Importance and Understanding of Bio-Statistics among Post Graduate Students at King Edward Medical University Lahore - Pakistan

ASIF H.,[1] ASIM B.,[2] AND S. M. AWAIS[3]

Address for Correspondence: *Asif Hanif, Department of Orthopedics Surgery and Traumatology unit-I (DOST I) KEMU Lahore*

Back ground: The research in medicine has caused concern among both doctors and bio-statistician for many years [1]. Fundamental concepts of statistics are dire need for medical doctors. If medical doctors do not understand fully the primary concepts of Biostatistics, then the scientific conclusions they reach will be more likely to be wrong [2].

Methodology

Study Design: Cross-sectional descriptive study design was used. **Total number of respondents:** The study was conducted at King Edward Medical University (KEMU) Lahore- Pakistan. A questionnaire was e-mailed to 332 post-graduate medical students (doctors, dentists and physiotherapist) in which only 227 responded. The questionnaire was also manually distributed to 110 medical post-graduate students. Consequently, the total number of respondents was 327 (response rate = 74%).

Results: The mean age of respondents was 31 ± 0.37 years along with the S.D = 6.67 years. There were 198 (60.55%) male and 129 (39.440 female respondents. The basic knowledge of biostatistics among students was not satisfactory. The proportion of students was significant (p-value= 0.00) who were agreed that this course is useful for them and every medical institute should start regular courses on Biostatistics during M.B.B.S.

Conclusion: Our medical institutes should take a daring step towards the education of Research Methodology and Biostatistics. This subject should be taught in graduation so that the doctors of future may get a significant understanding for exploring, implementing the research and make evidence based decisions.

Key Words: Medical-statistics, Research Methods and Medical Research.

Words Count: 238.

Introduction

Statistics has attained gratitude as an important component of many disciplines including medical and related sciences. Biostatistics is an applied science for biology, medical and health sciences[3]. Health care provider need to be aware of the progression of statistical investigations and be able to plan statistical inquest in medical and health related decisions.[4]

Biostatistics has been accepted as a discipline since less than 6 decade and the expansion of science is observed with the growth of systematic medical research in different countries of the world.[5,6] Unfortunately in Pakistan Biostatistics has not been accepted as an independent subject in the medical institutes. At the medical schools without Biostatistics Departments, the minor courses are taught by the instructors who are not biostatisticians and consultation is provided by non-professionals.[5,6]

Medical students must learn the principles of epidemiology and biostatistics to critically evaluate the medical literature so it should be taught early in the graduation, however this subject has traditionally been difficult to teach.[7,8]

It is well known fact that medical statistics are not particularly popular among the medical students. It is a general thought that there are some grim difficulties in the biostatistics education which may include:

- As medical students are very well motivated about study of medicine, in minor branch of basic sciences, they are not well motivated about studying of research methodology, epidemiology and bio-statistics.
- There is a wide variety on mathematical knowledge, ability and curiosity among the students. That kind of difficulties causes the decline of output and permanency of the bio-statistical knowledge [5] etc.

Numerous biostatisticians have been witnessed during the statistical consultancy many doctors argue that they didn't give ample importance on statistics when they were undergraduate students. Consequently from the beginning of the undergraduate education the education of biostatistics and epidemiology should be given to the medical students. As undergraduates their main aim is to pass the course, but for post graduate students conducting their own research the motivation is to obtain sufficient understanding of basic statistical methodology. The depth of understanding that they will require may not be obvious initially but will boost the longer they stay in research.[1]

Hence the main purpose of this study was to find out the importance of research methods, biostatics and epidemiology among post graduate medical students. We also focused their opinions at which level these subjects should be taught. Obviously, these findings will help to decide at

which semester of medical education the biostatistics education should be given.

Objectives

1. The aims of this study were to assess knowledge, attitudes and professional behavior of post graduate medical students towards basic knowledge of Biostatistics to evaluate the usefulness of health interventions, particularly hypothesis testing and interpretation of the results.

2. To see the importance of biostatistics in their opinion and to inquire when this subject should be taught.

Methodology

The respondents were asked very basic questions and understanding, like the concepts of: data collection methods, study design, measure of central tendency, measure of dispersion, proportions, rates, ratios, and sampling techniques and its types, probability and probability distributions, regression, correlation, concepts of hypothesis and analysis of data, difference between parametric and non-parametric statistics. Moreover we also asked some sophisticated concepts such as, survival analysis, Diagnostic tests (Sensitivity, Specificity, Positive predictive value (PPV), Negative Predictive value (NPV)), receiver operating curve (ROC) analysis and time series analysis.

Study Design: Cross-sectional descriptive study design was used.

Total Number of Respondents: The study was conducted at King Edward Medical University (KEMU) Lahore- Pakistan. A questionnaire was e-mailed to 332 post-graduate medical students (doctors, dentists and physiotherapists) in which only 227 responded (response rate 68.37%). The questionnaire was also manually distributed to 110 medical post-graduate students (response rate was 100%). Consequently, the total number of respondents was 327 with over all response rate = 74%.

Duration of Study: This study was concluded in five (5) months.

Statistical Analysis: The data was analyzed using SPSS 16 and results were presented as: Age of respondents was presented as *mean ± S.E*; we also used *Standard Deviation (S.D)*. All other qualitative variables were presented in form of Frequency tables and percentages. Chi-Square test for proportion was used, p-value less than 0.05 was taken as *significant*.

Results

The mean age of respondents was 31 ± 0.37 years along with the S.D = 6.67 years. The minimum and maximum age was 25-51 years respectively. There were 198 (60.55%) male and 129 (39.4%) female students. The ratio of married to un-married students was 1:0.80. Among all respondents

there were 228(69.72%) students who attended the course on Biostatistics and Research Methods during their study period; the rest of 30.27% students never attended that course.

The proportion of candidates was significant (*p-value = 0.000*) who could understand the term study design i.e. 221 (67.58%). There were 217(66.36%) candidates who could comprehend and define data collection methods, the rate of recurrence with positive answers for data collection was significant (*p-value =0.000*). There were 63.9% respondents who were aware about the methods of data presentation (graphical and tabulation) that was also significant. In addition, 319 (97.55%) were known with measures of central tendency (mean, median and mode only) and measure of dispersion (range, standard deviation and variance only). The knowledge of central tendency and measures of dispersion was statistically significant (*p-value=0.000*). The proportion of candidates who did not have the knowledge of birth rate, mortality and morbidity rate was significant (*p-value= 0.000*) i.e. 54 (16.5%) candidates.
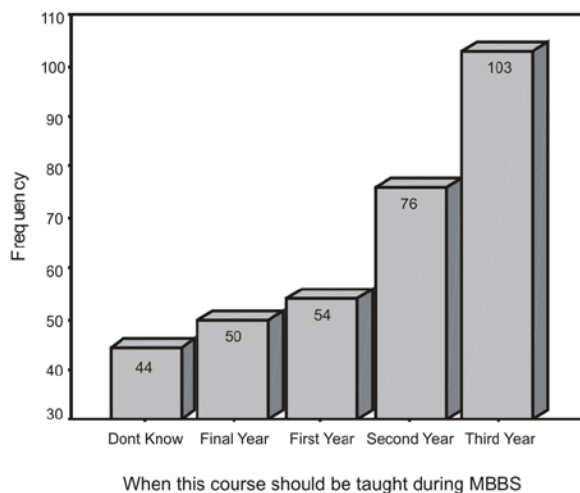
Regression and correlation analysis was famous to 221 (67.58%) students which was also significant (*p-value= 0.000*). Only 8 (2.4%) students could understand about the terms "sampling techniques and probability distributions (Bi-nomial and Poisson)", the frequency of those who did not know about these terms were more prevalent (*p-value= 0.000*). Other probability distributions like *Z-test* and *t-test* were known to 12 students only. The students without the knowledge of *Z-test* and *t-test* were also statistically significant (*p-value = 0.000*). The proportion of students without the knowledge of Analysis of Variance (ANOVA) was too significant (*p-value = 0.000*). The term chi-square test was much familiar to the students and the understanding of this term was more prevalent (*p-value =0.000*). In addition, there were 284 (86.85%) students who could not differentiate between the "Parametric and Non-Parametric tests" which was what's more significant (*p-value = 0.000*). Lastly, on asking them about Survival Analysis, Diagnostic tests, Receiver Operating Characteristic analysis (ROC) and Time Series, we received very interesting comments; so many students asked that "what is this"? Minimum number of students said that "yes we can understand and interpret these terms".

Over all, the basic knowledge was seen in fresh graduates than older students (*p-value = 0.043*). The male's knowledge was comparable with female, female significantly responded than males (*p-value = 0.046*).

Finally, 98.16% students were agreed that this course is useful for them and 318 (97.24%) candidates were in favor that every medical institute must have a separate department of Biostatistics. We also took their opinions that in which year of graduation the course on Biostatistics and Research methods should be taught. 54 (16.51%) students suggested that this course should be taught in first year, 76 (23.24) told in 2nd year, 103 students suggested that in 3rd literature on the assessment of biostatistical knowledge of

Table 1: *Response to questions evaluating basic concepts and applications of Biostatistical terms.*

Basic terms which were asked	*Yes (%)*	*No (%)*	*p-value*
Study design and its types	221 (67.58)	106 (32.41)	0.000
Writing report	26 (7.95)	301 (92.05)	0.000
Data collection methods	217 (66.36)	110 (33.64)	0.000
Presenting and summarizing the data	209 (63.9)	118 (36.1)	0.000
Measures of locations: means/ median/ mode etc.	319 (97.5)	8 (2.5)	0.000
Measures of variations: S.D/ variance/ range etc.	319 (97.5)	8 (2.5)	0.000
Birth rate, mortality, morbidity	54 (16.5)	273 (83.5)	0.000
Sampling techniques and sample size calculation	8 (2.4)	319 (97.5)	0.000
Regression and correlation	221 (67.6)	106 (32.4)	0.000
Hypothesis testing	12 (3.7)	315 (96.3)	0.000
Probability and probability distributions	9 (2.7)	318 (97.3)	0.000
Z-test (Normal distribution)	12 (3.7)	315 (96.3)	0.000
T-test / distribution	12 (3.7)	315 (96.3)	0.000
Analysis of variance	12 (3.7)	315 (96.3)	0.000
Binomial distribution and its probability	8 (2.4)	319 (97.5)	0.000
Poisson distribution and its probability	8 (2.4)	319 (97.5)	0.000
Chi-square test / distribution	198 (60.5)	129 (39.5)	0.000
Diagnostic tests (Sensitivity, Specificity, PPV, NPV)	20 (6.11)	307 (93.89)	0.000
Differentiating parametric & non-parametric tests	43 (13.15)	284 (86.85)	0.000
Survival analysis	7 (2.14)	320 (97.86)	0.000
Roc analysis	20 (6.12)	307 (93.88)	0.000
Time series analysis	3 (0.91)	324 (99.1)	0.000

When this course should be taught during MBBS

year, 50 recommended in final years while rest of 44 respondents replied that "we don't know".

medical students. Some authors conducted studies with a vigorous response rate. According to West CP et al 2007, the response rate of students was 64.3% but in this study we had higher response rate 74% than others. In the light of our

Discussion

Teaching Biostatistics is often considered a difficult task to medical students. However, no one can deny the need of statistics in the medical curriculum. In modern time, there has been a rising label for coaching only statistical concepts in medical institutes. It is general compromise regarding the use of basic statistics in medical research and practice. The aims of most medical institutes are to produce the clinicians not the researchers. But for those students who prefer a livelihood in research, there is a need to offer in-depth instructions in biostatistical philosophy and procedures.[9-10]

There is a very week findings it has been also assessed that clinicians during their trainings, have low superficial knowledge of biostatistical concepts even with a clear acknowledgment of the importance of these issues, which is also published by other researchers.[11,12]

Medical education must contain a more evidence-based approach.[13,14] To attain this, the students must have the

knowledge and skills in developing, analyzing and interpreting the output as part of their erudite work. Effective development and evaluation require a fundamental knowledge of study design and statistical methods [15]. In this study all students had a significant lack to define probability distribution, sampling techniques, hypothesis testing, diagnostic tests, different rates and ratios etc. According to a cross-sectional survey carried out on Italian physicians, a good knowledge was seen regarding randomized clinical trials and Meta analysis that was due to their frequent practice and basic knowledge of Biostatistics.[16] Our residents can also define all these terms if we start to give them a proper understanding regarding biostatistics.

Our findings have identified a series of positive response about the existence of biostatistics in medical education. We strongly agree with Butt AK et al that medical institutions should improve their curriculum with better prominence on bio-statistical thinking and logics. We can motivate the clinicians and produce more health researchers by introducing computerized methods and a greater focus on concepts instead of mathematical calculations through formulas.[17]

Acknowledgement

Conclusion and Suggestions

Our medical institutes should take a daring step towards the education of Research Methodology and Biostatistics. This subject should be taught in graduation so that the doctors of future may get a significant understanding for exploring, implementing the research and make evidence based decisions. According this study it is concluded that students have not an essential knowledge of conducting research and analysis of their problems. They really desire to learn biostatics and research methods so that they can play a pivotal role in the progress of new knowledge.

We can achieve all these goals if we revise the curriculum and introduce biostatistics as a discipline in their graduation. It is essentials to provide them conceptual knowledge and it is also important to introduce some computerized statistical packages like SPSS, Excel or SAS etc to avoid the difficult mathematical calculations and formulae which threat them to learn Biostatistics. Lastly, every medical institute must have the experts of Biostatistics and research methodologies.

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