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Research Methodology on Medicinal Chemistry

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Dr. Swarnali Nath Choudhury

Assistant Professor, Faculty of Science and Technology, The ICFAI University Tripura.

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ABSTRACT

Research is a careful and scientific inquiry into every subject, subject matter, or area, which is an endeavour to discover valuable information which would be useful for further application. Thus, research is a process of a systematic and in-depth study or search of any specific topic, subject or area of investigation. Suitable general and specific conclusion may be drawn from analysis of all the data obtained and the scope of further work may be discussed.

INTRODUCTION

Research is a careful and scientific inquiry into every subject, subject matter, or area, which is an endeavour to discover valuable information which would be useful for further application. Thus, research is a process of a systematic and in-depth study or search of any specific topic, subject or area of investigation. Research may involve a scientific study or experimentation and result in discovery or invention, which would increase in scientific development or decision-making[(1)]. Research is an organized and systematic finding answer to our questions[(2)]. The meaning of research is to search again, which means 'to examine closely and clearly' or 'to test to try to probe'. The two words forming a noun describes as 'searching again and again' or 'examining clearly again' or 'testing again'. It is a careful and systematic study in field of knowledge, undertaken to establish facts of principles. Scientific methods consist of systematic observation, classification, and interpretation of data. Hence research is a process for collecting, analyzing, and interpreting information to answer questions[(3)].

Scientific method refers to organization of process to investigate phenomena, obtaining new information, or modifying previous information.

The method of scrutiny must be based on method of collecting facts, measuring data so that it can be termed as scientific[(4)].

A scientific method is based on observation and experimentation, formulation and testing of hypotheses and finally collection of data [(4)].

Even though procedures followed in experimentation may vary from one field of inquiry to another, but specific identifiable features distinguish scientific inquiry from other methodologies of knowledge. Scientific researchers propose hypotheses as explanations of phenomena, and design experimental studies to test these hypotheses. These steps must be repeatable in order to dependably predict any future results. Theories that encompass wider domains of inquiry may bind many hypotheses together in a coherent structure. This, in turn, may help form new hypotheses or place groups of hypotheses into context.

Among other facets shared by the various fields of inquiry is the conviction that the process is objective to reduce a biased interpretation of the results. Another basic expectation is to document, archive and share all data and methodology so they are available for careful

scrutiny by other scientists, thereby allowing other researchers the opportunity to verify results by attempting to reproduce them[5]. This practice, called *full disclosure*, also allows statistical measures of the reliability of these data to be established.

The research process: an eight-step model[6]. Steps in planning a research study.

Step I: Formulating a research problem.

Step II: Conceptualizing a research design.

Step III: Constructing an instrument for data collection.

Step IV: Selecting a sample.

Step V: Writing a research proposal.

Steps in conducting a study:

Step VI: Collecting data.

Step VII: Processing data

Step VIII: Writing a research report.

PROCEDURE FOR REVIEWING THE LITERATURE

The literature review should be focused on our research problem. We should conceptualize our research problem before undertaking our major literature review. There are four steps involved in conducting a literature review.

i. Search for existing literature.

To effectively search for literature in our field of inquiry, it is imperative that we have in mind at least some idea of the broad subject area and of the problem we wish to investigate, in order to set parameters for our search. There are two sources that we can use to prepare a bibliography[8].

a) Books

b) Journals.

There are several sources designed to make our search for journals easier and these can save our enormous time. They are-

a) Indices of journals

b) Abstracts of articles (eg. Chemical Abstract ACS)

c) Citation indices (eg. SciFinder, PubMed.)

All the above indices, abstracts, and citation services are available in print or on CD-ROM or are stored on a mainframe computer accessible through the internet, a worldwide electronic communication system[9]. We should talk to our research supervisor and other available experts to find out about any additional relevant literature to include in our reading list.

Books- Books have their advantages as well as disadvantages. The main advantage is that the material published in books is usually important and of good quality, and the findings are integrated with other research, to form a 'coherent body of knowledge'.

The main disadvantage is that the material is not completely up to date, as it can take a few years between the completion of a work and its publication in the form of a book.

The best way to identify books is to use computer catalogue. If we think the title of books seems to be appropriate to our topic, we should note them down. Sometimes a title does not provide enough information to decide if a book is going to be of our use. To make this decision we may have to search such books in the library and examine their contents.

When we have selected 10-15 books that we think are appropriate for our topic, we should examine the bibliography of each. We can save time by making photocopy of these. If we can identify that a book has been referenced by a number of authors, we should also include it in our reading list.

Having prepared our reading list, we are to locate these books in our book's contents is relevant to our topic, we should make an annotated bibliography. An annotated bibliography contains a brief abstract of the aspects covered in a book and our own notes of its relevance.

Journals- Journals provide us with the most up-to-date information; even though there is often a gap of two or three years between the completion of a research project and its

publication in a journal. As with books, list of the journals can be done in a number of ways. We can:

* Locate the hard copies of the journals that are appropriate to our study;

* Look at citation or abstract indices to identify and/or read the abstracts of such articles.

* Search electronic databases.

*Use the internet.

The Research Problem

Any question that we want to be answered and any assumption or assertion that we want to challenge or investigate can become a research problem or a research problem or a research topic for our study. First identifying and then specifying a research problem might seem like research tasks that might seem to be easily and quickly accomplished.

The importance of formulating a research problem

The formulation of a research problem is the identification of a destination before undertaking a journey. The research problem serves as the foundation of a research study[(11)]. The way we formulate a problem determines almost every step that will be followed: the type of study design that can be used, the type of sampling strategy that can be employed; the research instrument that can be used or developed and the type of analysis that can be undertaken.

Consideration in selecting a research problem

While selecting a research problem/topic there are a number of considerations to keep in mind. These considerations are interest, magnitude, measurement of concepts, level of expertise, relevance availability of data and ethical issues.

Interest – A research endeavor is usually time consuming and involves hard work and possibly unforeseen problems. If we select a topic which does not greatly interest us, it could become extremely difficult to sustain the required motivation, and hence its completion, as well as the amount of time taken, could be affected.

Magnitude - We should have sufficient knowledge about the research process to be able to visualize the work involved in completing the proposed study. It is extremely important to select a topic that we can manage with the time and resources at our disposal. Even if we are undertaking a descriptive study, we need to carefully consider its magnitude.

Measurement of concepts – If we are using a concept in our study, we must be clear as to what must be clear as to what determines effectiveness and how it will be measured. While most of the developmental work will be done during our study, it is imperative that we are reasonably clear about the measurement of these concepts at this stage.

Level of expertise – We must have an adequate level of expertise for the task we are proposing. We will learn during the study and receive guidance from our research supervisors and others but we need to do most of the work ourself.

Relevance – We should select a topic that is of relevance to us as a professional. This will help us to sustain interest in the study.

Availability of data- If our topic entails collection of information from secondary sources (office records, client records, census, or other already-published reports etc.) Before finalizing our topic, we must make sure that these data are available and in the format we want.

Research problem on medicinal chemistry

After all possible literature survey the curiosity to work on medicinal plants and also being the resident of Tripura, the anxiousness to work on the plants available in that locality which the tribal people use for some of their physical ailment became strong.

Organization for the research work

The work will include the following components

1. Collection and identification of medicinal ethnobotanical plants.
2. Macroscopical and microscopical search.
3. Preparation of plant extracts.
4. Preliminary analysis involving physical and chemical characteristics.

5. Qualitative phytochemical studies using chromatographic methods.

6. Isolation and characterization of bio-active molecules from one/two medicinal plants.

7. Therapeutic evaluation by pharmacological studies includes hypnotic property, CNS depressant property, analgesic activity.

8. Tests on certain aspects of toxicity of one or two wild edible plants.

9. Antimicrobial screening.

10 Summary

11 References.

Objective

1. Collection of medicinal plants of tripura and their identification.

2. To find out the pharmacognostical features of the few medicinal plants.

3. To observe the probable chemical constituents (qualitatively) present in the extracts of few parts, along with the physical parameters.

4. Isolation and characterization of bio-active molecules from one/two plants.

5. To measure the therapeutic level of some medicinal plant extracts.

6. Toxicological study of one or two biological active medicinal plants.

7. Antimicrobial activity of the extracts of different parts of medicinal plants of Tripura.

METHODOLOGY AND ANALYTICAL TOOLS

To achieve the target, various methodologies are followed depending upon nature of the research problem. Considerable attention is being paid to minimize the wastes of chemicals and time and to follow the economically viable route are adopted in a research method. During the research work, various analytical methods have been adopted to purify and characterize the samples.

Collection of wild medicinal plants will be done by market survey and their identification.

Pharmacopical studies i.e., macroscopically and microscopically characterization of plant parts that have medicinal importance will be done.

Extraction of plant material Extraction of plant parts by solvent extraction method using soxhlet apparatus. Physical and chemical characteristics of the extract such as colour, density, specific gravity[16], pH[17], etc will be done. Phytochemical studies (qualitative)[18] to find out the presence of different chemical entities will be done by comparing R_f[18,19] values using TLC. The air-dried and powdered plant materials (10 g of each) will be extracted successively under shaking with chloroform ($CHCl_3$) for three to five times at room temperature, with 90% methanol (CH_3OH) in water-bath at 50ºC for three to five times and finally with water (H_2O) in a water-bath at 70ºC. The obtained extracts will be filtered and evaporated by using vacuum evaporator or by freeze dryer to give the crude dried extract, chemical group analysis, tests for different chemical groups such as-

(a) Alkaloids

(b) Steroid

(c) Saponins

(d) Flavones

(e) Poly Phenols, etc.

For isolation and identification of bioactive molecules, repeated extraction from plant parts with organic solvents using soxhlet apparatus will be done. Each of the components will be separated by using column chromatographic technique. The purification of the samples may be confirmed by HPLC (High Performance Liquid Chromatography), GC-MS (Gas Chromatographic Mass Spectroscopy). One of the most useful analytical tools for the characterization of samples at various stages is NMR (Nuclear Magnetic Resonance) spectroscopic technique. Other valuable spectroscopic technique used is to monitor the composition as well as progress of reaction, are UV-Visible (UV-Vis.) and Infrared (IR) Spectroscopy.

To screen the potential of biological properties of various compounds UV visible spectroscopic technique are being used.

Some microscopic instruments including simple microscope as well as Scanning electron microscope are used and are immensely helpful to study the biological property of naturally occurring compounds as well as synthetic compounds.

The extract obtained may contain mixture of compounds and hence will be subjected to TLC with correct eluent and spot will be traced after contacting with Iodine vapour or using UV-viewer. Purification and identification of the extract may be done by various methods including adsorption and column chromatography, acid and alkaline hydrolysis. The progress in the purification steps may be monitored by TLC, HPLC, UV-vis spectroscopy, IR, ^{1}H and ^{13}C NMR, MS (EI/FAB) or GC-MS.

The naturally occurring compounds will be isolated by following solvent extraction technique.

INTERPRETATION OF DATA OBTAINED

The data obtained from the various experimental sections will be compiled and will be interpreted based on available reports with an aim to present systematically in the form of manuscript for publication in reputed journals.

Elucidation of the structures of phytochemicals

Various data obtained from UV-Vis., IR, NMR (^{1}H and ^{13}C), GC-MS and X-ray (wherever possible) may be interpreted to elucidate the structure of the isolated pure compound.

Biological Aspects:

Therapeutic evaluation by pharmacological studies includes hypnotic property[20], CNS depressant property[20] and analgesic activity[21] of the extracts in Albino Swiss mice. For hypnotic activity sleeping time duration shall be measured using pentobarbitone as standard drug. CNS depressant property will be measured by observing the scores in Photo-Actometer. Analgesic activity will be measured by using acetic acid induced writing by taking Aspirin as standard drug.

Toxicological studies of the medicinal plant parts may be done using LD_{50} method[22].

Antimicrobial studies of the different plant parts by determining the zone of inhibition [23].

CONCLUSION AND FUTURE SCOPE OF STUDY:

Suitable general and specific conclusion may be drawn from analysis of all the data obtained and the scope of further work may be discussed.

SUMMARY OF THE WORK

A clear cut summary pointwise will be written to discuss briefly the whole of Research work carried out for a Ph.D. degree.

BIBLIOGRAPHY

1. Borse, M. N. 2005 Handbook of Research methodology: modern, methods & new techniques. Shree Niwa's publications, Jaipur (India).
2. Kothari, C.R. 2003 Research Methodology-methods and techniques. 2nd ed. (reprint). New Age International Pvt. Ltd. New Delhi.
3. Korde and Sawant. Science and scientific methods, 4th ed., Himalaya publishing house, Bombay.
4 Creswell, J. W. 2003.Research design: qualitative, quantitative and mixed methods approaches. 2nd ed. Sage, New Delhi.
5. Thomas R.M. 2003. Blending qualitative, quantitative and research methods in theses and dissertations. Thousand Oaks, CA: Corwin Press.
6. Paul D. Leedy. 1988. Practical research: Planning and design. Macmillan Publisher, USA.
7. Ranjit Kumar. 2005. Research methodology: A step by step guide for beginners. Sage publications, Thousand Oaks, California.
8. Maxwell, Joseph Alex**.** 1996. Qualitative Research Design: An Interactive Approach Sage Publications.
9. Kemmis, S. and R. McTaggart. 1988. The action research planner. 3rd ed. Victoria, Australia: Deakin University Press.
10. Britha Mikkelsen. 2005. Methods for development work and research. Sage publications. New Delhi.
11. Patton, M.Q. 2002. Qualitative research & evaluation methods (3rd edition). Thousand Oaks California: Sage Publications.
12. Melville S, Goddard W. 1996. Research Methodology: An Introduction for Science & Engineering Students Juta & Co. Ltd.
13 Creswell, J. 1998. Qualitative inquiry and research design: Choosing among five traditions. Thousand Oaks, California: Sage Publications.
14. Dawson, C. 2002. Practical Research Methods: A User-friendly Guide to Mastering Research Techniques and Projects. How To Books Ltd.
15. Schmuck, R. A. 2006. Practical action research for change. Corwin Press, sage publications, Thousand Oaks, California.
16. Bahl B S, Tuli G D and Bahl A, *Essential of Physical Chemistry*, S. Chand and Vallabh Prakashan, Delhi Company Ltd., New Delhi, 24th edition,2001, 853-854.
17. Beckett A H and Stenlake J B., *Practical Pharmaceutical Chemistry Part-1*, CBN publisher and distributors, New Delhi, 1st edition 2001, 180-186.
18. Kokate C K, *Practical Pharmacognosy*, Vallabh Prakashan, Delhi, 4th edition, 2001, 28, 92, 107.
19. Kokate C K, Purohit A P and Gokhle S B, *Pharmacognosy*, Nirali Prakashan, Pune 20th edition, 2002, 114-119.
20. Kulkarni S K, *Handbook of Pharmacology*, Vallabh Prakashan, Delhi, 2nd edition, 1996, 41-42.
21. Wittkin L B, Heuber C F, Galdi F, Okeefe E, *et. al., J Pharmacol. Expt. Therap.*, **133**, 400-404(1961).
22. Jr J T, Litchfiekld and Wilcoxon F, "A simplified method of evaluating dose effect experiments", *J. Pharmacol. Expt. Therap.* **96,**99-103 (1949).

23. PelczarM J, Chan E C S and Krieg I V R, *Microbiology*, Tata McGraw Hill Publishing Co.Ltd., New Delhi, 5th edition, 1993, 536-539.
24.https://www.csun.edu/~mss70398/Semester%201/Scientific%20Method/Scientific%20Method.html.