Short Communication

Importance of Biostatistics available courses and teaching institutions in India

Senthilvel Vasudevan

*Assistant Professor in Statistics (Biostatistics), Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research Centre, Ariyur, Pondicherry, Puducherry (UT), India.

Abstract

Background: Biostatistics is the important subject to all science subjects to prove the new finding in the various areas. Its tools are very much useful in the research of all types of sciences both medical and non-medical subjects. In this article, I discussed about Biostatistics concepts, its importance, available courses in that and about the teaching institutions in India.

Methods: In this, I described about Biostatistics tools, methods, and its applications. It is the back bone to all the science subjects. Without statistics results on one must prove their finding in the science areas/field. Biostatistics concepts and applications are enormous in the research world. Any specialty researchers have to prove their new scientific finding with the help of statistical tools and applications. This subject is teaching very well in many Government and Private Institutions in India with a nominal fee.

Observations: Biostatistical concepts, tools and its applications are vast in the scientific world. It has its same field name where it should be used in their area. ie., when one can use statistical tools in the medicine then, it would be called as "Medical Statistics". Similarly, one can use the statistical tools in economics then it will be called as "Econometrics".

Conclusion: From this article, I have revealed that the Biostatistical concepts, tools, and its applications are very important and useful in all scientific areas and its research.

Keywords: biostatistics, science, subjects, tools, methods, applications

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Corresponding Author: Dr. Senthilvel Vasudevan, Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research Centre, Ariyur, Pondicherry, Puducherry (UT), India. **Email ID:** senthilvel99@gmail.com

Introduction

Biostatistics [1 – 2] is the important subject to all science subjects to prove the new finding in the various areas. Its tools are very much useful in the research of all types of sciences both medical and non-medical subjects. Biostatistics is having two major topics: (i**). Descriptive Statistics:** It summarizes, organize, and describe the main features of a dataset using numerical values, providing a concise overview without drawing conclusions about a larger population. It is very much useful by all the researchers to describe their finding in their studies. In all research articles first table containing descriptive statistics. Example: frequency, percentage, mean, median, mode, standard deviation, range and inter quartile range. **(ii). Inferential Statistics:** Its uses of a data to generalize, predictions, and from that give the inferences about a larger population. All types of results in scientific researches are belonging to the above two divisions. Example: Chi-Square test, t-test, ANOVA, MANONA, ANCOVA, correlation, regression models. In this, prediction models are as follows: Binary Logistic Regression Analysis, Multinomial Logistic Regression Analysis, Ordinal Logistic Regression Analysis, Cox Regression Analysis, Markov Chain Analysis. [3 – 5] Biostatistics concepts, tools and applications are very much useful in any types scientific research, clinical research, and drug discovery research. [5] In any research, one can use these things in many ways and try to prove their new findings/results. Medical students like undergraduate, post graduates and super specialty students have used the biostatistics tools like appropriate tools and in the appropriate places and to prove or justify their findings in a good manner. [6] Any young or senior researchers planned to do any type of research sample size calculation is mandatory. [7 – 9] PG MD dissertation was mandatory by National Medical Council, Government of India in India. [9 – 10] In this article, I discussed about Biostatistics concepts, its importance, available courses in that and about the teaching institutions in India.

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Methods

In this article I described about Biostatistics concepts, tools, methods, and its applications in the medical and other science field. It is the back bone to all the science subjects. Without statistics results on one must prove their finding in the science areas/field. Biostatistics concepts and applications are enormous in the research world. Any specialty researchers have to prove their new scientific finding with the help of statistical tools and applications. [8 – 9] This subject is teaching very well in many Government and Private Institutions in India with a nominal fee. **[Table–1]**

Concepts of Biostatistics

Statistics: It is the study of the planning experiments followed by collecting, organizing, analyzing, interpreting and presenting data. So it deals with the overall establishment of experiments/ cases, beginning from design of experiment to inferring and presenting the resulting data obtained. Statistics can be broadly categorized into two types: descriptive and inferential statistics.

Data: It can be defined as any information, collected in raw or organized form based on observations (includes visual interpretations, measured quantities, survey responses, etc.), which suitably refer to a set of defined conditions, ideas or objects.

Population: It refers to the complete collection of all elements (scores, people, measurements, and so on) from where the data has been obtained. The collection includes all subjects to be studied.

Census: It refers to the systematic collection of data from every member of the population and is usually recorded periodically at regular intervals.

Sample: It refers to a sub-collection of elements selected from a population, and the data is collected and assumed to be representing the whole population.

Discrete Variable: It either has a finite number of values or a counted number of possible values. In other words, they can have only certain values and none in between. For example, the number of students on a class on roll can be 44 or 45, but can never be in between these two.

Continuous Variable: Possible values: They may take any value in each range without gaps or intervals. However, they may have intermediate discrete values depending on the measurement strategy used. For example, body weight may have any value, but depending on the accuracy of the weighing machine, the outcome may be restricted to one or two decimal places, however, originally the outcome may have any value in the continuous range. [5]

Measurement of scales in Statistics

a). Nominal Scale: It means 'names only'. Nominal level data includes qualitative information which cannot be further classified as ranks or in order and do not have quantitative or numerical significance. Data usually contains names, labels, or categories only. **Example:** names of cities, eye color, survey responses as yes, no.

b). Ordinal Scale: It is the next level where the data can be ordered in some numerical order, however, the differences between the data, if determined, are meaningless. For example, top ten countries for tourism, exam grades A, B, C, D, or F.

c). Interval Scale: It deals with data values that can be appropriately ranked and the differences between data points are meaningful. Data at this level does not have an intrinsic zero or starting point. Ratio of data values at this level is meaningless. For example, temperature in Fahrenheit or Celsius scale, where 20 degrees and 40 degrees are ordered, and their difference make sense. However, 0 degrees do not indicate an absence of temperature, also 40 degrees is not twice as hot as 20 degrees. Similarly, years 1000, 2000, 1776, and 1492, where the difference is meaningful, but the ratio is meaningless.

d). Ratio Scale: It deals with data quite similar to an interval level, but there is an intrinsic zero, or starting point, which indicates that none of the quantity is present. Also, the ratios of data values in ratio level are meaningful. For example, distance measurement, where 2 inches is twice as long as 1 inch and can be added, subtracted to give a meaningful value. For example, prices of commodities (pen, pencil, etc.).

Correlation and Regression

It is necessary often to establish a relationship between two variables. Correlational techniques are used to examine the relationship of the two variables. Two basic correlational techniques are as follows:

Correlation: It is used to establish and quantify the strength and direction of the relationship between two variables.

Regression: It is used to express the functional relationship between two variables, so that the value of one variable can be predicted from knowledge of the other.

Types of courses in the subject Biostatistics

Academic Degrees Courses: Full time and part-time courses like Master of Science (M.Sc) and Doctorate of Philosophy (Ph.D) course in Biostatistics with Epidemiology as a one of the subjects.

Certificates and Diplomas Courses: In this short-term certificate courses, post graduate diploma courses, and online courses available in the areas of medical research, biostatistics, its applications, and epidemiology.

Online Courses and Self-Learning/paced Courses: It is conducting by Swayam offer online courses by National Programme on Technology Enhanced Learning (NTPEL) [11] **[Table – 1]**

Main Topics Covered in the courses

Basics/Fundamentals: Introduction to Biostatistics, descriptive and inferential Statistics/Biostatistics, Sampling Theory, Mathematical Statistics, Statistical Inference.

Applications of Statistics/Biostatistics: How Biostatistics tools are using in Clinical Trials, medical research, and statistics in Public Health?

Table–1 List of Institutions related to Biostatistics in India

Institution Name	Course name	Years	University Name	Website Link
SDNB Vaishnav College for Women	M.Sc In Biostatistics	2007	University of Madras	https://www.sdnbvc.edu.in/m-sc-biostatistics-sfs/
Christian Medical College	M.Sc in Biostatistics Ph.D in Biostatistics	1986	University of Madras	https://cmcbiostats.in/cmcbiostats/
Jawaharlal Institute of Postgraduate Medical Education & Research	M.Sc in Biostatistics Ph.D in Biostatistics	2011	Pondicherry University	https://www.jipmer.edu.in/department/biostatistics/general-info
Indian Biological Sciences and Research Institute	Certificate Courses in Biostatistics	2010	IBRI, Noida, UP	https://www.ibri.org.in/biostatisticsdistanc.html
Bharati Vidyapeeth Deemed University	Certificate Programme in Biostatistics in Medical Research	1964	Pune, Maharashtra	https://www.bvuniversity.edu.in/
SRM Institute of Science and Technology	M.Sc. in Biostatistics and Epidemiology	2002	Chennai, Tamilnadu, India	https://www.srmist.edu.in/program/msc-biostatistics-and-epidemiology/
All India Institute of Medical Sciences, New Delhi	M.Sc. in Biostatistics & Ph.D in Biostatistics	1973	New Delhi, India	https://www.aiims.edu/index.php/en/departments-and-centers/departments?id=640
Sanjay Gandhi Postgraduate Institute of Medical Sciences	Basic Course, Advanced Courses, Fellowship and PhD in Biostatistics	1990	Lucknow, Uttar Pradesh, India	https://www.sgpgims.org.in/Departments/Biostat/en/page/Courses.html

Biostatistics is the one of the most important subjects in the scientific world. Its concepts and applications are frequently used by the researchers in science, medical sciences, agriculture, and all other sciences. This subject biostatistics is teaching in many educational and research institutions in India as shown in **Table–1.**

Observations

Biostatistical concepts, tools and its applications [8] are vast in the scientific world. It has its same field name where it should be used in their area. ie., when one can use statistical tools in the medicine then, it would be called as "Medical Statistics". Similarly, one can use the statistical tools in economics then it will be called as "Econometrics". Statistical tools are the strong and important instrument in all scientific related research. If anyone researcher wants to prove their new research findings in the scientific forum or in the scientific world. Already the subject Biostatistics is one of the allied subjects in the all the science subjects like Medical, Nursing, Allied Health Sciences, Pharmacy and other Arts and Science subjects. Medical Statistics is performed as a main tool in the medical and its related researches like one, double- and triple-blind randomized control trials. Biostatistical tools are very much useful in the pharmaceutical manufacturing researchers in the manufacturing of new vaccines, and drugs. [12 –13] Biostatistics courses are teaching in many institutions and research centers in India. Now NMC made an amendment as Ph.D in Statistics / Biostatistics is mandatory to appoint as Assistant Professor in Biostatistics in Medical Colleges in India. [14] Biostatistics is the most important subject in the science discipline and especially in under graduate and post graduate in the medical field.

Conclusion

From this article, I have revealed that the Biostatistical concepts, tools, and its applications are very important and useful in all scientific areas and its research. All researchers must know about the statistical concepts, measurement scales of Biostatistics, correlation, regression and higher statistics, types of courses available in Biostatistics, and main topics covered in the courses. Separate Biostatistics department were established in some of the medical colleges only. Government of India has to make an amendment as "Private medical colleges are to form Biostatistics as a separate department". In some of the private medical colleges have started research units only.

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