

RESEARCH
PAPER
WRITING

The Research Report Paper writing/ thesis writing:

Different parts of the Research paper

1. Title –Title of project with authors name
2. Abstract- Statement of the problem, Background list in brief & Purpose and scope.
3. Key Words.
4. Methodology-subject, apparatus, instrumentation & procedure.
5. Results- tables, graphs, figures & statistical presentation.
6. Discussion support or non support of hypothesis, practical & theoretical Implications.
7. Conclusion
8. Acknowledgements.
9. References
10. Errata
11. Importance of Spell check for entire project
12. Uses of footnotes

Research report writing is the major step in the whole research. Because all the tasks whichever done, we have to publish or made to known to all unknown public by that article, or research paper only. So we can say that it is very important. But it is not very easy task at all. It requires a skilled person or need help of certain expert in the field.

Research report writing is a last step which is involved in the research. Research reports are the product of slow, painstaking, accurate inductive work.

Steps involved in the research paper writing are

- (a) Logical analysis of the subject-matter;
- (b) Preparation of the final outline;
- (c) Preparation of the rough draft;
- (d) Rewriting and polishing;
- (e) Preparation of the final bibliography; and
- (f) Writing the final draft.

The key to scientific writing is clarity. Clarity should be the characteristic of any type of communication. When something is being said for the first time, clarity is essential. A published scientific process is useless unless it is neither received nor understood by its intended audience. Scientific writing is the transmission of clear signal to the recipient. The words of the signal should be clear, simple and well-ordered as possible.

Second key in the scientific writing is appropriate language. The scientific knowledge must be communicated effectively, clearly in words of certain meaning. It is said that “The best English is the one which give the sense in the fewest short words.”

At tertiary level assignments and term papers are written in the institute because by that way students can learn how to write research paper.

THESIS AND DISSERTATIONS

Both the word can be used interchangeably. It is expected to make original contribution to knowledge. Scientific or thesis writing is not of a personal or conversational nature and for this reason; a third person is usually used. Personal pronouns are avoided. It should have higher level of readability. Sentences must not be too involved and complex. Sweeping statements and exaggerated claims should be avoided. Statements must be suitably qualified. Quotations must be accurately cited and suitably acknowledged. Accurate spelling is essential for scholarly writing. An authenticated dictionary should be consulted for correct spelling. Particular attention should be paid to grammar and punctuation.

SCIENTIFIC PAPER

A scientific paper is a written and published report describing original research results. The council of biology editors (CBE), an authoritative professional organization dealing with such problems, defined primary publications as follows:

An acceptable primary scientific publication must be the first disclosures containing sufficient information to enable peers to assess observations, to repeat experiments and to evaluate individual intellectual process. In other words, primary publication is the first publication of original research results, in a form whereby peers of the author can repeat the experiments and test the conclusion and in a journal or other source document readily available within a scientific community.

The scientific paper should have IMRAD which is introduction, material & methods, result and discussion. These all term are described ahead one by one.

Different parts of the Research paper-

TITLE

- The title is the first part of the submitted manuscript to be seen by editor, and then by reviewers.
- It also appears in the journal issue content page, and may also be the part of email notification or internet search results.
- The title therefore gives the first impression of author's work
- Short titles usually more interesting to reader, take up less space, and favored by editors.
- Title should almost never contain abbreviation, chemical formulae, proprietary names and jargon.

So in title all the words should be chosen with the great care, and their association with one another must be carefully managed. Good title is the one which can adequately describe the content of the paper in fewest possible words. It should not be too short also that reader can't understand what it is describing.

Example of good title is “**paracetamol: fast absorbing oral tablet preparation and evaluation.**”

Title of paper is a label, it is not full sentence. Simpler than a sentence. The meaning and order of the words having higher importance because it gives idea to reader about the whole paper.

Constructing the Title

- Write in as few words as possible (150 characters)
- Complete enough to clarify central theme
- Contain keywords
- Contain Name of the author
- Contain author affiliation

- **Running Title** (It is the short version of the title) which is printed at the top of the each page.

In short good title should

- Short
- Informative
- Attractive
- Catch attention

ABSTRACT

- Mini version of the entire paper
 - AB** – Absolutely
 - STR** – Straight forward to
 - ACT** – Actual presentation of data

- After the title, the abstract is probably the next most read part of a scientific paper. So it must provide a brief summary of all the important section of the paper.

- Thesis abstract should be focused more on the problem and solution discussed in the thesis. Methodology of collection of data is not needed, nor is it needed that the researcher mentions literature reviews.
- On reading abstract, one can get idea about the basic content of the article and by that way can get idea that whole article is read or not.
- Normally placed at the beginning of an article, following the title.
- Abstract may be structured or unstructured depending upon the journal style.
- Unstructured abstract are seen in case reports and review articles
- Structured abstract are seen in research articles.
- The key elements of the abstracts are
 - Background information and Aim
 - Principle activity
 - Material and Methods
 - Result
 - Conclusion
- Should not include figures, tables and references.
- Data should include actual No. or percentage.
- There are two types of the abstracts:

Informative abstracts: used in the primary journals and used to capsulize the paper. It should briefly state the problem, the method used to study the problem and principal data and conclusions.

Indicative abstracts: It can serve as substitute for the full paper. It should not be used as “headings” in research papers. Also called as descriptive abstract.

- Word limit:
 - 150 – 200 words for unstructured
- abstract
 - 200 – 300 words for structured abstract

SUMMARY

Summary is different from abstract that appears at the beginning of the paper, and usually summarizes all the major parts of the paper. Summary is placed at the end of the paper. The summary should satisfy the following conditions:

- It should summarize the report in such a way that it could stand on its own and would make sense to a managerial, public or non-technical audience.
- It should include just enough background and information about methodology to orient readers.
- It should summarize the key information from the report, concentrating the problem, conclusions and recommendation.
- It should exclude any information not presented in the report itself.

Some reports may contain both technical abstract as well as executive summary. But generally it is not mentioned.

KEY-WORDS

- 3 – 10 words or short phrases should include.
- Assist the indexers.
- Medical Subject Headings (MeSH) list should be used.
- Published with the abstract.

INTRODUCTION

It is said that, “A bad beginning makes a bad ending.”

It is the most important first part of the text in the research paper. It should introduce the whole paper in some words. And reader is given chance to think or to understand and evaluate the result of the present study and for that all the background information regarding the topic should be provided to the reader. After reading introduction reader is drawn to read rest of the paper, such interest should be created.

Introduction part should include

- A statement of the goal of the paper
- Background information of the topic
- Proper acknowledgement of the previous work on which you are building.
- Explanation of the scope of the work

There are five stages of the writing of the introduction which are described

1st stage includes general statement about a field of the research. Relevant literature should be provided that supports the need of our project.

2nd stage includes the aspects of the problems already studied by the other researchers.

3rd stage includes need for more investigations. What is done about the problem, define the gap in the knowledge, and state what needs to be done to address the gap.

4th stage includes the purpose of the study. State the hypothesis that what will be tested in your studies.

5th stage includes optional statement that gives value or justification.

MATERIAL AND METHOD

OBJECTIVES

At the end of the reading whole article, reader must able to

- Appreciate why Material and Method is important part???
- Understand why this section should be written in meticulous detail???
- Enumerate the items to be included in this section...
- It gives all the information of the study.

This section is usually very straight-forward. It is undertaken before study is initiated. Writer must fulfill all the questions of the reader as it is in the text. How truth worthy the observation is also important. If anyone wish to repeat that experiment then also it should be possible by reading the text only. So all the measurement must be recorded and interpreted correctly.

In short, we can say that this part will include

- How the study is designed?
- How the study was carried out?
- How was the data analyzed?

FIVE DIFFERENT TYPE OF STUDY

1. Clinical trials

- Description of the study/trial design.
- Where was the study conducted?
- The study population and eligibility of the participants.(Inclusion and Exclusion criteria)
- Informed consent process and ethics
- Clearance.
- Sample size.
- Method of randomization
- Masking or blinding.
- The interventions planned for each group with details.
- Drugs details.
- Measurements/techniques/device used.
- The primary and secondary outcome measures.
- Dropouts.
- Analysis.
- Rules and conditions for stopping the trials.
- Appropriate reference provided.

2. An animal study

- The animals used for study including the species, strain, age, weight, gender etc.
- Housing condition
- Groups-types, number, interventions in each.
- Drugs used including:
Name, dose, route of administration, timing of dose,
- Name of company, how solution was prepared, vehicle used and storage condition.
- Surgical procedure.

- Tests-detail a new or modified from a known procedure.
- Instruments-the manufacturer, model, calibration.
- If software used mention name, version, and company.
- Whether approval has been obtained from the Animal Ethics Committee.
- Appropriate References.

3. An analytical study

- Specimen tested.
- Method of analysis.
- Name, instrument of measurement, company
- Name of the kits, if used, company, sensitivity
- Controls, duplicates used.
- How the method was developed and validated
- Formulae used to calculate any parameter.
- Statistical analysis.
- Software used-name, version and company.

4. A descriptive study

- Setting where the study was carried out.
- Time of data collection.
- Questionnaires used if any.
- Ethics clearance.
- Description of cases selected.
- Test performed, treatment/procedure evaluated.
- Outcome measures-criteria and measured after how long.
- Statistical analysis.

5. An epidemiological study

- The study design.
- Description of the population.
- How was the sampling done-size and method?
- Whether ethics clearance was obtained?
- Informed consent

- Questionnaire-translation, pretesting & validation, who administered it,
- Instruments used.
- Statistical analysis

SOME USEFUL TIPS

- Write early during the study, before you begin it.
- Avoid Micro-detailing of all procedures.
- Concise but detail description.
- The usual order of presentation is chronological, however related methods May need to describe together.
- Give heading to each method.
- Describing measurements precisely & include errors of measurements.
- Write with precision, clarity and economy.
- Every sentence should convey the exact truth as simply as possible.
- Show the section to colleagues. Ask if they would have difficulty in repeating the study.
- Use active rather than passive voice when possible.
- Write what you did, not what you intended to do but could not.
- Avoid using trademark and brand name.

RESULT

Before giving the results, one should give some kind of overall description of the experiment without repeating the experimental details which is prescribed in the material and method section.

The Result section states what has been found in scientific research.

Results can be provided in

- Text
- Tables

- Chart/figure format

TEXTS

Criteria:

- Descriptive data.
- Qualitative data.
- Single observation.
- Summarize & highlight the relevant data.

Points:

- Report all finding, expected, unexpected or negative.
- Present in a same sequence.
- Prefer natural order.
- Use flow charts to present the sequence of different phases of clinical trials.
- Indicate the messages derived from data in tables and figures in the text.
- Use past tense - **“we observed”**
- Avoid repetition of the same data in text and in tables/figures.
- Avoid reporting results for the parameter not mentioned in the method section.
- Avoid making conclusions and speculations of the reported results.
- Avoid using adjectives.
- Write with accuracy, brevity & clarity.

TABLES

- The data which is too Numerous and complicated can be accurately Represented in table.
- It can accommodate, compare, and summarize a large volume of data in an organized manner.
- Data retrieval easy.
- Widely preferred.

Checklist for Table:

- A table should be self explanatory and show all the characteristics.
- Check the total number of tables accommodated as per type of journal.
- Make sure the data is accurate and consistent.

- Pattern of journal should be consider.
- Don't make tables unnecessarily

Characteristics of the table:

1. Lines
2. Alignment –horizontal & vertical
3. Uniformity
4. Precision
5. Simplicity
6. Clarity

CHARTS/FIGURES

- Eyes/Brain pick up visual clues effectively as compare to numerical data.
- Graphs are better than table to show the time trend, frequency and relationship of the data.
- There are several types of graphs each with the specific use.

Types:

Line diagram -For showing time course of an event

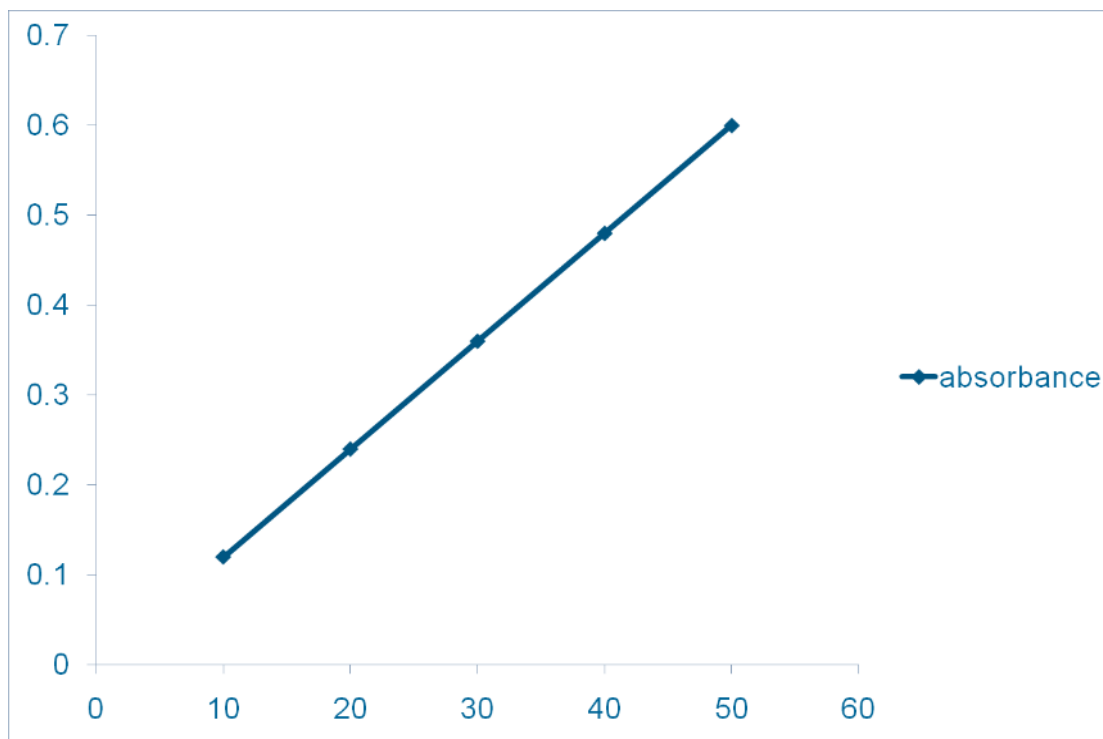
Bar chart -For presenting comparative data

Pie chart -For illustrating the division of the whole into segments

Histogram -For presenting frequency distribution of quantitative data

Scatter diagram -For pointing out relationship b/w two variables.

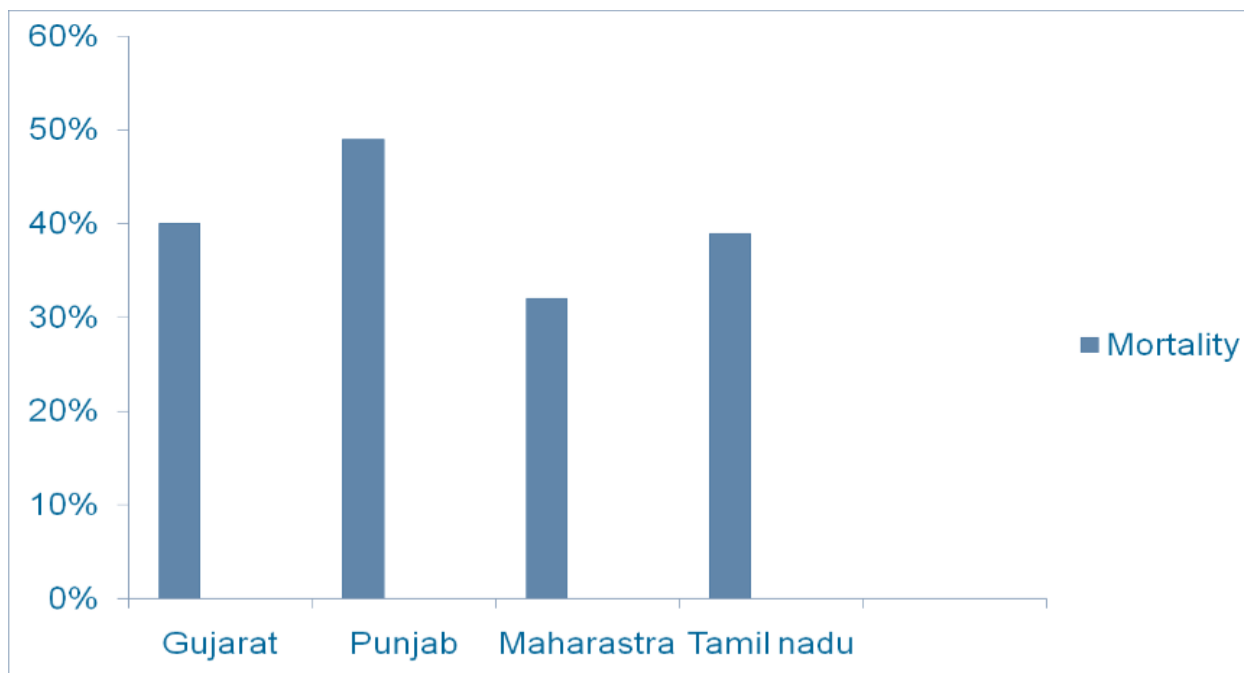
Line diagram



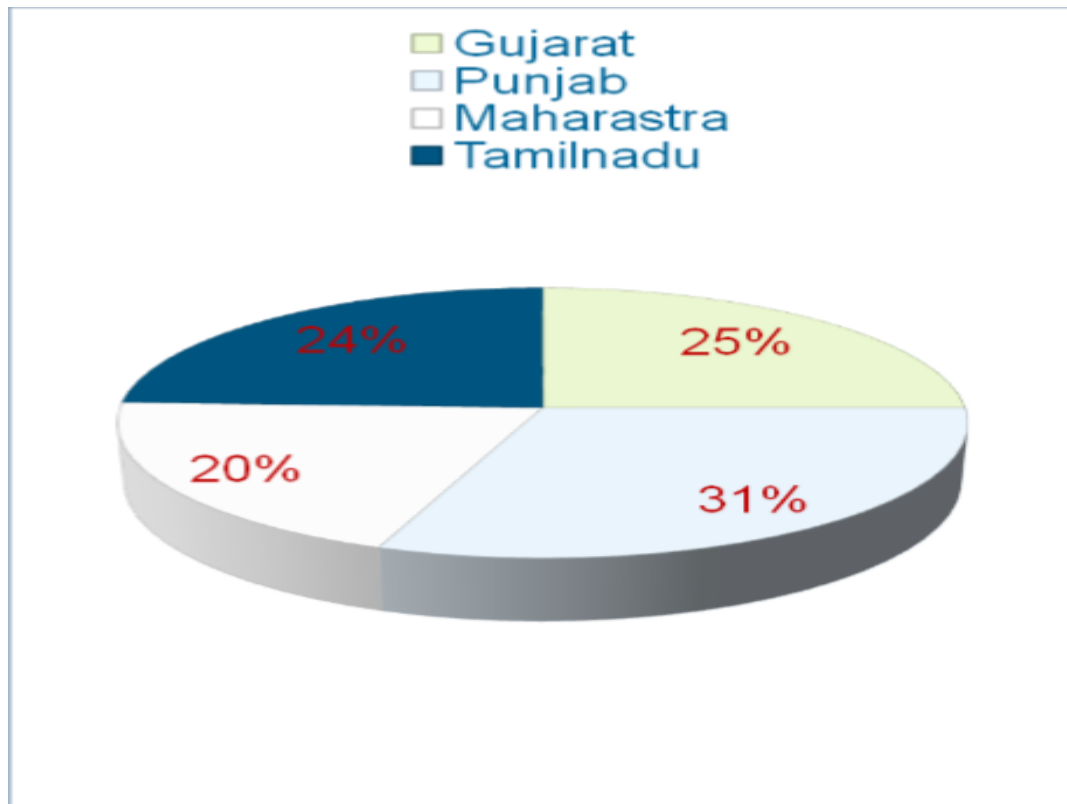
Time (min.)

Bar

chart



Pie chart



Common Mistakes:

- Mismatch number: Text & Table.
- Exceeding total number of tables or figures.
- Repetition.
- Incomplete table.
- No proper correlation between table & text or figure & text.

DISCUSSION

Definition

- “Discussion is the interpretation of result within limit of systematically collected data evaluated against the available knowledge.”
- Discussion is most important part of a scientific paper and it is hardest part of the paper to write.
- It is a challenging difficult and weakest part of the study/paper.

The difference between the result and discussion is that result is fact but discussion is writer's opinion. So it must answer all the following questions described:

- What is the significance of the results which we have obtained?
- If multiple hypotheses are there, it should give all the information regarding all the results obtained. Not like pushing your favorite one only.
- What are the things which we know after the present work which we do not know before the work?
- Is there any agreement or disagreement with the previous work?

Components of the discussion:

1. General components

- Length
- Language
- Format
- Structured V/S Unstructured discussion.

2. ESSENTIAL COMPONENTS:

- Summary of principle finding (direct declarative)
- Meaning of finding (explain finding or possible mechanism)
- Relationship with other studies
- Strengths/Weakness/Limitations
- Relevance/Importance/Implication
- Unanswered questions

Discussion consist of the three different parts which are

1. Opening

It is like news-paper headline. Start with the brief summary. Whatever different things and also whatever something special points are included. Sensation main finding should be included in the opening part.

2. Body

Statement of Objective

Summarize the Result (interpretation of experiments)

Refer to other studies

Novelty of finding

Possible mechanism for interpretation

3. Conclusion

Discussion should end with the concluding remarks. This section usually consists of a concise recapitulation of the objectives, results obtained and conclusion and possible future research objectives.

It should consist of the following:

- Strength / Weakness / Doubts
- Final Conclusion
- Original hypothesis
- What conclusion Mean and what doesn't mean?
- Conclude with the final message
- Particularly in view of the stated objectives and the future direction.

At last of the conclusion, what future work can be done should be provided by the following points:

- Remedial action to solve the problem
- Further research to fill in gaps in our understandings
- Direction for future investigation on this or related topics

Major committed mistakes in the discussion are following:

- Too lengthy. (hiding others)
- Very long review of literature.(reference with little or no relevance)
- You don't know what do you mean??(simple reiteration of result)
- Over-interpretation of the results.(distracts / confusion / dilutes)
- Drawing unjustified conclusions.
- Making glorifying claims.
- Assuming you are right and others are wrong.
- Unnecessary criticism or personal attack.
- Unnecessary data are included.

ACKNOWLEDGEMENT

An individual or organization that assisted but had no significant intellectual contribution in the research work should be acknowledged

- Designing of research project
- Statistical analyst
- Computer or clerical assistance
- Providing any material for research work
- Provided facility to carry out research work
- Financial support or Sponsorship

REFERENCE

The term reference is used for the assignment or research paper while for thesis presentation bibliography is used while Citation(Literature citation) refers to acknowledging the source of information that has been mentioned in the research paper. Every book, article, thesis, document or manuscript which has been read or examined or cited should be included in the list of the reference.

STYLE

Journals are varying in their style of handling the references. Some journals print the title of the articles and some do not, some insist on inclusive pagination, while other print first page only.

Mostly three systems are used for the mentioning the reference which are described here.

- Harvard system of references (name and year system)
- Alphabet- number system
- Citation order system

ERRATA

It is the additional information in the next edition of the journal or book or any document that any mistake if present in the previous edition, it can be recovered by this special section in which all the information including page number the salvation of the mistakes is given. This section is known as the errata.

This section is also very important because man-made mistakes are always being present in the articles. If there is no such section there will be chances of misunderstandings, misinterepretations, etc.

USE OF FOOTNOTES

As the name suggest, at the foot of the page some notes are present in the body part not in the abstract, which are conventional validity and explanatory procedures which should be used sparingly and only when the material being presented clearly needs amplification or acknowledgement.

Use of the footnotes are following:

- To validate a point, statement or argument
- To explain, supplement or amplify material that is included in the main body of a paper.
- To provide cross-references to other sections of a paper.
- To acknowledge a direct quotation or indirect quotation.
- To provide the readers with sufficient information to enable them to consult sources independently.

The following information should be included in footnotes which are:

1. Source of information, usually name of the author
2. Title of the source
3. Exact page of the source of reference
4. Date of the publication
5. Publisher and place of publication