What is research

Research is a systematic process for generating new knowledge. Research uses scientific methods. The knowledge generated can be used to solve a problem or to improve the existing status of a system.

Why should we do research

Research promotes knowledge. Dental health care has greatly improved by the understanding of the disease process and by the development of newer treatment methods. Many new materials, drugs and tools have been developed by research. Publication of the findings keeps others informed. Research data paves the way for effective planning and the formulation of oral health policy.

Why to prepare a thesis or dissertation

Earning a master’s degree with thesis option requires the graduate student, in collaboration with a faculty research advisor to design and conduct an original research project. Scholarly activity and research is encouraged from the outset of the student’s post graduate program and should continue to play an important role until completion. The process of designing, writing, and completing the thesis or dissertation affords the student an opportunity to draw upon and consolidate knowledge obtained from classroom lectures, research projects, teaching, and other experiences. However, the thesis or dissertation is viewed as the beginning of the student’s scholarly work, not its culmination. Thesis or dissertation provides the student with hands-on, directed experience in the primary research methods of the discipline and prepares the student for research and scholarship that will be expected after receipt of the degree.

Integrity in research

The graduate student is expected to adhere to the highest standards of academic integrity in research and scholarship. Plagiarism, falsification of data, or other unethical behaviors are not expected.

Dissertation/Thesis

Dissertation is a spoken or written discourse upon a subject or treatment of a subject in which it is discussed at length. Thesis is a proposition laid down or stated especially as a theme to be discussed and proved or to be maintained against attack. This helps in learning research methodology, developing a scientific attitude, doing an in depth study, reading critically and publication.

Selecting a Topic for dissertation

Selection of a thesis or dissertation topic is the responsibility of the student. The student is advised to
consult with an advisor and other faculty members to explore possible fields of interest and available resources and expertise that may exist within the discipline and the University. The potential contributions of faculty members to the development of the student’s thesis or dissertation should be thoroughly investigated before the topic is selected. The thesis or dissertation topic must be approved by the professor and a committee. The student will submit a written statement outlining the scope of the proposed study and procedures to be followed for approval. These procedures must be in compliance with University policies regarding research and the use of human subjects, animals, and radioactive materials in research. The original approval statement and outline are to be maintained in the department office with copies distributed to the Professor and the student.

**Hypothesis**

Hypothesis is an idea which is yet to be proved. Dental implants in chronic smokers failed within a short duration. This has raised doubts in the mind of a dentist. He can formulate a hypothesis “Smoking is an aetiologic factor in the failure of dental implants”

**Aims and objectives**

Aim is the general purpose of a study. Objective spells out exactly what one intends to do in the study. Both the terms are used without much difference on many occasions.
- to study the effect of smoking on dental implant treatment can be the aim of a study
- to compare the failure of dental implant treatment in smokers and non smokers can be the objective of a study

**Study design**

Commonly used study designs are as follows

**Randomized Controlled Trial** is a prospective, analytical, experimental study using primary data generated in the clinical environment. Individuals similar at the beginning are randomly allocated to two or more groups (treatment and control) then followed to determine the outcome of the intervention.

**Cohort Study (prospective)** is a study of a group of individuals, some of whom are exposed to a variable of interest (e.g., drug or environmental exposure), in which participants are followed up over time to determine who develops the outcome of interest and whether the outcome is associated with the exposure.

**Cohort Study (retrospective)** is when data is gathered for a cohort that was formed sometime in the past. Exposures and outcomes have already occurred at the start of the study. You are studying the risk factor and see if you can associate a disease to it. Individuals split by exposure.

**Case Control Study** is a study in which patients who already have a specific condition or outcome are compared with people who do not have. Researchers look back in time (retrospective) to identify possible exposures. They often rely on medical records and patient recall for data collection. Individuals split by disease.

**Survey Study** is an epidemiologic study that produces survey results, and will consist of simultaneous assessments of the health outcome, primary risk exposure and potential confounders and effect modifiers. Two types of survey research are cross-sectional and longitudinal studies.

**Cross-Sectional Study** is the observation of a defined population at a single point in time or during a specific time interval to examine associations between the outcomes and exposure to interventions. Exposure and outcome are determined simultaneously. Often rely on data originally collected for other purposes.

**Longitudinal Study** follow subjects over time with continuous or repeated monitoring of risk factors or health outcomes, or both. Researchers conduct several observations of the same subjects over a period of time, sometimes lasting many years.

**Before and After Study** is a study in which observations are made before (pre) and after (post) the implementation of an intervention, both in a group that receives the intervention and in a control group that does not.

**Case Series** and **Case Reports** are descriptive study/studies that consist of collections of reports on the treatment of individual patients or a report on a single patient.

**Systematic Review** usually focuses on a specific clinical question and conducts an extensive literature search to identify studies with sound methodology. The studies are reviewed, assessed, and the results summarized according to pre-determined criteria of the review question.

**Meta-Analysis** takes a systematic review one step further by combining all the results using accepted statistical methodology.

Usually interventional studies are selected for masters programme in dentistry. These are also known as
experimental studies. Clinical trials are also included in this. In vitro and in vivo studies are taken up. The investigator has to take many decisions on what he has to find out and from where he has to get the data. Shirahatti. R.V, Hegde Shetiya.S have evaluated more than three hundred dissertations submitted to the Rajiv Gandhi University of Health Sciences, Bangalore between 2006 and 2009. 61 studies belonged to Prosthodontics of which 46 (75%) were in vitro laboratory studies, 11 (18%) experimental studies and 4(7%) observational studies.

Components of a thesis

Introduction
The first portion of a thesis is an introductory section. Typically this section is 2-3 pages in length. This section begins with a paragraph or two of general information in the area to acquaint the new reader with the topic. Next should be a brief mention of the most pertinent research in the area to give the reader an understanding of what has been accomplished in this area of research. The next section should be a lead-into the specific topic studied so that the reader will be able to understand the significance of the present study in relationship to prior knowledge and its practical significance to the field. Toward the end of the introduction, the research hypothesis should be mentioned and the objectives of the study is clearly stated.

- Introduction identifies the global area of research and justifies the current effort
- Quickly funnel the topic down to the specific focus
- State the objectives precisely

Review of literature
The review of the literature is a critical, and some would say the most important, part of the research experience. It is often the most difficult portion of the proposal for the student. The sections within a literature review are dependent on the study being done. Areas such as definitions, a general history of the topic, any measurement issues related to the topic, background information related to the variables, and previous research directly related to the topic are often included. The student and faculty advisor(s) should have decided early in the project what topics should be included in this section. This decision gives direction to the time consuming task of library searching. Knowing the areas that must be covered in the literature review will guide the search and allow the student to select and discard articles for their pertinence to the study. Often the first section of the review is a general section that includes an attempt to define the terms that the researcher will be using from a historical to a current perspective. The challenge of the literature review is to synthesize information from a variety of sources. Writing should be in the past tense and should be interesting to the reader. The literature may be criticized and studies evaluated within this section. In this section, the author is putting information together from many sources to support the line of study of the research. Another area commonly included is information related to the measurement that is being used. Background related to the test or instrument and reliability and validity data about selected methods should be reported. Additionally, the author defends why the methods were selected over other available tests. Critical research in the area must also be reviewed. This often represents the bulk of the literature review. Again, synthesis, not research abstracting is the goal. In this area the methods of previous research studies is often scrutinized. The last paragraph of this section should be a summary paragraph that presents a brief review of all of the literature. If not carefully thought out, this chapter will fall easy prey to plagiarism.

Methods
In this section the methodology used for the study should be described in such detail that another researcher would be able to duplicate the study. The section is written in past tense. Several subsections are likely to be included in this section. Some typical subsections might be: Subjects, Sampling Procedures, Pilot Testing, Measurements, Instrumentation, Research Design, and Procedures. The specific sections are dependent on the type of study that is done. The subject group must be clearly indicated in the Subjects section. Only specifically designed apparatus needs to be described. Equipment used by other researchers should be documented, but does not need to be described. Tests that are used should all be documented and briefly described appropriately. Reliability and validity of tests should also be addressed briefly. Questionnaires, testing instruments, and other materials should be included in an appendix. Somewhere in this section, the research design that is being used
should be specified and clarified. Often this is done in a subsection titled Research Design. The variables appropriate for the study (predictor and criterion variables for correlational research and dependent, independent variables for comparative research, etc.) need to be stated, and, if necessary, defined. Common terms (such as pre-test-post-test) do not need to be documented, but if some type of unique design was used, the authority from which it was selected should be cited. A flow chart on methodology is a vital addition to this chapter.

Results

The first paragraph of the results section should describe the variables and how they were analyzed (how the hypothesis was tested). It should also describe how the data are presented. Usually, this first paragraph will have some descriptive statistics for each of the variables and an indication of the sample numbers obtained. Raw data should be included in an appendix that would be listed in the “Table of Contents”, but would not be referred to here since it would not be submitted to a journal for publication. The next paragraphs should be the main statistical presentation including the answers to each of the hypotheses. There might be subsections if there are a variety of analyses. Tables must be referenced in the body of the text. The body of the text should also have a statement about the statistical findings within the table, though the text and table should not be redundant of each other. The probability value should be stated for important findings with a statement of significance. For instance, “The difference in effectiveness between the two groups was 12, which was significant (p<.05) [or (p=.024)].” A statistical analysis must be reported for each hypothesis stated in the introductory section of the article.

Discussion

The discussion section should briefly describe the context of the study, justify the methodology and relate the results to the hypotheses in a statement(s) usually called the “conclusion” statement(s). There should be one conclusion for each hypothesis, though some hypothesis may require a two or three part statement. The conclusions should be a generalization of the statistical findings to the population under investigation, but caution must be used against over generalization. The conclusion is stated in the present tense and should not include technical terms such as statistical jargon or the word “significant.” Following the conclusion statement(s), the findings of the study should be related to the findings of other researchers. If the findings contradict past research, the researcher may present some tentative explanations, based on the literature. Interpretations that may be drawn from the data analysis also should be made here, including implications of the findings for practice or the work setting. The researcher may attempt to add meaning to the data analysis by indicating any interpretations or insights that appear pertinent. The final statements should be suggestions for future researchers in the area so that a new researcher might find direction on what is now needed in this area of research.

Tables and Figures

Include all tables, followed by all figures. Each table and figure should be on a separate sheet of paper and should have a number and a title.

List of references

Use Vancouver format for the bibliographic entry of cited works. The candidate should be very cautious using the Internet as a reference. Anyone can put anything on the Internet. Citing the Internet gives no credibility in and of itself. If there is an Internet resource, it is best to go to some other sources to validate it. The Internet is a powerful tool, but should not be depended upon without other validation of the information.

Vancouver is a numbered referencing style commonly used in medicine and science, and consists of:

- citations to someone else’s work in the text, indicated by the use of a number
- a sequentially numbered reference list at the end of the document providing full details of the corresponding in-text reference

It follows rules established by the International committee of Medical Journal Editors, now maintained by the U.S. National Library of Medicine. It is also known as Uniform Requirements for Manuscripts submitted to Biomedical Journals.

In-text citations

- Insert an in-text citation:
  o when your work has been influenced by someone else’s work, for example:
    § when you directly quote someone else’s work
    § when you paraphrase someone else’s work

K. Chandrasekharan Nair
General rules of in-text citation:
- A number is allocated to a source in the order in which it is cited in the text. If the source is referred to again, the same number is used.
- Use Arabic numerals (1, 2, 3, 4, 5, 6, 7, 8, 9) or either square [ ] or curved brackets ( ) can be used as long as it is consistent. Please check with your faculty/lecturer to see if they have a preference. For consistency in this guide we have chosen to use round brackets for our examples.
- Superscripts can also be used rather than brackets eg. ...was discovered.¹
- Reference numbers are generally placed outside or after full stops and commas - however check with your faculty/journal publisher to determine their preference. For consistency in this guide we are placing reference numbers after full stops.
- Whatever format is chosen, it is important that the punctuation is consistently applied to the whole document. Multiple works by the same author: Each individual work by the same author, even if it is published in the same year, has its own reference number.

Citing secondary sources:
A secondary source, or indirect citation, occurs when the ideas on one author are published in another author's work, and you have not accessed or read the original piece of work. Cite the author of the work you have read and also include this source in your reference list.

Citing more than one reference at a time:
The preferred method is to list each reference number separated by a comma, or by a dash for a sequence of consecutive numbers. There should be no spaces between commas or dashes. For example: (1, 5-6-8)

Reference List
- References are listed in numerical order, and in the same order in which they are cited in text. The reference list appears at the end of the paper.
- Begin your reference list on a new page and title it ‘References.’
- The reference list should include all and only those references you have cited in the text. (However, do not include unpublished items such as correspondence).
- Use Arabic numerals (1, 2, 3, 4, 5, 6, 7, 8, 9).
- Abbreviate journal titles in the style used in the NLM Catalog.
- Check the reference details against the actual source - you are indicating that you have read a source when you cite it.
- Be consistent with your referencing style across the document.

Format of a thesis

Paper and Copying
Students should use a laser printer or other high quality printer to print a master copy of the thesis, which remains with the student. All pages should be printed only on one side.

Students are responsible for obtaining copies of the approved thesis, bearing the signatures of the guide, for themselves, their advisors, the library and their departments as well as the University. The copy submitted to the University must be a clean copy on 25% cotton fiber, white, 8 ½ by 11 inch paper, not the original master copy. Folded pages must be of the same quality as the others and must be folded such that they accommodate binding.

Fonts
A standard font of 12 points should be selected for use throughout the entire thesis (Standard fonts include Times New Roman, Arial or Courier). Eccentric type styles, such as cursive, are not permitted.

Margins and Spacing
The entire thesis should be double-spaced except for long quotations, computer programs, endnotes, and footnotes. These exceptions should be single-spaced.

Paragraphs should begin with a standard, consistent indentation and each sentence should be consistently followed by one or two spaces after the period before the next sentence begins.

Margins on all copies must be uniform. The first page of each chapter, Table of Contents, List of Figures, List of Tables, Acknowledgement, Bibliography, etc., must have margins of:
- 2 inches at the top
- 1½ inches at the left
- 1 inch at the right and bottom

All pages with a 2-inch top margin must have the page number at the bottom center of the page. There must be a double space between the last line of the text and the page number at the bottom of the page. The number at the bottom of the page must not intrude into the 1-inch margin.
All other pages must have page numbers at the upper right corner of the page. There must be a double space between the page number and the first line of type. These pages must have margins of:
1 inch at the top
1 ½ inches at the left
1 inch at the right and bottom

Forms, questionnaires, etc., used in the preparation of the thesis/dissertation and included in the manuscript, must be designed to comply with the margin guidelines.

Landscape pages must be positioned with the heading at the binding edge.

The beginning of a paragraph at the bottom of a page must contain at least two lines. Likewise, a concluding paragraph at the top of a page must contain a minimum of two lines. Excessive division of words on the right margin should be avoided. Never divide words between pages.

Illustrations, Tables, Figures

Illustrations, Tables, Figures etc., must not be larger than the space within the margins. Tables which are larger than the ordinary page must be reduced or folded to come within the margins so they will not be sheared off in binding. The page number for fold-outs must be placed in the upper right corner of the outside of the folded portion, 1 inch from the top and right edges. The page number for reduced pages must be typed after reduction. Illustrations, Tables, Figures, etc. must be numbered.

Parts and order of pages for a Thesis

Blank Page

The blank page is required and should not include markings of any sort. It should be left unnumbered, and it is not counted in numbering successive pages.

Title Page

The title page is required. It should be assigned the page number “i” (lower case Roman numeral one), although the number does not appear on the page. The date included on the title page is the month and year of the author’s graduation.

Copyright Page

The copyright page is optional but if included, must be inserted immediately after the title page. It should be left unnumbered, and it is not counted in numbering successive pages.

Approval/Signature Page

This page is required for all theses. The committee signatures must be original (not copies of the original) and in black or blue ink. The date on this page is the date of the final examination. The page should be numbered as page “ii” (lower case Roman numeral two). Successive pages should be numbered from this page.

Dedication and/or Acknowledgment Pages

These pages are optional for theses. Lower case Roman numerals should be used to number these pages.

Abstract

All theses must include an abstract. It should be numbered with lower case roman numerals and should include the student’s name, the title of the thesis, and the date of examination. The abstract must not exceed 250 words. Although the University determines the contents of the abstract, the following information is appropriate:

a brief introduction of background or importance;
a brief discussion of methods and procedures used;
a condensed summary of findings / results;
a summary of conclusions reached in the study.

Table of Contents

The Table of Contents is required for all dissertations. The Table of Contents is NOT listed in the Table of Contents. Number all table of contents pages with lower case Roman numerals. The thesis may be presented in the form of Chapters or Sections, at the discretion of the student and guide.

List of Tables

This list should only be included in a thesis that incorporates five or more tables. If used the List of Tables page(s) should be numbered with lower case Roman numerals.

List of Figures. Illustrations, Charts, or Graphs

This list should only be included in a thesis that incorporates five or more figures, illustrations, charts, or graphs. If used, the List of Figures page(s) should be numbered with lower case Roman numerals. A list of symbols page is optional as needed. If figures must be presented in landscape format, the page must be numbered at the bottom center and the margin of 1 ½” must be maintained on the binding side of the figure.
Text
The pages of the body of the thesis should be numbered with Arabic numerals (1,2, 3, etc) at right hand top corner. Each chapter or section should begin at the top of a new page. With a top margin of 2”, the title of the section should be centered and typed in full capital letters. The first line of text begins three single spaced lines below the section title. Major headings (Chapters or Sections) may be in BOLD TYPE for organization.

Footnotes or Endnotes
Footnotes come at the bottom of the page where noted and endnotes come at the end of each chapter or are grouped together directly after the entire body of the thesis. They should be uniform and formatted according to a standard style guide.

References or Citations
All theses must include a list of works cited and/or referenced. The citations should appear directly after the body of the thesis (and after footnotes or endnotes, if they are used). References may be presented in the style of the scholarly discipline, i.e., Vancouver system or Harvard system. All pages of the references should be numbered with Arabic numerals as in the text page.

Preparation of abstract
1. The abstract must not exceed 350 words for dissertation. It must consist of the briefest possible summary of the thesis/dissertation and the conclusions reached. Explanatory matter and opinion must be omitted.
2. The word “Abstract” must not appear at the top of the page.
3. The title must be arranged as follows:
   a. typed single spaced
   b. flush with 1 ½” left margin
   c. placed 1” from the top of page
   d. full name of the student typed in UPPER-CASE
   e. title typed in upper and lower case
   f. name of guide in UPPERCASE
   g. triple-spaced between title and first line of text

(Example of Abstract Title):
GOPI
A Study on the Relationship between Ceramo-Metal Bond Strength and Ceramic Firing Temperature
(Under the guidance of NAIR.M)

4. The body of the abstract must be double-spaced, continue with margins as above, with 1” bottom margin.
5. Indentation of paragraphs must be the same used in the text.
6. The student should select several key words derived from the title and subject heads and additional descriptive words that will be of value to information retrieval services. The words must be listed three lines below the body of the abstract, flush with the 1 ½” left margin

(example below).
KEY WORDS / MeSH WORDS: Ceramic, Ceramo-metal bond, Firing temperature
7. Do not number pages of the abstract.
8. Binding of the abstract is optional. If bound, it should be placed in the front of the manuscript, preceding the Title Page.

Sample outline for research proposal

Chapter I Introduction
A. Introduction (provides a brief orientation to the reader)
   B. Statement of the problem
   C. Significance of the problem (addresses the importance of the problem to the discipline)
   D. Statement of the purpose (a clear, concise statement of the purpose of the study)
   E. Theoretical/Conceptual framework (provides a framework for examining the problem and for linking it to relevant literature)
   F. Objectives, hypotheses, research questions (to be derived from the purpose and framework and provide specific direction for data analysis and interpretation)
   G. Assumptions/theoretical limitations
   H. Definition of relevant terms

Chapter II Review of literature
(Provides an overview of essential information that will guide the study and illustrates that the researcher has a command of current knowledge regarding the proposed problem.)

Review of relevant literature

Chapter III Methods
Description of the research design (the general strategy for conducting the study)
   A. Population and sample (population to which the findings will be generalized and from which the sample will be selected, how sample will be selected)
   B. Setting (where the study will be conducted)
   C. Protection of subjects’ rights (illustrates recognition and protection of rights and welfare of subjects)
D. Measurement methods (methods of measuring study variables described, including instruments)

E. Plans for data collection (the procedure by which the data will be collected, and who will collect it)

F. Plan for data analysis (statistical analysis techniques which will be used)

G. Limitations (methodological limitations)

H. Study budget and timetable (might be in an appendix)

**Qualities of a title**

Title should be as revealing and precise as possible. The reader should be able to quickly discern the content of the thesis from the title. The title should be useful for electronic database searches. Title should contain key words/MeSH words for a Pubmed search. The title should tell the reader which material, test and time span are involved.

**Title**: Mechanical properties of dental cements

**Revised title**: Biaxial flexural strength of resin modified glass ionomer versus composite dental cements.

**Citation of reference**

The reference should contain Author, Title and Source. Vancouver system is generally accepted.


**Reference**