Perception about the Role of Biostatistics in Medical Curriculum: A Cross-Sectional Study among Medical Students

Vinoth Gnana Chellaiyan[1], Rajeshkannan Sivakumar[1], Buvnesh Kumar M[1], Aravind Manoharan[1], Jasmine Maruthappapandian[2], Suruliraman SM[3]

[1]Associate Professor, [2]Assistant Professor, [3]Professor and Head, Department of Community Medicine, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education, Kelambakkam, Chennai, India

Correspondence : Dr. Aravind Manoharan, Email: m_aravind86@yahoo.co.in

Abstract:

Introduction: A good understanding of biostatistics can improve clinical thinking, decision-making, evaluations, and medical research. Undoubtedly, medical professionals are becoming aware of the importance of learning and applying biostatistical methods in their research. This study was done to assess the knowledge and attitude among medical graduates regarding the role and application of biostatistics in medical science. **Method:** The study was a cross-sectional study conducted in a tertiary care teaching hospital among 120 medical students pursuing MBBS third and final year. Systematic random sampling was used to select the study participants. A pretested validated semi-structured questionnaire was used for data collection. **Results:** Majority of the study participants, strongly agree that the subject helps in interpretation (75.8%), and is important in medical practice (61.7%). However, 85% of the study participants feel that software is difficult to use. 90% of the study participants find the subject hard to understand. The mean score of subject content, understanding, the current impact was significantly higher among the fourth-year students than the third-year students. There was no significant difference between the genders. **Conclusion:** Introduction of data collection sessions and appraisal of excerpts in published articles can provide practical knowledge and accentuate the role of bio statistics in health care.

Keywords: Biostatistics, Medical curriculum, Medical students, Research.

Introduction:

The principle of biostatistics refers to the handling of quantitative data andfurther application of the concepts to the testing of a hypothesis. The statistics include data related to estimates of disease or health burden, mortality, morbidity, health coverage and health systems.[1]

Medical knowledge has witnessed enormous advances due to the healthcare technology revolution.[2] These rapid advances in biomedical research have indeed stimulated the development of numerous efficacious medical technologies, but their translation into clinical use has raised several issues. There has been increasing controversies, extensive bias, and diversity in medical information.[3] Biostatistics plays an integral role in modern medicine. Almost all medical researches use biostatistics from beginning to end. Statistics helps medical researchers to design their studies, decide what data to collect, analyse data from their medical experiments, help them to interpret the results of the analyses, and collaborate in writing articles to describe the results of their medical research.

Inadequate use of statistics in biomedical research and its subsequent false results can lead to serious consequences that might not only affect science but also harms human beings.[4] This makes learning biostatistics pivotal. But clinicians and medical students show unsatisfactory knowledge in Biostatistics and poor ability to apply its concepts in medical research.[5] This has led to difficulty in understanding the statistics of published articles and medical guidelines and also reduce their ability to critically appraise the literature.[6]

Biostatistics modules are challenging so it has to be taught uniquely.[7] Despite being important for future careers, biostatistics modules are still perceived negatively by medical students.[8] It is assumed that inappropriate teaching methods are found to be the reason behind poor knowledge in biostatistics among medical students. Hence the present study was planned to assess the knowledge among medical graduates regarding the role and utility of biostatistics in medical science. The objective was to assess the knowledge and attitude among medical graduates regarding the role and application of biostatistics in medical science.

Methods :

The study was a cross-sectional study conducted in a tertiary care teaching hospital, in Chennai, Tamil Nadu. The study population was medical students pursuing MBBS third and final year. The study was conducted from January 2021 to June 2021.

Sample size calculation

The sample size is calculated using the formula $4*p*q/l^2$ (p = proportion of adequate knowledge on biostatistics, q = 1- p, l=allowable error). The prevalence of adequate knowledge on biostatistics among medical students from the previous study was taken as 70% [9] with 8% allowable error, the sample size calculated from the formula was 126. Thus in the present study, a total of 120 students were included.

Sampling and Study tool

Systematic random sampling was used to choose students from each year students were chosen from each year- third and final year. The students within each class were chosen by a table of random numbers method. The students undergo biostatistics training from the second and third-year curriculum of MBBS. A study questionnaire was used to assess the perception of the utility of medical statistics among medical students. The study tool was pretested, a validated self-administered questionnaire. The questions assessed the knowledge on biostatistics, interest in the subject, understandability, software and prospects of biostatistics in the practice of medicine. The questionnaire consisted of 20 items under four domains such as course content, understanding, current impact and prospects. The assessment was done on a five-point Likert scale – Strongly agree-5, Agree-4, Neutral-3, Disagree-4 and Strongly disagree-5.The key study outcomes were perception – attitude towards biostatistics.

Table 1 : Baseline characteristics of the study participants. (n=120)

No.	Variables	n (%)
	Academic year	
1.	Third MBBS	60(50)
	Final MBBS	60(50)
	Sex	
2.	Male	74(61.7)
	Female	46(38.3)
	Stay	
3.	Hosteller	86(71.7)
	Day Scholar	34(28.3)
	Education of the Father	
4.	Graduate and above	63(52.5)
	Below graduate	57(47.5)
	Education of the Mother	
5.	Graduate and above	44(36.7)
	Below graduate	76(63.3)
	Researcher in family members	
6.	Yes	27(22.5)
	No	93(77.5)

Table 2 : Distribution of the study participants according to domains. (n=120)

Sr. No.	Domains	Strongly agree/ Agree	Neutral	Strongly disagree/ Disagree
1.	**Subject content**			
	The subject helps in interpretation rather than just numerical	91(75.8)	26(21.7)	3(2.5)
	The subject content was important in medical practice	74(61.7)	36(30)	10(8.3)
	Only the diagrammatic representation of data is easy	11(91.7)	10(8.3)	99(82.5)
	The concepts of data are interesting	89(74.2)	27(22.5)	4(3.3)
	Software is difficult to use	102(85)	11(9.2)	7(5.8)
2.	**Understanding**			
	Some topics under the subject are hard to understand	108(90)	3(2.5)	7(5.8)
	I can understand published papers	54(45)	6(5)	60(50)
	The method of teaching needs a change	42(35)	8(6.7)	70(58.3)
	The subject should be made mandatory in the medical curriculum	10(8.3)	104(86.7)	6(5)
	More training classes are required	21(17.5)	42(35)	57(47.5)
3.	**Current impact**			
	I gained skills to do research	72(60)	8(6.7)	40(33.3)
	For evidence-based practise, the subject is necessary	77(64.2)	32(26.7)	11(9.2)
	I am conducting scientific research now	34(28.3)	23(19.2)	63(52.5)
	My orientation towards medical practice is changed	14(11.7)	26(21.7)	80(66.7)
	I read the subject only to pass the exam	56(46.7)	52(43.3)	12(10)
4.	**Prospects**			
	The biostatistics will be the future of medical practice	83(69.2)	24(20)	13(10.8)
	I wish to carry on many types of research in future	64(53.3)	21(17.5)	35(29.2)
	I wish to pursue a research career	23(19.2)	54(45)	43(35.8)
	I will not be using biostatistics in my medical practice	11(9.2)	31(25.8)	78(65)
	I will teach biostatistics to medical students	45(37.5)	21(17.5)	54(45)

Data entry and analysis

Data were entered and analysed with statistical software- SPSS IBM version 22.0. The data sheets were checked for completeness and cleaning was done before analysis. Means and proportions were calculated. Normality checks were made. Tests of significance were applied and a p-value of less than 0.05 is considered significant. Written informed consent was obtained from all the study participants before recruiting in the study. The study was approved by the Institutional Ethics committee.

Results:

The majority of the study participants were males. Only 22.5% of the study participants had a researcher in the family. (Table 1)

The majority of the study participants, strongly agree that the subject helps in interpretation (75.8%), and is important in medical practice(61.7%). However, 85% of the study participants feel that software is difficult to use. Upon assessing the understanding, 90% of the study participants find the subject hard to understand (Table 2).

Table 3 : Mean difference between the scores

No.	Variable	Subject Content	Understanding	Current impact	Prospects	Total score
	Academic year	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
1.	Third-year	13.1(±5.7)	10.3(±3.4)	11.5(±2.5)	13.3(±3.3)	66.1(±11.7)
	Fourth-year	18.2(±6.3)	13.2(±4.1)	16.4(±3.4)	12.1(±5.1)	78.2(±12.3)
	p value*	0.014	0.032	0.022	0.123	0.021
2.	Sex					
	Male	12.1(±3.6)	12.3(± 2.5)	13.2(±2.1)	13.2(±1.5)	64.3(±13.2)
	Female	11.3(± 2.9)	12.8(± 1.1)	12.2(±2.3)	14.3(±1.2)	62.1(±12.2)
	p value*	0.123	0.365	0.239	0.443	0.429

*Independent t-test applied

The mean score of subject content, understanding, the current impact was significantly higher among the fourth-year students than the third-year students. There was no significant difference between the gender (Table 3).

Discussion:

The results of the present study about the medical student's perception towards biostatistics showed that the majority of the students had a positive perception of the importance of biostatistics. This is contrary to the study done by Mostert P, which stated that the significance of biostatistics is appreciated well only by the qualified medical practitioners than the medical students.[10] Similarly in a study done by Ahmad F et al, which showed that the majority of the medical students had a positive perception of the importance and relevance of biostatistics in the medical curriculum.[8] This result correlates with the study done by Hren D[11] reporting majority of the study participants showed a higher perception towards the importance of biostatistics.

Literature has shown that biostatistics is mostly disliked by medical students because of its complex mathematical calculation which is confusing.[9] A possible recommendation for this could be to give a more frequent workshop or short term courses, small group discussion and introduction of more practical sessions for data collection and analysis. The result of the present study showed that the majority of the

study participants perceived that only the diagrammatic representation was easy to understand and they also perceived that mathematical calculation is of secondary importance as the focus is more on the interpretation of results. The finding of the present study showed that some topics of biostatistics are difficult to understand. This could be attributed to the method of teaching, no prior exposure to biostatistics. Lecturers come from varied backgrounds and teaching skills and approaches to teaching. Knowledge and awareness of biostatistics as a tool for analytical reasoning and biomedical research is significant for health professionals to comprehend medical research, analysis of new information and translate the scientific knowledge gained to clinical practice. Thus, the inclusion of biostatistics in the medical curriculum is important.

Recommendation: This study is an attempt to assess the level of biostatistics knowledge and assess the biostatistics curriculum prevalent in medical college. Though majority students agreed that knowledge of biostatistics helps in interpretation, the need to learn biostatistics should be emphasized in beginning period of MBBS curriculum. Hands on workshops could help in fluency of handling the statistical softwares.

Limitation: Present study carried out in a single centre with a small sample size owing to financial and operational reasons.

Conclusion:

Biostatistics is an important subject in the medical curriculum and is closely related to medical and health care. The need to understand the diversity of the biostatistics syllabus and the integration of different teaching methods is a necessity.There is need to sensitize the syllabus on biostatistics and hands-on exercises should be incorporated in teaching for better use of biostatistics knowledge in medical practice.

Declaration:

Funding: Nil

Conflict of Interest: Nil

References:

1. Indrayan A. Medical Biostatistics as a Science of Managing Medical Uncertainties. Indian J Community Med. 2021 Apr-Jun;46(2):182-185. doi: 10.4103/ijcm.IJCM_763_20. Epub 2021 May 29.

2. Gelijns AC, editor. Modern methods of clinical investigation. National Academies Press; 1990 Feb 1.

3. Tilden S. Health Research and the HIPAA Privacy Rule. JAMA. 2008;299(11):1259.

4. These M, Arnold Z, Walker S. The misuse and abuse of statistics in biomedical research. BiochemiaMedica. 2015:5-11.

5. Dommisse J, Joubert G. Profile of research methodology and statistics training of undergraduate medical students at South African universities. South African Family Practice. 2009;51(2):158-161.

6. These M, Ronna B, Robbins R. Misuse of statistics in the surgical literature. Journal of Thoracic Disease. 2016;8(8):E726-E730.

7. Daher AM, Amin F. Assessing the perceptions of a biostatistics and epidemiology module: views of Year 2 medical students from a Malaysian university. A cross-sectional survey. BMC Med Educ. 2010 May 13;10:34.

8. Ahmad F, Zehra N, Omair A, Anjum Q. Students' opinion regarding application of Epidemiology, Biostatistics and Survey Methodology Courses in medical research. J Pak Med Assoc. 2009;59(5):307–310.

9. Sahai H. Teaching biostatistics to medical students and professionals: Problems and solutions. International Journal of Mathematical Education in Science and Technology. 1999 Mar 1;30(2):187-96.

10. Mostert P. Changing approaches and perceptions: biostatistics and its role in teaching the Stellenbosch doctor. InProceedings of the Seventh International Conference on the Teaching of Statistics-ICOTS 7; 2006 Mar 1-3; Salvador, Brazil:International Association of Statistical Education.

11. Hren D, Lukić IK, Marušić A, Vodopivec I, Vujaklija A, Hrabak M, Marušić M. Teaching research methodology in medical schools: students' attitudes towards and science knowledge. Medical education. 2004 Jan;38(1):81-6.