison of invasive and conservative strategies after treatment with intravenous tissue plasminogen activator in acute myocardial infarction. Results of the TIMI Phase-II trail. N Engl J Med. 1989;320:618-627.

Reference from Newspaper articles:

Malik Mahmood A. Autonomous hospitals, "Pulse" International, Karachi, Pakistan, 2000. January 15-31, Page 1-2.

Reference from Website: Write the title, complete address of the website and when it was accessed should be written at the end. Eg.

Defining the Role of Authors and Contributors. http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html [Accessed 25th December 2017]

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