

# A scientific research



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# Research

- Research is the *systematic collection, analysis* and *interpretation of data* to answer a certain question or solve a problem
- It is crucial to follow scientific steps when conducting one's research

# Steps of Scientific Research



**Refined research question**

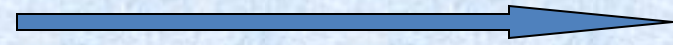


**Literature review**



**Research hypothesis, goals, and objectives**

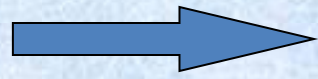
**Study design**



**Population & sampling**



**Variables**



**Ethical issues**

**Research tools**



**Pilot study**



**Work plan**



**Collection of data**



**Data management**



**Interpretation, and**

**Reporting**



# 1- Selection of Research Area:

Selection of research is based on the following:

- researcher's: Specialty, Interest, Scientific background, Experience
- Actual need for research in this area,
- Available resources

## **2- Selection of Research Topics:**

The priority of a topic for research depends on:

- **The characteristics of the problem (topic):**  
impact on health, magnitude, seriousness, preventability, curability, available interventions, proposed solutions.
- **The characteristics of the proposed study:**  
feasibility, cost-effectiveness, applicability of the results.

## *Criteria for a good research topic*

A good research topic should be:

- Feasible
- Interesting
- Novel
- Ethical
- relevant

## ***Feasibility:***

- Possible to recruit subjects.
- Materials, equipments and resources available.
- Investigators have the required expertise.
- Objectives can be achieved.

## **Novelty:** التجديد

Research must be expected to contribute new information.

- “Novel” does not necessarily mean that the research has not been done before.
- The addition to previous studies may be confirmatory, contradicting, or extending to previous findings.
- ❖ *The question should not be whether the study has been done before, but whether it will add to the existing body of knowledge.*



## ***Relevance: صلة***

For the research to be relevant:

- It must have the potential to advance scientific knowledge.
- Influence clinical management.
- Influence health policy.
- Guide further research

### 3- Research question: defining and refining

The research topic has to be changed to research question which should be defined and refined so that it can be answered precisely.

*Example of research question:*

*“Is passive smoking harmful to the fetus?”*

first **define** passive smoking, indicate how many cigarettes smoked per day,..

Also **define** effect on fetus: whether IUGR, LBW, condition at birth,..

Precise definition will affect size of sample needed, control of other variables which will have to be excluded.

- After defining research question, there is a need to be refined:

*“Are the children born to women whose husbands smoke more than 20 cigarette a day, of lower birth weight than children born to women whose husbands do not smoke?”*

This research question is now suitable to turn into a specific hypothesis that can provide a good basis for developing appropriate study design and calculating sample size needed.

# What is a “Literature Review”?

- a literature review surveys scientific articles, books, medical journals, dissertations and other sources ... relevant to a particular issue, area of research, or theory, providing a description, summary, and critical evaluation of each work.

## Sources of Literature:

- Journal articles:

these are good sources, especially for up-to-date information. They are frequently used in literature reviews because they offer a relatively concise, up-to-date format for research.

- Books: books tend to be less up-to-date, as it takes longer for a book to be published than for a journal article.

They are still likely to be useful for including in your literature review as they offer a good starting point from which to find more detailed sources of information

- **Conference proceedings**: these can be useful in providing the latest research, or research that has not been published.
- **Theses and dissertations**: these can be useful sources of information. However there are disadvantages:
  - 1- they can be difficult to obtain since they are not published, but are generally only available from the library,
  - 2-the students who carried out the research may not be an experienced researcher and therefore you might have to treat their findings with more caution than published research.

- Internet: the fastest-growing source of information is on the Internet.

### Disadvantages:

- 1- anyone can post information on the Internet so the quality may not be reliable.
- 2- The information you find may be intended for a general audience and so not be suitable for inclusion in your literature review

## **4- Research Aim & Objectives:**

The goal (aim) and objectives must be stated at the very beginning of the study

### Aims (Goals):

It describes the aim of the work in broad terms.

### Specific objectives:

These are more specific and relate directly to research question.



- The research objectives should be:
  - Closely related to the research question
  - Covering all aspects of the problem
  - Very specific
  - Ordered in a logical sequence
  - Stated in action verbs that could be evaluated e.g. **to describe, to identify, to measure, to compare, etc.**
  - Achievable, taking into consideration the available resources and time
  - Mutually exclusive, with no repetitions or overlaps

## (SMART) Objectives:

- S → Specific
- M → Measurable
- A → Achievable
- R → Relevant
- T → Time-bound

Properly formulated, specific objectives will facilitate the development of your research methodology and will help to orient the collection, analysis, interpretation and utilization of data.