

Research methodology

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Research: Overview

- WHO defines research as-
"A systematic collection, analysis and interpretation of data to solve a problem or to have an answer of a question".
- Importance of research:
 - ✓ **Advancements in medical treatments** are a direct result of research. Through rigorous scientific inquiry, researchers develop new medications and treatments.
 - ✓ By **uncovering the underlying causes of diseases**, research enables the development of more targeted and effective treatments.

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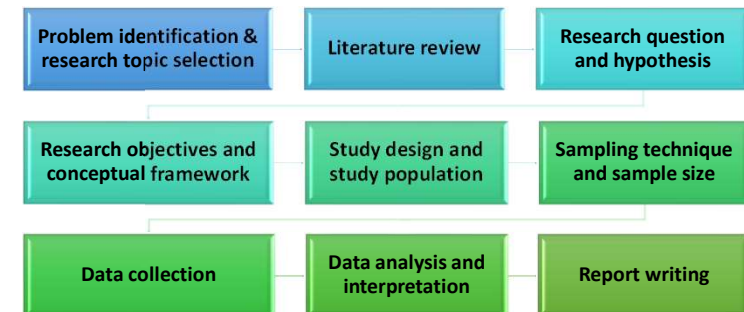
Research: Overview

- ✓ Research also plays a **vital role in disease prevention and early detection**. By identifying risk factors and developing early detection methods, research enables healthcare professionals to intervene earlier, reducing the burden of diseases on individuals and communities.
- ✓ The **impact of research on public health is profound**. Research informs public health policies and interventions, addressing health disparities and inequities.
- ✓ It also plays a **crucial role in pandemic preparedness and response**, enabling the development of vaccines, diagnostics, and treatments.

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Steps of research



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Research problem

- **Research problem** is a controversial, troubling area where there is a **gap in existing knowledge**, which needs an inquiry to get better understanding and to find out the best solution.
- Research problem arises out of the **discrepancy** between the common belief (what it should be) and the reality (what it is).
- So, research problem (P) is the **gap between expectation (E) & reality (R): Problem (P) = E – R.**

Research topic

- Research topic refers to **specific area or subject** of interest that a researcher chooses to investigate.
- A research topic is typically formulated **based on a research question, problem or hypothesis** that the researcher wishes to explore.
- In other words, it is a specific subject or issue that a researcher plans to **investigate through a research study.**

Criteria of a good research topic

- The criteria for selecting a research topic are:
 - ✓ **Relevance**
 - ✓ **Avoidance of duplication**
 - ✓ **Feasibility**
 - ✓ **Political acceptability**
 - ✓ **Applicability**
 - ✓ **Urgency of data needed**
 - ✓ **Ethical consideration**

Research question

- **Research question** is the reflection of the problem under study.
- It is the **foundation** of research process.
- It indicates what the **researcher intends to know and unveil.**
- A research question is a clear, focused, concise, complex and arguable question around which research is undertaken.
- A research question should have following criteria: **Feasible, Interesting, Novel, Ethical and Relevant (FINER criteria).**

Research question

- There are **3 basic types** of research questions:
 - **Descriptive question:**
What is the level of knowledge of rickshaw-puller regarding HIV-AIDS?
 - **Relationship question:**
Is there any association between passive smoking and dental caries?
 - **Difference question:**
Is there any difference in the level of disability between ischemic and hemorrhagic stroke?

Research hypothesis

- A hypothesis is a **formal, tentative statement of the expected relationship** between two or more variables under study.
- WHO defines hypothesis as “a **prediction of a relationship between one or more factors** and the problem under study, which can be tested”.
- Hypothesis may be of two types:
 - Research hypothesis**
 - Statistical hypothesis**
- **For example:** Ginger reduces the morning sickness in pregnant women is a hypothesis for the study entitled “A quasi experimental study on the effects of ginger on morning sickness in pregnant women”.

Research objectives

- Criteria of research objectives: **SMART** criteria
 - **Specific**
 - **Measurable**
 - **Appropriate**
 - **Realistic**
 - **Time-specific**

Research objectives

- Research objectives are **of three types**:
 - General objective:** It denotes what will be done during the study.
 - Specific objective:** It denotes the activities that will be undertaken during the study.
 - Ultimate objective:** It denotes the benefits, implications and utilization of the study findings.

Research objectives

- In a study on “Utilization of community clinic services in Sylhet division”, the objectives may be as follows:

❑ General objective:

- To identify the reasons of poor utilization of community clinic services in Sylhet division

Research objectives

❑ Specific objectives:

- To compare the level of utilization of services among various community clinics
- To compare the level of utilization of services among various socio-economic groups
- To determine the pattern of utilization of Community clinic services in various seasons of the year
- To assess the relationship between the distance of CCs from homes of the community people
- To ascertain client's perception regarding the quality of CC services

Research objectives

❑ Ultimate objective

- The findings of the study will help in identifying the reasons of poor utilization of CCs in Sylhet division and thereby policymakers and health managers will be able to take necessary measures to increase utilization of CC services.

Questionnaire

- A **questionnaire** is a written list of questions, the answer to which are recorded by respondents.
- **Types of questions** in a questionnaire: Can be **two types**:
 - **Open-ended question:** Permits free responses i.e.
What is your opinion regarding medical education system in Bangladesh? _____
 - **Closed question:** Offers list of possible options i.e.
What is your marital status? A. Married B. Unmarried C. Divorced

Questionnaire

- Questionnaires are of **three types**:
 - Structured questionnaire**: Researcher uses only closed questions
 - Unstructured questionnaire**: Researcher uses only open-ended questions
 - Semi-structured questionnaire**: Researcher uses both open-ended and closed questions

Sample size calculation

- Simply sample size is calculated using the following **Cochran's formula**:

$$n = \frac{Z^2 p q}{d^2}$$

- Here
 - n**= The desired sample size
 - Z**= Standard normal deviate for Z distribution which corresponds to 95% confidence interval in normal distribution = 1.96
 - p**= Proportion
 - q**= 1-p
 - d**= Degree of accuracy=5%

Data analysis

☐ Descriptive statistics

- Statistics that only describes and sum up data.
- Some examples of descriptive statistics are- frequency counts, tables, graphs, measures of central tendency, measures of dispersion.

☐ Inferential statistics

- Inferential statistics assist researcher in drawing inferences and making predictions based on the data.
- Here, hypothesis testing are done.
- Examples are- t-test, ANOVA test, regression analysis, correlation etc.

Basic structure (format) of scientific paper (Research report)

- | | |
|---------------------------------------|---------------------------------|
| • Title | • Discussion |
| • Authors details | • Conclusion and recommendation |
| • Details of the corresponding author | • Acknowledgement |
| • Abstract | • Conflict of interest |
| • Keywords | • Funding statement |
| • Introduction | • Ethical considerations |
| • Methods | • Author's contributions |
| • Result | • References |

Format of thesis report

□ Front matter:

- Title page
- Table of contents
- Declaration of principal investigator
- Supervisor certificate
- List of tables
- List of figures
- List of abbreviations
- List of appendices
- Acknowledgement
- Abstract/Summary

Format of thesis report

□ Body

- **Introduction:** Background; Rationale or justification; Research question, hypothesis ; Research objectives; List of variables; Conceptual framework; Operational definition
- **Literature review**
- **Methods:** Study design; Study duration and period; Study place; Study population; Sample size calculation; Selection criteria; Sampling method; Data collection tools and techniques; Data management; Data analysis; Ethical considerations; Limitations

Format of thesis report

□ Body

- Results
- Discussion
- Conclusion
- Recommendation
- References

□ Back matter

- Appendices/ Annexures

References

- abc of research methodology & biostatistics by Prof. Md. Mozammel Haque 4th edition
- Henry Fordd (2024). Importance of research work in medical field.
- Research methodology by Prof. Dr. Md. Ziaul Islam PhD 3rd edition.