*Editorial - Educational*

# Biases in Research Study: How to Avoid

Jaffar M Al Bareeq, DLO, RCP, RCS (London)*

**Bias is a tendency which could prevent unbiased consideration or evaluation of an idea, selecting or encouraging one finding or result over others. Bias could occur at any stage of research, including pretrial, during the trial, after trial, data collection and data analysis. Bias in research could begin in the conception stage through preconceived ideas. Motivated Reasoning is dangerous for a scientist; it is based on preconceived ideas rather than finding the truth. It is virtuous to test your beliefs now and then. Many historical beliefs were proven wrong though rigorous scientific studies.**

**Hormone replacement therapy (HRT) studies found that there is a decreased risk of heart disease among post-menopausal women prior to 1998. An increased risk of heart disease with HRT had been found after performing recent triple-blind, randomized studies to minimize biases[1,2].**

**Pre-trial bias could be avoided in the study design if risk and outcome were clearly defined, distinct objective or validated methods were identified; select standardized and blind data collection. The patients should be recruited from the same general population; otherwise, bias would be unavoidable. To avoid channeling bias, select two interventions that carry the same risk and apply rigorous selection criteria.**

**Bias during trial could be avoided by blinding the interviewer to exposure status; prospective studies could eliminate chronology bias; use objective data or prospective studies to avoid recall bias; cater for lost-to-follow-up patients prior to the study; clearly define exposure prior to the study; use objective diagnostic studies; consider cluster stratification to minimize variability in surgical technique; physical examination should confirm reported history of healing or other changes by the patient and finally, to avoid selection bias, define the study population, make certain the population is accessible and reliable.**

**Bias after trial could be avoided by registering the trial with an accepted clinical trials registry and to publish the trial despite the negative outcome and the objection of the sponsors; confounding factors could be controlled by case-control design and randomization and never allow gift authorship based on position.**

Bias is a tendency which could prevent unbiased consideration or evaluation of an idea, selecting or encouraging one finding or result over others. Bias in a research study has to be avoided at all times; otherwise, the study result could not be depended on, and its citation could be in jeopardy[3].

Bias could occur at any phase of research, including study design, data collection, data analysis and publication. Bias in research could begin in the conception stage through preconceived ideas, for example, the researcher believes that aspirin is better than any analgesic; therefore, he would do his utmost to prove his point[3].

Bias could be during the study design if the outcome were not defined prior to the study implementation and no cross-reference data sources were used for confirmation. To avoid bias in study design, choose a defined objective, validated method, standardized and blind data collection. Selection bias could transpire when the study population is not clearly defined, not accessible and not reliable[3].

Bias could occur during patient recruitment if they are not drawn from the same general population. In surgery, bias could occur if one intervention carries a greater risk than the other.

Bias could occur during the trial if the researcher or statistician are not blinded, and transfer bias (lost for follow-up) are not catered for.

Bias could occur after the trial: citation bias, such as delaying publication for monetary gains and gift authorship based on position.

Randomization should be appropriate and representative. Sample size should be adequate and representative. It is difficult to find a comparable control group and under the same conditions especially in a retrospective study.

Blinding is an important practice to avoid biases. In a single-blind trial, the bias of the researcher could not be avoided; in the double-blind trial, the bias of the statistician could not be avoided. Only in the triple-blind trial could the bias of the researcher and the statistician be avoided.

Data collection should be meticulous and appropriate software should be used for data analysis.

* Chief Editor
Bahrain Medical Bulletin
Director of Research and Ethics
King Hamad University Hospital
The Kingdom of Bahrain
E-mail: jmab@batelco.com.bh; Jaffar.albareeq@khuh.org.bh

A confounding factor is not an essential feature in the association between the exposure and disease; it is usually distributed unequally between the study groups. Confounders that are known or measurable could be controlled by the researcher in study or analysis[4].

Confounders could be reduced by randomization; restriction of entry of individuals with known risk bias to the study; the individual or groups should be matched in order to distribute the confounders equally; confounders should be evenly distributed among the groups; multivariate analysis should not be done except if the confounders could be identified and measured[4].

Design biases in a prospective cohort study could be all or one of the following: non-randomization may have to follow large numbers of individuals for a long period; it is very expensive and time-consuming; it is not suitable for rare diseases and diseases with a long latency period; finally, follow-up loses could be a major source of bias[5].

Design biases in retrospective cohort study could be due to uncontrolled exposure and factors; it is not suitable for very rare diseases. In a retrospective study, the recorded data might be of poor quality or insufficient because the records are not designed for the study, and there might be an absence of information regarding potential confounding factors if the data was recorded in the past. It is difficult to identify a suitable disease-exposed cohort and a matching controlled group, losses to follow-up could be a source of bias[6].

A retrospective study is easy and inexpensive; it uses accessible patients' data. Through a retrospective study, it is possible to study rare diseases or those with long latency period between the exposure and disease. Finally, the retrospective study could be used to generate a hypothesis, which could be tested prospectively and used for quality improvement initiatives.

A retrospective study has many disadvantages because it depends on the precision of written data or recall/memory of individuals, who might not be able to remember precisely and might recall the wrong event (recall bias); important data may not be available in such study. It is difficult to control bias and confounders; no randomization, blinding could not be initiated, it may be not possible to access vital data due to the restriction imposed by the government or the institution.

## CONCLUSION

**It is advisable to start your research with a retrospective study in order to generate your hypothesis. To achieve the best evidence in medicine, you have to test your hypothesis by planning and organizing a triple-blind randomized control-trial and that trial should be registered in a recognized trial registry.**

## REFERENCES


1. Pannucci CJ, Wilkins EG. Identifying and Avoiding Bias in Research. Plast Reconstr Surg 2010; 126(2): 619–625.
2. Rossouw JE. Postmenopausal Hormone Therapy for Disease Prevention: Have We Learned Any Lessons from the Past? Clin Pharmacol Ther 2008; 83(1): 14–16.
3. Pannucci CJ, Wilkins EG. Identifying and Avoiding Bias in Research. Plast Reconstr Surg 2010; 126(2):619-25.
4. Confounding. Statsdirect. http://www.statsdirect.com/help/content/basics/confounding.htm Accessed on 9 January 2016.
5. Advantages & Disadvantages of Cohort Studies. Boston University School of Public Health. http://sphweb.bumc.bu.edu/otlt/MPH-Modules/EP/EP713_CohortStudies/EP713_CohortStudies5.html Accessed on 9 January 2016.
6. Cohort Studies. http://sphweb.bumc.bu.edu/otlt/MPH-Modules/EP/EP713_CohortStudies/EP713_CohortStudies_print.html Accessed on 9 January 2016.