

Major steps in scientific research

L 2



A checklist of steps may be given in the following sections. It covers the issues that must be considered by any researcher before the launching of the field activities.



Step one: The definition of a problem (*what will be studied*).

The researcher decides that:

- a. A problem does exist and a research is needed.
- b. The research is feasible to be conducted.
- c. The results of the research help in the solution of the problem.



Examples of problems :

- ***A high incidence of postoperative complications.***
- ***A low use rate of prenatal care by pregnant women.***
- ***The role of environmental pollution in cancer and so on.....***



Step two: Statement of the general purpose of the study (*the why of the study*).

It might be put as to:

- **study** the problem of postoperative complications.
- **study** the problem of defaulters or
- **study** the extent of under utilization of prenatal care.



Step three: Gaining more knowledge about the problem.

At this stage, the researcher tries to gain as much and as relevant knowledge as possible about the problem under study.

This will help the researcher to understand different methods used so that he can use a known method, a modified method or a new one designed by him for the purpose of the study.



He can also be able to identify the findings of other researchers so that he can make additional contribution to the body of knowledge rather than repeating the work of others.

Two main sources can be of great benefit to any researcher:

- **Literature.**
- **Experts.**



Step four: Formulation of the study topic (title) and statement of specific objectives.

By the end of step three, a researcher must be very clear about the problem he is intending to tackle.

He needs to formulate the title of the research work and to state in written terms the specific objectives he intends to attain.



In reference to the problems mentioned in step one above, a title may take the form of the following:

1. A study on the extent and causes of postoperative complications in surgical wards.
2. The study of determinants of low utilization rate of prenatal care: A household-based study.
3. Cancer and environmental pollution: Current state of evidence.



The specific objectives: are statements describing exactly the end results the researcher wishes to achieve.

They need to be:

1. Stated clearly without any ambiguity.
2. Written in such away as to translate the general purpose of the study.
3. Written in quantitative (measurable) terms.



For example :

An objective of the sort (**to study infant mortality rate in Basra**) is very vague because it is not clear enough what the researcher intends to measure in such a study and for what exact purpose.

This objective could mean to estimate the infant mortality rate or the study of causes. It could mean the study of risk factors and distribution in different population subgroups. Such objective phrasing is neither clear nor quantitative.



- A specific objective could be phrased as (to estimate the infant mortality rate in Basra in the year 2020).
- Notice here that the statement specifies the place, time and the parameter to be measured.



Step five: The methodology.

In the methodology, the researcher has to be very clear about the following points:

1. **Type of the study** whether it is descriptive (cross-sectional or longitudinal) or analytical (case-control or cohort) or interventional (experimental).



2. Study population. This is the universe on which the study is expected to be carried out. The study population might consist of people inhabiting a village(s), town(s) or country, all university students, Records in a hospital and so on.

Sampling saves money, time, labour and probably ensures a higher overall level of accuracy than a full coverage of the whole population.



An important issue here is to draw the sample in such a way to be representative of the universe from which it is drawn.

Representative sample is a precondition for the generalization of results from the sample to the universe (the general population).



3. Sampling and sample size: In many instances, a researcher can not and actually need not to examine all the population he is interested in.

Instead, a sample may be drawn, the size of which is determined by certain statistical methods and limited by economic consideration.



4. Determination and definition of **variables** included in the study.

5. The tools of the study: the questionnaires, tests, examination or any other method used must be decided upon and validated before the implementation in the proper main study.

6. The procedures of **interviewing**, recording, coding and checking of the data.



7. Training of those who are expected to obtain the data to ensure accuracy, consistency and uniformity of procedures and recording.

8. Checking the quality of data.



Step six: Pilot study and pretest of the questionnaire.

This is a small-scale study carried out on a small number of individuals under conditions similar to those of the final study. The size of the pilot study is a matter of convenience, time and money.



The purposes of the pilot study are :

- a. **To have an idea about** the time required for the study as a whole.
- b. **To have an idea about** the cost of the final study
- c. **To have an idea about** the skills required by the investigators and whether the instructions given to them are efficient and adequate.
- d. **To have an idea about** the adequacy of the questionnaire, the ease of handling, the efficiency of its layout, the clarity of the definitions and the adequacy of the questions themselves. Any problems with the questionnaire contents should be detected and can be resolved prior to the main study.
- e. **To have an idea about** the extent of non-response.(refusals and non contacts).



Step seven: The proper study.

In the light of the pilot study results, the final and proper study is conducted to collect the required data.

Continuous monitoring and checking is essential at this stage of the study.



Step eight: Data analysis.

The data analysis is carried out either manually, by pocket calculator or by computers.

The results are displayed in the form of tables and diagrams.



Step nine: The writing of an article, a report,

As a general rule, a scientific document consists of the following parts.

- **Title**
- **Author** names and titles
- **Summary.**
- **Introduction/** literature review.
- **Methodology**



- **Results.** Here the researcher presents and describes his results in the form of tables and/ or diagrams without interpretation or comparison with the findings of other researchers. A table and a diagram must be complete and self-explanatory.

- **Discussion,** The discussion must cover the merits and limitations of the methodology used in the study in addition to interpretation and comparison of results within the context of available literature and body of knowledge.



- Conclusions and Recommendations.

-References. The researcher should follow a uniform system of referencing throughout his report. There are two commonly used methods of referencing. The first is the Vancouver style and the second is the alphabetical system.

- Appendices.

