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# ASSESSING BIOSTATISTICAL KNOWLEDGE AMONG POSTGRADUATES IN A TERTIARY CARE HOSPITAL IN CHENNAI: A CROSS-SECTIONAL STUDY

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**Abstract**

**INTRODUCTION:** Healthcare professionals are increasingly recognizing the value of Evidence-Based Medicine (EBM), which incorporates clinical expertise, patient preferences, and the latest research findings in healthcare decision-making. The main aim of this study was to assess the understanding of biostatistics among postgraduate students in a private medical institution. **METHODS:** A cross-sectional survey was done in a tertiary care hospital in Chennai, utilizing universal sampling to select postgraduates. A total of 171 samples were obtained. A self-administered questionnaire was used to collect demographic information and to assess knowledge in specific to biostatistics. Data analysis was performed using Microsoft Excel and SPSS 26 software. **RESULTS:** The survey results demonstrated inadequacies in the participants' knowledge of biostatistics in the fields of types of data 79 (46.2%), sampling methods 55 (32.2%), and 95% confidence intervals 88 (51.5%). Variables such as year of study, having enough time to read articles daily, and understanding the results of articles showed more substantial associations, indicating the need for improvements in the curriculum and educational methods. Despite recognizing the importance of biostatistics, the participants displayed varying levels of understanding, suggesting the necessity for tailored educational approaches. **CONCLUSION:** This study underscores the importance of ensuring that healthcare professionals have a comprehensive grasp of biostatistics to facilitate evidence-based practice and enhance patient care quality. Further research and educational interventions are essential to effectively address the identified gaps in biostatistical knowledge among postgraduates.

**Keywords:** Biostatistics, Evidence-Based Medicine, Healthcare Professionals, Medical Training, Curriculum Development.

## INTRODUCTION

Health professionals have shown a significant amount of interest in the notion of Evidence-Based Medicine (EBM) over the past ten years. By definition, evidence-based medicine is the process of making decisions about a patient's care that integrates clinical competence, the patient's values, and the best available evidence. Every day, scientific knowledge in medicine expands to the point that previously held beliefs quickly become outdated, and keeping up with this rapid pace of knowledge expansion appears unachievable [1]. To advance medical knowledge, enhance healthcare outcomes, and support evidence-based decision-making, biostatistics is essential. The research area of biostatistics is concerned with gathering, organizing, analyzing, and interpreting data, as well as drawing conclusions based on the data. To evaluate and explain the study's findings to readers, researchers need to possess the necessary expertise. The primary goal of biostatistics is to analyze and assess the type and significance of the data [2].

A solid understanding of biostatistics aids in the design of studies, inference-making, and test validity determination. Health professionals who are not well-versed in biostatistics may draw dangerous conclusions from their clinical expertise since they

do not understand the necessary scientific process. Health workers can experience anxiety related to biostatistics due to their dread of complex mathematical formulas. Nonetheless, biostatistics classes can now be taught without a strong mathematical background [3]. Health practitioners must be knowledgeable in epidemiology and biostatistics to properly comprehend research findings and make recommendations based on a critical evaluation of the available data. Furthermore, reviewing literature and spotting significant errors in analysis, design, and interpretation starts early in health professionals' training and continues throughout their careers [4].

Understanding postgraduates' current perceptions of their understanding of biostatistics may aid in revising the medical curriculum, teaching techniques, and continuing education programs to incorporate this essential field of research and data management. While there is no doubt that medical statistics education needs to be improved, assessments of clinicians' statistical understanding over the previous few decades have not changed much, which suggests that little is known about how to make this progress. Thus, the purpose of this study was to evaluate postgraduate students' understanding of biostatistics at a private medical institution.

## METHODOLOGY

This cross-sectional survey was done in a tertiary care hospital in the suburbs of Chennai to assess the biostatistical knowledge among postgraduates. The study participants included clinical and nonclinical postgraduates of all three academic years and excluded those who did not consent to participation. A total of 171 postgraduates participated in the study out of 320 postgraduates. A self-administered questionnaire was used to collect the data from postgraduates. The first part of the questionnaire contained the respondent’s general information, such as age, gender, department, and year of study. The second part of the questionnaire consisted of closed-ended questions with multiple-choice options, focusing on general knowledge of biostatistics and specific terms related to biostatistics. A pilot study was conducted to evaluate the clarity and comprehensiveness of the questionnaire. The data was analyzed with the help of Microsoft Excel and SPSS 26 software. The average score for general knowledge of biostatistics and specific terms related to biostatistics was calculated. All the survey questions related to basic definitions of concepts in biostatistics were assigned an equal value, that is, 1 for the correct response and 0 otherwise. A score of 10 corresponds to those who have obtained all correct responses on the basic concept of health economics. A score of zero corresponds to those who have incorrect responses to all questions. The mean score of the study participants was calculated and found to be 6. The participants were categorized as having sufficient knowledge if the mean score is more than 6 and insufficient knowledge if the mean score is less than or equal to 6. Descriptive statistics was done for the characteristics of the study participants, and chi-square analysis was done to find the association between the characteristics of study participants and knowledge of biostatistics.

## RESULTS

Table 1 provides insights into the demographics, educational background, and reading habits of the surveyed population, as well as their perceived needs for additional training in biostatistics. Out of the total population, 77 individuals are male (45%), and 94 are female (55%). Among the respondents, 96 individuals (56.1%) are aged 28 or below, while 75 individuals (43.9%) are older than 28. Within the sample, 20

respondents (11.7%) belong to non-clinical departments, while 151 (88.3%) belong to clinical departments. The distribution of respondents across years of study is as follows 1st year 56 (32.7%), 2nd year 65 (38%), and 3rd year 50 (29.2%). Among the respondents, 139 (81.3%) have received formal training in biostatistics, while 32 (18.7%) have not. 111 respondents (64.9%) report not having enough time to read articles daily, whereas 60 (35.1%) indicate they have sufficient time. The distribution of respondents based on the number of articles read in 2023 is as follows 0 articles 24 (14%), 1-5 articles 67 (39.2%), 6-10 articles 46 (26.9%), and more than 10 articles 34 (19.9%). 85 respondents (49.7%) report being unable to understand the results of articles, while 86 (50.3%) indicate they can understand them. Most respondents, 152 (88.9%), feel that they need further training in biostatistics, while only 19 (11.1%) believe they do not.

**Table 1: Characteristics of the Study Participants (N=171)**

| S. No | Variables | | Frequency (n) | Percentage (%) |
|---|---|---|---|---|
| 1 | Gender | Male | 77 | 45 |
| | | Female | 94 | 55 |
| 2 | Age | ≤28 | 96 | 56.1 |
| | | >28 | 75 | 43.9 |
| 3 | Department | Non clinical | 20 | 11.7 |
| | | Clinical | 151 | 88.3 |
| 4 | Year of study | 1st | 56 | 32.7 |
| | | 2nd | 65 | 38 |
| | | 3rd | 50 | 29.2 |
| 5 | Received formal Bio statistical training | No | 32 | 18.7 |
| | | Yes | 139 | 81.3 |
| 6 | Enough time to read article daily | No | 111 | 64.9 |
| | | Yes | 60 | 35.1 |
| 7 | Number of articles read in 2023 | 0 | 24 | 14 |
| | | 1-5 | 67 | 39.2 |
| | | 6-10 | 46 | 26.9 |
| | | >10 | 34 | 19.9 |
| 8 | Able to understand the results of the article | No | 85 | 49.7 |
| | | Yes | 86 | 50.3 |
| 9 | Bio statistics training needed | No | 19 | 11.1 |
| | | Yes | 152 | 88.9 |

Table 2 presents the performance of participants on a set of topics related to biostatistics, measured in terms of the number of correct responses and the percentage of correct responses. A majority of participants correctly responded to questions related to study design, with 141 out of 171 participants answering correctly, representing a high percentage of correct responses at 82.5%. Fewer participants demonstrated understanding of types of data, with only 79 out of 171 participants providing correct responses, resulting in a lower percentage of correct responses at 46.2%. Understanding of sampling methods was relatively low among participants, with only 55 out of 171 participants answering correctly, accounting for a mere 32.2% of correct responses. Participants showed moderate understanding of screening concepts, with 107 out of 171 participants providing correct responses, representing a percentage of correct responses of 62.6%. A significant proportion of participants demonstrated understanding of hypothesis testing, with 135 out of 171 participants answering correctly, yielding a high percentage of correct responses at 79.9%. Understanding of types of error was moderate among participants, with 102 out of 171 participants providing correct responses, resulting in a percentage of correct

responses of 59.6%. Participants' grasp of the concept of a 95% confidence interval was relatively moderate, with 88 out of 171 participants answering correctly, representing a percentage of correct responses of 51.5%. The majority of participants demonstrated understanding of odds ratio, with 143 out of 171 participants providing correct responses, resulting in a high percentage of correct responses at 83.6%. Understanding of statistical significance was moderate among participants, with 112 out of 171 participants answering correctly, yielding a percentage of correct responses of 65.5%. A significant proportion of participants demonstrated understanding of blinding, with 153 out of 171 participants providing correct responses, representing a high percentage of correct responses at 89.5%. In summary, while participants generally performed well on topics such as study design, hypothesis testing, and odds ratio, their understanding was comparatively weaker on concepts related to types of data, sampling methods, and 95% confidence intervals. These findings suggest areas where further education or training may be beneficial to improve participants' understanding of biostatistical concepts.

**Table 2: Correct Responses to Biostatistical Knowledge Question (N=171)**

| S.no | Topic | Correct responses (n) | Percentage (%) |
|---|---|---|---|
| 1 | Study design | 141 | 82.5 |
| 2 | Types of data | 79 | 46.2 |
| 3 | Sampling method | 55 | 32.2 |
| 4 | Screening | 107 | 62.6 |
| 5 | Hypothesis | 135 | 79.9 |
| 6 | Types of error | 102 | 59.6 |
| 7 | 95% CI | 88 | 51.5 |
| 8 | Odds ratio | 143 | 83.6 |
| 9 | Statistical significance | 112 | 65.5 |
| 10 | Blinding | 153 | 89.5 |

Table 3 shows the associated factors of the biostatistical knowledge. The chi-square test revealed that there was no statistically significant association between gender and knowledge in biostatistics ($\chi^2 = 0.468$, $p = 0.494$). Both males and females had similar proportions of sufficient knowledge, with slightly more females 68 (72.3%) exhibiting sufficient knowledge compared to males 52 (67.5%). Similarly, age did not show a significant association with knowledge levels ($\chi^2 = 0.637$, $p = 0.425$). Participants aged 28 or younger had comparable levels of knowledge to those older than 28, with approximately two-thirds of participants in each age group demonstrating sufficient knowledge. The department in which participants were affiliated clinical and non-clinical also did not significantly influence knowledge in biostatistics ($\chi^2 = 3.334$, $p = 0.985$). Both clinical and non-clinical departments had similar proportions of participants with sufficient knowledge. In contrast, the year of study displayed a significant association with knowledge ($\chi^2 = 7.51$, $p = 0.023$). Participants in their second year had the highest proportion of sufficient knowledge 53 (81.5%), followed by those in the third year 34 (68%) and the first year 33 (58.9%). There was no significant association between receiving formal biostatistical training and knowledge levels ($\chi^2 = 1.19$, $p = 0.276$). Both those who received training and those who did not had similar proportions of sufficient knowledge. Having enough time to read articles daily was significantly associated with knowledge in biostatistics ($\chi^2 = 9.44$, $p = 0.002$). Participants who reported having enough time had a higher proportion of sufficient knowledge (44.3%) compared to those who did not (21.8%). The number of articles read in 2023 did not demonstrate a significant association with knowledge levels ($\chi^2 =$

3.66, p = 0.300). Participants who read different numbers of articles had comparable proportions of sufficient knowledge. Understanding the results of articles showed a trend towards significance ($\chi^2$ = 3.20, p = 0.074), suggesting a potential influence on knowledge. Participants who were able to understand the results had a slightly higher proportion of sufficient knowledge compared to those who did not. The need for biostatistics training approached significance ($\chi^2$ = 3.80, p = 0.051), indicating that participants recognizing a need for training may have lower knowledge levels, although this finding was not conclusive. In summary, while factors like gender, age, and department did not significantly influence biostatistics knowledge, variables such as year of study, having enough time to read articles daily, and understanding the results of articles showed more substantial associations. These findings highlight the complex interplay of various factors in shaping individuals' knowledge levels in biostatistics.

**Table 3: Association between Characteristics of the Study Participant and Biostatistical Knowledge (N=171)**

| Variables | | Knowledge in biostatistics (N=171) | | Chi square $\chi^2$ (P-value) |
|---|---|---|---|---|
| | | Insufficient n (%) | Sufficient n (%) | |
| Gender | Male | 52 (67.5) | 25 (32.5) | 0.468 (0.494) |
| | Female | 68 (72.3) | 26 (27.7) | |
| Age | ≤28 | 65 (67.7) | 31 (32.3) | 0.637 (0.425) |
| | >28 | 55 (73.3) | 20 (26.7) | |
| Department | Non clinical | 14 (70) | 6 (30) | 3.334 (0.985) |
| | Clinical | 106 (70.2) | 45 (29.8) | |
| Year of study | 1st | 33 (58.9) | 23 (41.1) | 7.51 **(0.023)*** |
| | 2nd | 53 (81.5) | 12 (18.5) | |
| | 3rd | 34 (68) | 16 (32) | |
| Received formal Bio statistical training | No | 25 (78.1) | 7 (21.9) | 1.19 (0.276) |
| | Yes | 95 (68.3) | 44 (31.7) | |
| Enough time to read article daily | No | 86 (78.2) | 24 (21.8) | 9.44 **(0.002)*** |
| | Yes | 34 (55.7) | 27 (44.3) | |
| Number of articles read in 2023 | 0 | 18 (75) | 6 (25) | 3.66 (0.300) |
| | 1-5 | 51 (76.1) | 16 (23.9) | |
| | 6-10 | 31 (67.4) | 15 (32.6) | |
| | >10 | 20 (58.8) | 14 (41.2) | |
| Able to understand the results of the article | No | 65 (76.5) | 20 (23.5) | 3.20 (0.074) |
| | Yes | 55 (64) | 31 (36) | |
| Bio statistics training needed | No | 17 (89.5) | 2 (10.5) | 3.80 (0.051) |
| | Yes | 103 (67.8) | 49 (32.2) | |

## DISCUSSION

This cross-sectional study conducted as a part of evidence-based medicine to assess the knowledge of biostatistics among postgraduates in a tertiary care hospital revealed that there is a lack of knowledge in certain areas of biostatistics. A survey found that oral health practitioners have a high perceived knowledge and attitude toward biostatistical concepts, despite a clear understanding of their importance. Even those with vast research experience and advanced statistical training believed they had a significant lack of ability [5].

This study systematically elicited the perspectives of six different main professional groups working in primary care on evidence-based practice. While all professional groups were largely supportive of evidence-based practice, some notable variances emerged [6].

They concluded that there was a significant gap in knowledge about the concept and process of implementing evidence-based practice dimensions, including knowledge, attitude, and outcome/decisions [7]. Clinicians at all levels of training have inadequate perceived awareness of biostatistical concepts, despite a strong recognition of the importance of these issues. Integrating biostatistics with therapeutically relevant medical discussions, similar to those found in many EBM courses for epidemiological principles, can enhance learning [8].

Medical students are aware of the necessity to comprehend and evaluate medical research critically, as well as the growing pressure on physicians to defend their treatment choices. Students will be more likely to be motivated by the course and participate in it to pass the exams and acquire the skills they will need for both the undergraduate program and their future careers if the goal of a medical statistics course is to give them the tools to do this [9].

A study done among resident physicians in training at a hospital affiliated with Tehran University lack adequate knowledge about the fundamental concepts of evidence-based medicine. Moreover, the majority of them still rely on conventional knowledge sources rather than evidence-based sources [10]. Having completed an external course in biostatistics, research, or a similar field enhanced the likelihood of having sufficient knowledge of the subject. Previous research has demonstrated that prior courses in epidemiology or biostatistics were connected with increased confidence in digesting and critically appraising the medical literature and organizing a research study [11].

## LIMITATION

The study's findings may be limited by the characteristics of the postgraduates sampled. For instance, if the sample consists predominantly of individuals from a particular institution, the results may not be generalizable to the broader population of postgraduates. Postgraduates may be pressed for time due to their academic commitments, which could affect their participation and performance in the study. This may result in incomplete responses or rushed efforts that do not reflect their true level of biostatistical knowledge.

## CONCLUSION

This study done in a tertiary care hospital underscores a significant gap in biostatistics knowledge among postgraduates, highlighting the urgent need for enhanced education in this area. Improving biostatistics training can empower healthcare professionals to make evidence-based decisions, ultimately enhancing patient care outcomes. Moving forward, integrating biostatistics education into medical curricula and professional development programs is crucial for bridging this knowledge gap and improving healthcare delivery.

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