

Steps in research planning-A literature review

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Abstract

The need for scientific evidence should be the basis of clinical practice. Though the clinical practice is evolving at a rapid pace, with the introduction of several materials, instruments, and equipment’s still there is huge gap between translation of research into clinical practise. The primary purpose of research is to produce new knowledge or find new ways of making the existing knowledge available to those who need it. This review focusses on the different steps in research planning, methods to improve evidence-based practice, by improving methods to integrate laboratory and clinical research.

Keywords: Clinical epidemiology, evidence-based dentistry, PICO format, Research Planning

Introduction

The field of dental research in India has witnessed exponential growth in the last five years. ^[1] However, scientific publications in international peer-reviewed journals have been few. ^[2] The lacuna of Indian

contribution to international scientific literature is probably a skewed understanding of research and its contribution in effecting improved patient care. The primary purpose of research is to produce new knowledge or find new ways of making the existing knowledge available to those who need it.

A good research design and methodology clearly describes the techniques to be used for selecting samples, collecting data, managing cost, and other aspects that are essential for conducting a research.

The research process is the cornerstone for informed and effective decision-making, and is integral to countries’ efforts to improve the health of their populations and the effectiveness of their health systems, particularly during times of dramatic epidemiological, demographic and economic changes that profoundly affect health systems.

Discussion

Research definition: Systematic approach of reasoning, documenting analyzing, reporting unusual clinical observations that we come across every day.

Characteristics of Research

1. Clarity
2. Well Defined
3. Systematic Investigation
4. Language
5. Titling
6. Importance
7. Logical

Requisites of Good Research

1. Focus: Area of interest/expertise, Meaningful progress
2. Rationale: Clinically relevant, Proof of concept Challenge
3. Validity: Will the results be useful and to whom?. In vivo studies-Good internal validity. In vitro studies-Good external validity
4. Feasibility: Time, Study population, Infrastructure

Clinical Epidemiology^[3]

The term Epidemiology refers to the study of the distribution and determinants of health-related states or events (including disease), and the application of these methods to the control of diseases and other health problems. **David Sackett**, in 1969, coined the term clinical epidemiology.

Figure 1: Measurement Iterative Loop



Figure 2: Era Of Evidence Based Dentistry^[3]

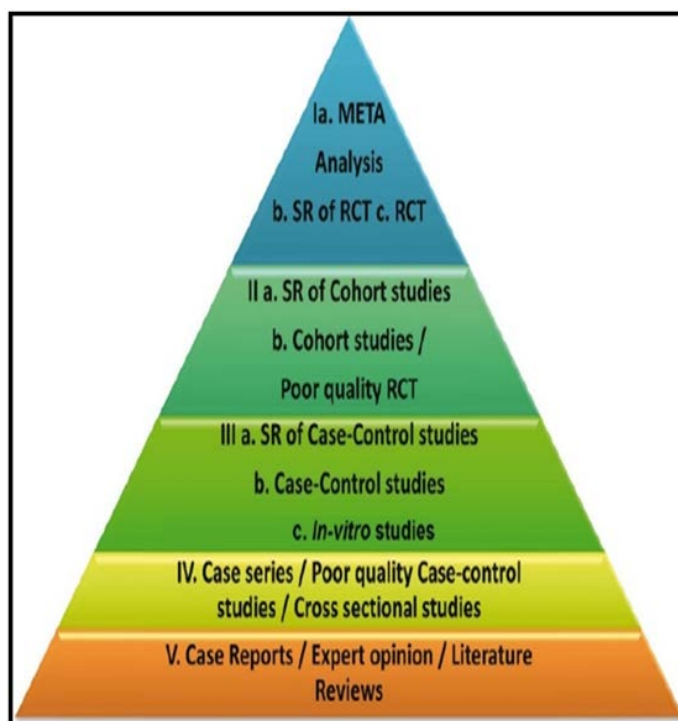
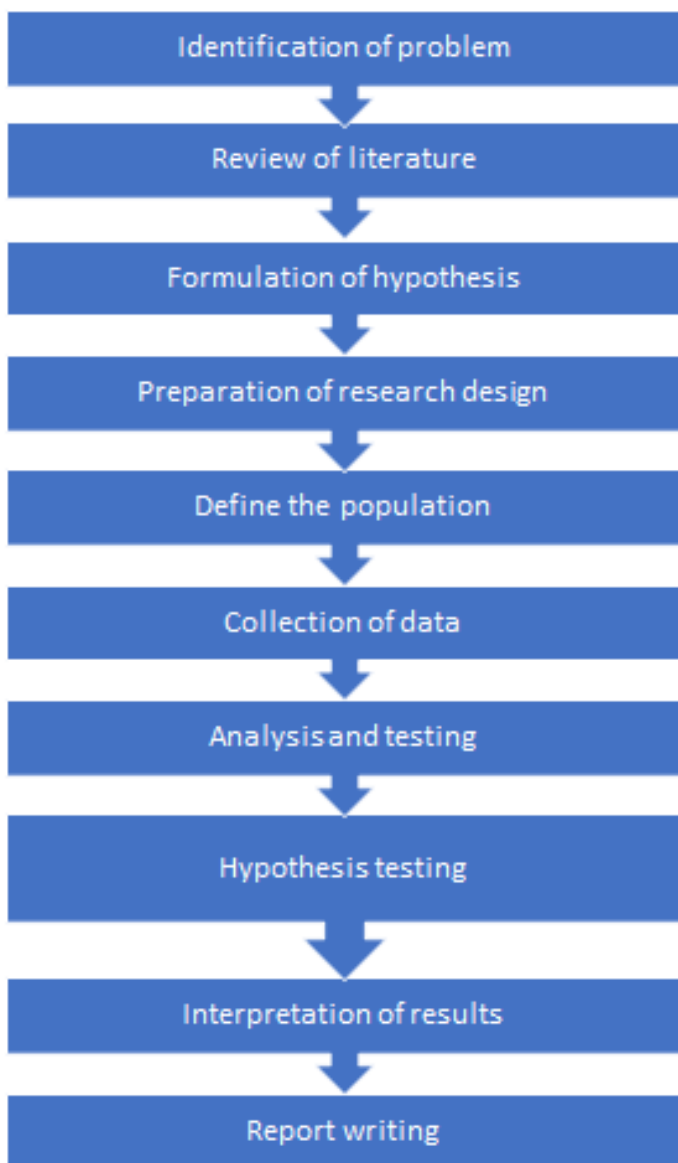


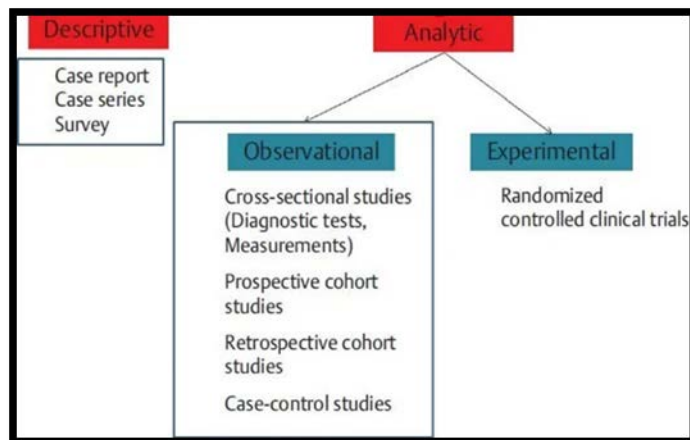
Figure 3: Steps In Research Planning [3]



Research Strategies And Design^[6]

The research strategy must include the definition of the population of interest, the definition of variables (characteristics of the individuals in this population), their status and relationships to one another population of interest, the definition of variables (characteristics of the individuals in this population).

Figure4

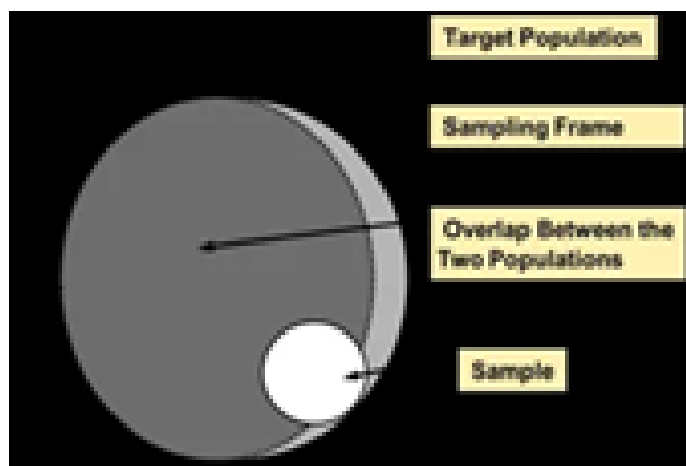


Sampling. -^[13,14,15]

Definition: Sampling is a process used in statistical analysis in which a predetermined number of observations are taken from a larger population.

Sample: Sample is a group of people, objects, or items that are taken from a larger population for measurement.

Figure5



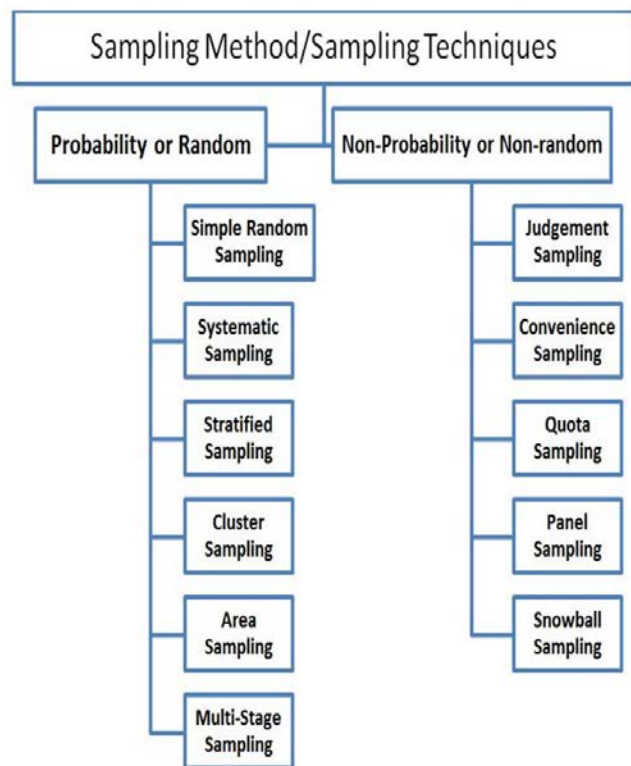
Identification Of Problem And Hypothesis Formulation^[3,4]

RESEARCH QUESTION- A well-built research question should include four parts, referred to as the PICO format / Finer Criteria^[5,6]

Review of Literature^[7-13]

A Literature Review is "a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners."

Figure 6



Data Collection^[13]

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes.

Types Of Data

1. Qualitative data
2. Quantitative data

Statistical Analysis Of Data

Statistical methods^[13] involved in carrying out a study include planning, designing, collecting data, analysing, drawing meaningful interpretation and reporting of the research findings. The statistical analysis gives meaning to the meaningless numbers, thereby breathing life into a lifeless data. The results and inferences are precise only if proper statistical tests are used.

Variables

Variable is a characteristic that varies from one individual member of population to another individual.^{-[16]} Stevens⁻ ^[17]. proposed 4 classes of measurement scales-

1. nominal scales
2. ordinal scales
3. Interval scales
4. ratio scale

HYPOTHESIS TESTING^{-[13]}

What is Hypothesis testing

A set of logical and statistical guidelines used to make decisions from sample statistics to population characteristics. Hypothesis testing is the process used to evaluate the strength of evidence from the sample and provides a framework for making determinations related to the population. The first step in testing hypotheses is the transformation of the research question into a null hypothesis, H₀, and an alternative hypothesis, H_A. ^{-[18]}

Basic Concepts In Hypothesis Testing

1. Null hypothesis and Alternative hypothesis
2. Level of significance
3. Critical region
4. Decision rule
5. Type 1 and Type 2 errors
6. Power of tests
7. Parametric and Non parametric tests

Parametric and nonparametric tests [19,20,21-24]

Figure 7

Parametric test	Non-Parametric equivalent
Paired t-test	Wilcoxon Rank sum Test
Unpaired t-test	Mann-Whitney U test
Pearson correlation	Spearman correlation
One way Analysis of variance	Kruskal Wallis Test

Interpretation of Results and Report Writing

Definition of Research Report: Simply, a research paper/report is a systematic write up on the findings of the study including methodologies, discussion, conclusions etc. following a definite style.

Conclusion

The need for good research is to find the best evidence for clinical practice, for specific problems, and to address methods in reducing the burden of illness on a larger scale. Research studies in Endodontic and Restorative dentistry are two dimensional. The first dimension is the laboratory research, which provides the best evidence on material science and the second dimension is clinical research, which provides the best evidence in dealing with the burden of illness, with efficient clinical practice. This increases the avenues for research studies in several directions. With an increasing requirement to publish, articles with good clinical evidence stand a definite chance to find their place in scientific literature.

The results section of a study is the lifeline of any original research. It is the responsibility of the investigators to understand this section in order to bring out a meaningful inference. Statistics is the only method available to deduce

this inference. Hence, our understanding of the statistical methods plays a pivotal role in claiming authority of the inference of our study. The knowledge of research methodology is essential. Concrete results can be drawn only when a study is valid and reliable while planning any study one must keep in mind all the steps of research planning and the above-mentioned guidelines to prevent bias and errors in the study.

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