Original Research Paper

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# Effect of didactic learning on knowledge and perception regarding biostatistics amongst postgraduate students: A questionnaire-based study

**Abstract:**

**Introduction:** Biostatistical tools form the backbone of evidence-based research and are essential for scientific decision-making. However, the wide scope and complexity of biostatistics often make its application challenging for postgraduate students. Structured teaching and repeated reinforcement may help improve understanding and perception of the subject.

**Objective:** To evaluate the effect of didactic learning on knowledge and perception regarding biostatistics among postgraduate dental students.

**Methodology:** A questionnaire-based pre–post study was conducted among postgraduate dental students from a single institution. Participants attended a series of structured lectures on biostatistics delivered by a faculty member. Responses were recorded before and after the teaching sessions, and changes in knowledge and perception were assessed. Statistical analysis was performed using McNemar's test.

**Results:** Post-intervention analysis showed a significant improvement in knowledge and perception regarding biostatistics for questions related to application, interpretation, and understanding of statistical concepts (questions 2–7; $p < 0.05$).

**Conclusion:** Didactic teaching significantly improved knowledge and perception of biostatistics among postgraduate dental students. Reinforced and structured learning may help reduce anxiety and improve the effective application of biostatistics in research.

**Key-words:** Biostatistics, Didactic learning, Postgraduate dental education, Knowledge assessment, Perception and attitude, Questionnaire-based study

## Introduction:

Biostatistical tools add value to scientific research and serve as the backbone of evidence-based practice. However, the wide scope and versatility of biostatistics make it difficult for many researchers to understand and apply these tools appropriately. Continuous learning and reinforcement through teaching and microteaching can help improve comprehension and application of biostatistical concepts.

The main dissertation and short research studies are essential components of the postgraduate curriculum; therefore, it is important for postgraduate students to become familiar with biostatistics at an early stage of their training. Moreover, the fundamental essence of research cannot be developed without adequate knowledge of biostatistical tools. Despite its importance, postgraduate students often lack confidence in applying biostatistics in research.

Several studies have assessed the knowledge, attitude, and perception of biostatistics among medical and dental students as well as clinicians, and have reported gaps in scientific understanding, highlighting the need for continuous learning to improve scientific competence.[1]

Only a limited number of studies have evaluated the impact of structured didactic teaching, in the form of short-term courses

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and lectures, on improving both knowledge and perception of biostatistics.[2] Therefore, the present study was undertaken to evaluate the change in knowledge and perception of biostatistics before and after didactic learning among postgraduate students of different dental specialties.

## Materials and method:

### Study Design:

A questionnaire-based pre–post interventional study was conducted between 1st January 2024 and 28th February 2024 at a single dental teaching institution after obtaining approval from the Institutional Ethics Committee (MDC/IEC/36/2024).

### Study Population and sampling:

The study included first- and second-year postgraduate students enrolled in the Master of Dental Surgery (MDS) program across various specialties, including Periodontics, Conservative Dentistry and Endodontics, Orthodontics, Oral and Maxillofacial Surgery, Pediatric Dentistry, and Prosthodontics, during the academic years 2022–23 and 2023–24.

A convenience sampling method was adopted. All eligible postgraduate students present during the study period were invited to participate. Participants were eligible for inclusion if they were first- or second-year postgraduate dental students enrolled in the Master of Dental Surgery (MDS) program across various specialties, were present during the study period, and provided informed consent to participate. Additionally, only those students who were available for both pre-intervention and post-intervention assessments were included in the study. Students were excluded if they had previously undergone formal training in biostatistics, such as workshops, certificate courses, or structured programs, as this could influence baseline knowledge levels. Those who were unwilling to participate or who submitted incomplete questionnaire responses were also excluded from the final analysis. Out of 58 students approached, 55 participants were included in the final analysis. **(Table 1)**

### Study instrument (Questionnaire):

A structured, self-administered questionnaire was used to assess knowledge and perception regarding biostatistics. The questionnaire consisted of six close-ended and one open ended questions, covering:

- Perceived importance of biostatistics
- Application in clinical practice and research
- Understanding of statistical concepts
- Interpretation of p-values
- Confidence in using statistical tools

Responses were recorded in a dichotomous format (Yes/No).

### Validity and reliability:

Content validity of the questionnaire was assessed by a panel of three subject experts in dental research and biostatistics, who evaluated the items for relevance, clarity, and comprehensiveness. Necessary modifications were made based on their feedback.

### Intervention (Didactic Teaching):

Participants underwent a structured series of didactic lectures delivered by a designated faculty member over a period of one and a half months. The teaching sessions included:

- Introduction and scope of biostatistics
- Data collection and presentation
- Sampling methods
- Types of bias and errors
- Commonly used statistical tests
- Null hypothesis and p-value interpretation

The sessions were designed to provide conceptual clarity with simplified explanations and clinical relevance.

### Data collection procedure:

Baseline (pre-intervention) responses were collected prior to the commencement of the teaching sessions. Post-intervention responses were obtained immediately after completion of the lecture series using the same questionnaire. (Table 2)

### To minimize information bias:

- Questionnaires were completed anonymously

### Outcome Measures:

The primary outcome was the change in knowledge and perception regarding biostatistics, assessed by comparing pre- and post-intervention responses to individual questionnaire items.

### Statistical Analysis:

Data were entered and analyzed using appropriate statistical software (SPSS version 25).

Descriptive statistics were expressed as frequencies and percentages.

The **McNemar test** was applied to compare paired categorical responses before and after the intervention. A p-value of <0.05 was considered statistically significant. **(Table 3)**

## Results

### Participant characteristics

Out of the 58 postgraduate students approached, 55 (94.8%) participated in the study. The study population consisted of 55 postgraduate students, including 10 males and 45 females, from various departments of the institute. Participants belonged to the departments of Periodontics, Pediatric Dentistry, Conservative Dentistry and Endodontics, Oral and Maxillofacial Surgery, Orthodontics, and Prosthodontics. Responses were recorded before and after a series of didactic lectures on biostatistics.

### Overall change in knowledge and perception:

Changes in knowledge and perception regarding biostatistics were assessed based on pre- and post-intervention questionnaire responses, as summarized in **Table 2.** Statistical analysis was performed using McNemar's test. A statistically significant improvement was observed in responses to questions 2 through 7 following the training sessions.

### Perception of importance of biostatistics:

Among the 55 participating postgraduate students, 94.5% agreed prior to the initiation of lectures that biostatistics should be taught as a topic of special importance in the postgraduate curriculum. Following completion of the didactic sessions, this proportion increased to 98.2% **(Question 1).**

### Effect of didactic learning on research understanding:

Prior to the teaching sessions, 43.6% of participants agreed that the knowledge gained during undergraduate training in biostatistics was helpful in understanding research papers during the MDS curriculum. This proportion increased to 58.2% after the lectures **(Question 2, Figure 1).**

### Impact on clinical practice and manuscript interpretation:

After the training sessions, 92.7% of students agreed that knowledge of biostatistics would help them perform better in clinical practice, compared to 76.4% before the lectures **(Question 3).**

An improvement of 30.9% was observed in the number of students who reported giving importance to statistical analysis while reading scientific manuscripts, increasing from 61.8% before the lectures to 92.7% after the intervention **(Question 4).**

### Understanding of statistical concepts:

Following the lectures, 90.9% of participants reported improved confidence in using various statistical tools and tests and demonstrated better understanding of the difference between statistically significant and clinically significant results. Before the training, only 45.5% reported such awareness **(Questions 5 and 6, Figure 2).**

### Understanding of p-value interpretation

With regard to interpretation of p-values in scientific research, 89.1% of students reported improved understanding after the training sessions, compared to 54.5% prior to the lectures **(Question 7).**

### Qualitative feedback from participants:

The final question was open-ended and explored participants' suggestions for improving knowledge of biostatistics. Three major themes emerged from the responses. The first theme emphasized integration of biostatistics as a formal component of the postgraduate curriculum through structured coursework, lectures, and clinical workshops. The second theme highlighted the importance of continuous didactic learning and regular reinforcement through teaching and microteaching sessions. The third theme focused on encouraging postgraduate students to read scientific manuscripts to enhance critical thinking and improve practical application of biostatistics in clinical practice.

## Discussion:

Biostatistics is an essential component of postgraduate dental education and plays a vital role in evidence-based research. It equips students with analytical skills required for proper data collection, analysis, and interpretation, thereby helping to prevent misconceptions in scientific research. A sound understanding of biostatistical principles enables clinicians to critically appraise research findings and apply them appropriately to achieve optimal patient care.

Biostatistical tools encompass a wide range of concepts and techniques, often requiring structured teaching and repeated reinforcement for effective comprehension. Continuous education and systematic training are therefore necessary to

establish a strong foundation in biostatistics. Several studies have evaluated the knowledge, attitude, and perception of biostatistics among postgraduate dental students and clinicians and have reported adequate awareness regarding its importance, but limited confidence and proficiency in its practical application.[1,3]

The baseline findings of the present study demonstrated that the majority of postgraduate students had deficiencies in core knowledge related to biostatistical tools and tests. Despite this, the students showed a positive attitude towards learning, as reflected by complete attendance during the teaching sessions. The observed lack of proficiency may be attributed to the complexity of the subject and the limited exposure during earlier stages of training. Repeated teaching sessions and simplification of concepts appeared to improve both understanding and perception of biostatistics among the participants.

Although the present study did not aim to evaluate improvement in clinical decision-making through problem-based learning or clinical assessment, a significant improvement was observed in students' understanding of the difference between statistical significance and clinical significance, as well as in their interpretation of p-values. Statistical significance indicates that an observed result is unlikely to have occurred by chance, whereas clinical significance reflects the practical importance of the result in clinical practice.[4] Understanding this distinction is crucial for accurate interpretation of research findings.

Similarly, knowledge regarding the interpretation of p-values improved after the training sessions. The p-value indicates the probability that the observed results occurred by chance, with lower values reflecting stronger evidence against the null hypothesis. Basic understanding of this concept is essential for postgraduate students to critically evaluate scientific literature and research outcomes.

These findings are in agreement with those reported by **Hood**, who suggested that aversion to biostatistics among students may stem from its mathematical nature, limited prior exposure, and lack of confidence, leading to a perceived difficulty with the subject.[5] Misconceptions regarding the relevance of biostatistics in future clinical practice may further contribute to this knowledge gap. The results of the present study support the role of continuous reinforcement and simplified teaching approaches in enhancing interest, acceptance, and confidence in biostatistics, as also reported in previous studies.[6,7] The consistent improvement in post-training responses indicates a positive shift in knowledge and perception towards biomedical research.

## Limitations of the study:

The present study has certain limitations. The sample size was relatively small, and the participants were recruited from a single institution, which limits the generalizability of the findings. The absence of a control group further restricts the strength of causal inference, although this was influenced by practical and ethical considerations. Additionally, spreading the lectures over a period of one and a half months may have introduced recall or memory bias. The assessment was based on a self-reported questionnaire, which may be subject to response bias and social desirability bias. Additionally, the questionnaire, although content-validated, did not undergo formal reliability testing, which may affect the robustness of the measurement tool. Finally, the study assessed only short-term outcomes, and long-term retention of knowledge was not evaluated.

## Conclusion:

The present study highlights the importance of continuous and structured education in improving knowledge and fostering a positive attitude towards biostatistics among postgraduate dental students. Reinforced didactic learning was associated with improved understanding and perception of biostatistical concepts. Modification of teaching methodologies, including the incorporation of clinically oriented exercises, may further enhance learning outcomes. Developing strategies to reduce anxiety and apprehension towards biostatistics could make the subject more engaging and facilitate its effective application in research and clinical practice.

**Table-1. Distribution of the survey's respondents**

| Demographic | Number of respondents (%) |
|---|---|
| Total | 55 (100%) |
| Gender | |
| Males | 18.19% |
| Females | 81.18% |
| Year of study | |
| First year PGs | 29 (52.7%) |
| Second year PGs' | 26 (47.3%) |
| Departments included | |
| Periodontics | 10 |
| Conservative and endodontics | 08 |
| Orthodontics | 10 |
| Oral and maxillofacial surgery | 05 |
| Pedodontics | 12 |
| Prosthodontics | 10 |

**Table-2. Showing questionnaire along with responses.**

| S. N | Questions asked | Before teaching responses | | After teaching responses | |
|---|---|---|---|---|---|
| | | Yes | No | Yes | No |
| 1. | Do you think that biostatistics should be taught as the topic of special consideration in postgraduate curriculum? | 94.5% | 6% | 98.2% | 3% |
| 2. | Has knowledge gained in BDS final year w.r.t biostatistics has been helpful for understanding research papers during postgraduate curriculum? | 43.6% | 56.4% | 58.2% | 41.8% |
| 3. | Do you think that the research methodology training will help you to Perform better in clinical practice? | 76.4% | 23.6% | 92.7% | 7.3% |
| 4. | While reading manuscripts, do you give importance to statistics? | 61.8% | 38.2% | 92.7% | 7.3% |
| 5. | Are you aware of various statistical tests used in research methodology? | 45.5% | 54.5% | 90.9% | 9.1% |
| 6. | Do you know the difference between statistically significant and clinically significant results? | 45.5% | 54.5% | 90.9% | 9.1% |
| 7. | Do you understand the importance of p- value in scientific results? | 54.5% | 45.5% | 89.1% | 10.9% |
| 8. | Can you suggest the methods to improve your knowledge of biostatistics? | 1. Integration of biostatistics into curriculum.<br>2. Continuous didactic learning and constant reinforcement.<br>3. Encouragement to read research manuscripts. | | | |

**Table-3. Showing level of significance using McNemar Test:**

| Question number | A | B | Y=A-B | C | D | Z=C-D | $\chi^2$ |
|---|---|---|---|---|---|---|---|
| 1. | 52 | 52 | 0 | 3 | 1 | 2 | 2 |
| 2. | 24 | 24 | 0 | 31 | 23 | 8 | 8* |
| 3. | 42 | 42 | 0 | 13 | 4 | 9 | 9* |
| 4. | 34 | 34 | 0 | 21 | 4 | 17 | 17* |
| 5. | 25 | 25 | 0 | 30 | 5 | 25 | 25* |
| 6. | 25 | 25 | 0 | 30 | 5 | 25 | 25* |
| 7. | 30 | 30 | 0 | 25 | 6 | 19 | 19* |

## Legends:

A: Number of subjects with 'yes' response before training

B: Number of subjects with 'yes' response after training

Y= Change in number of subjects with' yes' response

(students who responded in affirmative before the training continued to do the same after training too)

C: Number of subjects with 'no' response before training

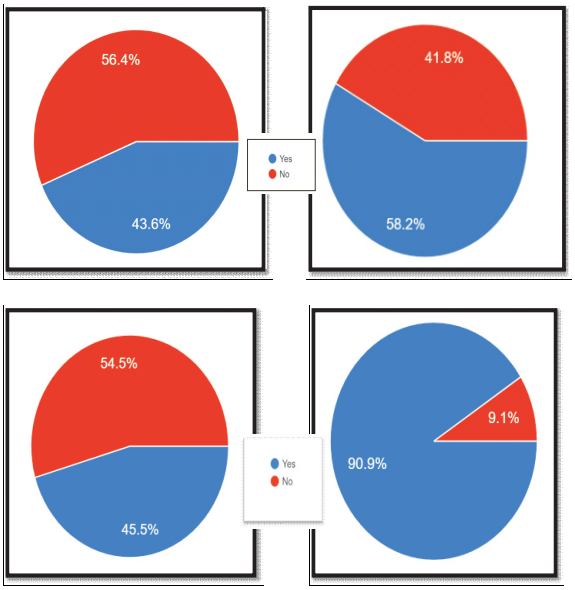
D= Number of subjects with 'no' response after training

Z=Change in number of subjects with 'no' response

$\chi^2 = (X-Y)^2 / X+Y$

Critical value of $\chi^2$ at p=0.05=3.841

*Value of $\chi^2$ more than critical value indicates significant change




## References:


1. Penmetsa GS, Dubba K, Mohammad Z. Knowledge, attitude and perception regarding biostatistics among postgraduate students in dental institution of Andhra Pradesh. J Indian Assoc Public Heath Dent 2017;15(1):68-72.
2. Chima SC, Nkwanyana NM, Esterhuizen TM. Impact of a short biostatistics course on knowledge and performance of postgraduate scholars: Implications for training of African doctors and biomedical researchers. Niger J Clin Pract 2015;18(7):562-70.
3. Sujatha BK, Reddy MN, Vijayan S. Assessment of knowledge, attitude and perception about biostatistics among faculty and postgraduate students in a dental institution, Bengaluru city – A cross sectional survey. J Dent Res Rev 2018;5(2):54-8.
4. Sharma H. Statistical significance or clinical significance? A researcher's dilemma for appropriate interpretation of research results. Saudi J Anaesth 2021;15(4):431-34.
5. Hood M, Neumann DL. Evaluation of a workshop to reduce negative perceptions of statistics in undergraduate psychology students. Psychol Learn Teach 2013;12(2):115-25.

6. Kadri G, Enejjari Z and Bouziane A. Knowledge, attitude, and practices towards evidence-based dentistry among dental practitioners: A cross-sectional study. Ann Med Surg 2022;82:(1):1-7.
7. Swetha JL, Arpita R, Srikanth C, Nutalapati R. Cognition, comprehension and application of biostatistics in research by Indian postgraduate students in periodontics. J Indian SocPeriodontol 2014;18:65-8.