



Usage of Statistics tools in the area of Pharmacological Research

Senthilvel Vasudevan 

Assistant Professor of Statistics (Biostatistics), Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research Center, Ariyur, Pondicherry, India.

Abstract

Background: Statistics is a science and it is a tool in biomedical sciences, pharmacology and other sciences. Its tools are very important and powerful in pharmacological research. In this article, I have to discuss about the contribution of statistician/Biostatistician, selection of topic for a study, formation of hypothesis, sample size determination, selection of appropriate statistical tests and fixing the level of significant for a study/research.


Methods: Statistics is very much useful to be conduct the hypothesis testing and to make a decision on the experiments in pharmacy/pharmacological research. It tools are using to find the efficacy of a drug and to find out which drug is superior and which one is having efficacy in treatment/healing. Discuss about various topics related to pharmacological research here.

Results: Statistical tools are very much useful to the pharmacologists in the way of how to use it in an appropriate way in their research. Statistical tools are using in many fields like sciences, medical, nursing and pharmacy. Tools are very much essential and important to prove the results scientifically in pharmacological research.

Conclusion: The pharmacologists are to be trained in statistical tools and its applications in a good manner then only they have to use the statistical tools in their clinical research and in career. So, the sound knowledge of statistical tools and its applications are needed to the pharmacologist for their future to conduct research to get the correct results at the end of their research.

Keywords: pharmacology, pharmacologist, statistics, statistical tools, research, training

Article Summary: Submitted: 14-October-2023 Revised: 15-November-2023 Accepted: 04-December-2023 Published: 31-December-2023

Quick Response Code:	<p align="center">Web Site http://ijmsnr.com/</p> <p align="center">DOI 10.55349/ijmsnr.202334810</p>	<p>This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non-Commercial-ShareAlike 4.0 International License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.</p>
		<p align="center">Corresponding Author: Dr. Senthilvel Vasudevan, Assistant Professor of Statistics, Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research Center, Pondicherry, India. Email ID: senthilvel99@gmail.com</p>

Introduction

Statistics is a science and tools and using in all sectors. It means collection of data, tabulation, analysis of data, and interpretation of numerical data. In statistics, two fundamental things/ideas are there in this field are uncertainty and variation. Statistics tools are very important in pharmacological research. i.e., to summarize experimental outcomes by using measures of central tendency like mean, median and mode, in terms of measures of dispersion like range, standard deviation, standard error of mean, and further higher statistics like confidence interval, odds ratio, statistical significance, effect size, multivariate linear regression, multivariate logistic regression equations, survival analysis, and other statistics analysis tools. Furthermore, statistics is to be conduct the testing of hypothesis [1, 2] and make a decision on the experiments in pharmacy/pharmacological research. It tools are using to find the efficacy of a drug and which drug is superior to another one in quality and efficacy in treatment/healing. Statistical tools are very much useful to the pharmacologists in the way of how to use it in an appropriate way in their research. Statistical tools are using in many fields like sciences, medical, nursing and pharmacy. When we use the statistical tools in a particular area then it takes the area name. For example, statistical tools using in biology then it will be called as Biostatistics, used in pharmacy it will be called as pharmacological statistics and etc. [3] In this article, I have to discuss about the contribution of statistician/Biostatistician, selection of topic for a study, formation of hypothesis, sample size determination, selection of appropriate statistical tests and fixing the level of significant for study/research.

How to cite this article: Vasudevan S. Usage of Statistics tools in the area of Pharmacological Research. Int J Sci and Med Res 2023;3(4):8-10

Contribution of statistician in the research:

Usage of statistical tools in pharmacology is enormous to explore the finding in it, and to the hypotheses. So much of restrictions are there in the experimental design of research. If anyone wants to conduct a research/study in pharmacology simply conduct a statistician at the time of protocol preparation (beginning of the study), and his/her opinion about that particular research. i.e., get the statistician helps [4] at the time of research proposal/protocol preparation. [5, 6] Statistician contribution in research has explained below.

Topic selection for the study, formation of hypothesis and sample size calculation:

One should select the topic and it should be a self-explanatory one and very much carefully. After that, select an appropriate existing literature (already published article in a peer reviewed journal) which was done within 5 years and it would be 50% to 60% similarity study as their parent article and preserve it safely. Based on that frame their primary objectives and secondary objectives very carefully as per your finding in your study. At that time, the allowable error (margin of error) should be fixed from minimum 5% to maximum 10% itself. More than that percentage is not permissible as ethically. Primary objective (which parameter is more important for that study) is very important to determine the sample size for that particular study. Sample size would be found by using some appropriate formula or online sample size calculator. [7, 8]

Selection of suitable statistical tests for the study:

This is the very important step in any research/study/project in careful manner. For this keen and depth knowledge is needed to select an appropriate statistical test for the selected primary and secondary objectives. This should be done before conducting/proceeding any study. Then only, the principal investigator and the co-authors are to aware about the study and what is to be planned to do in the study and what is their outcome by their study. Most of the researchers can't do like this. That is to be avoided by the researchers.

For describing or explore their analyzed results in a suitable table (Simple and Complex Tables)/diagrams (Simple bar diagram, multiple bar diagram)/figures (line diagram, pictogram, scatter diagram). This is one way of describing their results. Expressing their categorical variables as frequency and proportions/percentage and expressing the continuous variables as mean and standard deviation. Depending on their study results will be mentioned/expressed as median and mode also.

No missing data in the collected data. Comparison of mean between groups will be analyzed by using Independent Samples 't' test if it is normally distributed. If not normally distributed then Mann Whitney U test will be used to analyze the data. Normality test is to be done by Kolmogorov – Smirnov test and Shapiro – Wilk test. If three groups in the study, then one can use Analysis of Variance (ANOVA). One-way has one independent variable with 2 levels. Example: brand of cereal. Two-way has two independent variables (it can have multiple levels). Example: brand of cereal, calories. To find the association between two variables will be analyzed by using Chi-Square test/Fisher's Exact test wherever applicable. To find the risk factors that influence to a disease

will be analyzed by using multivariate logistic regression analysis with backward elimination method. Depending upon their study, a researcher can use binary, multinomial, ordinal, cox regression methods. [2, 9, 10]

Fixing of level of significant for the study:

Normally, we have to fix the level of significant (or) alpha error (or) type I error as 5% only. Its meaning if any one conducts a study, then they will have to give the assurance that their study is to be 95% give the correct answer/result. Two tails test only be following in all the studies. In clinical study or clinical trials, they have to fix the level of significant as 1% and one tail test is to be fixed. [11]

Conclusion

From this I have to conclude that the statistical tools are very much essential and important to prove scientifically in pharmacological research. Not only in this, any sciences or any sectors these statistics tools are mandatory to prove the results in a scientific way. The pharmacologists are to be trained in statistical tools and its applications in a good manner then only they have to use the statistical tools in an appropriate way in their research and in their career. So, the sound/keen knowledge of statistical tools and its applications are needed to pharmacologist for their future to conduct research to get the correct results at the end of their research/study.

Source of funding: None

Conflict of Interest: The authors declare that they have no conflict of interest in the research conducted.

Authors' Contributions: SV – Authors contributed to the conceptualization, writing of the article and in preparation and checking of the article.

Here, SV – Senthilvel Vasudevan

References

1. Chinna K. Statistical significance, Effect Size and Confidence Intervals. Int J of Med Sci and Nurs Res 2022;2(4):3-4. **DOI:** <https://doi.org/10.55349/ijmsnr.20222434>
2. Vasudevan S. Formation, Testing of Hypothesis and Confidence Interval in Medical Research. Int J of Med Sci and Nurs Res 2022;2(3):22-27. **DOI:** <https://doi.org/10.55349/ijmsnr.2022232227>
3. Barua A, Deb PK, Maheshwari R, Tekade RK. Chapter 10 – Statistical Techniques in Pharmaceutical Product Development. Dosage Form Design Parameters Volume II. Advances in Pharmaceutical Product Development and Research 2018;339-362. **DOI:** <https://doi.org/10.1016/B978-0-12-814421-3.00010-5>

4. Vasudevan S. Formation, Testing of Hypothesis and Confidence Interval in Medical Research. *Int J Med Sci and Nurs Res* 2022;2(3):22-27. **DOI:** <https://doi.org/10.55349/ijmsnr.2022232227>
5. Al-Jundi A and Sakka S. Protocol Writing in Clinical Research. *J Clin Diagn Res* 2016;10(11):ZE10-ZE13. [\[PMID\]](#)
6. Vasudevan S. Teaching of subject Biostatistics its applications and research methodology to undergraduate pharmacy students in Central Region of Saudi Arabia. *Int J Med Sci and Nurs Res* 2023;3(2):14-16. **DOI:** <https://doi.org/10.55349/ijmsnr.2023321416>
7. Al-Riyami A. How to prepare a Research Proposal. *Oman Med J* 2008;23(2):66-69. [\[PMID\]](#) **DOI:** <https://doi.org/10.7860/JCDR/2016/21426.8865>
8. Bach LA, Sharpe K. Sample size for clinical and biological research. *Aust NZ J Med.* 1989;19(1):64-68. **DOI:** <https://doi.org/10.1111/j.1445-5994.1989.tb01681.x> [\[PMID\]](#)
9. Parab S and Bhalerao S. Choosing statistical test. *Int J Ayurveda Res* 2010;1(3):187-191. **DOI:** <https://doi.org/10.4103/0974-7788.72494> [\[PMID\]](#)
10. Vasudevan S. Biostatistics teaching to the undergraduate medical students through research-oriented medical education posting program in a Teaching Medical Institute in Coastal Area of Pondicherry: An experience of a biostatistician. *Journal of Pharmacy and Bioallied Sciences* 2016;8(1):78-79. **DOI:** <https://doi.org/4103/0975-7406.171693> [\[PMID\]](#)
11. Jae K. How to Choose the Level of Significance: A Pedagogical Note. 2015;1-14. **Available from:** https://mpra.ub.uni-muenchen.de/66373/1/MPRA_paper_66373.pdf