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A STUDY ON LEARNING DIFFICULTIES IN PRE-CLINICAL TEETH ARRANGEMENT AMONG DENTAL STUDENTS

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ABSTRACT :

Background: Effective pre-clinical teeth arrangement is vital for dental education, impacting students' technical skills in prosthodontics. This study explores learning difficulties in this area among dental students.

Methods: A cross-sectional study was conducted from September to October 2024 with 160 dental students from a private dental college. Data were collected using a 20-question questionnaire administered via Google Forms. Statistical analysis included descriptive statistics and comparisons across year groups using Pearson's chi-square test.

Results: Significant challenges were identified in arranging maxillary and mandibular teeth, particularly in lateral incisors and canines. Variations in difficulties were noted across educational year groups, emphasizing a need for targeted instruction and practice.

Conclusion: The findings highlight the necessity for improved pedagogical strategies and a balanced approach integrating traditional and digital learning methods to enhance dental students' skills in pre-clinical teeth arrangement.

Keywords: Pre-Clinical Teeth Arrangement, Dental Education, Learning Difficulties, Occlusion, Tooth Alignment, Pedagogical Approaches.

Introduction :

Pre-clinical teeth arrangement is a fundamental aspect of dental education, serving as a crucial bridge between theoretical knowledge and clinical practice. This essential component of the curriculum equips dental students with the foundational skills necessary for various dental disciplines, particularly prosthodontics.[1] Prosthodontics focuses on the restoration and replacement of teeth, requiring practitioners to have a keen understanding of dental anatomy, occlusion, and aesthetic principles. Mastering pre-clinical teeth arrangement allows students to develop their technical skills in manipulating dental materials and understanding the spatial relationships between teeth, which is vital for successful patient outcomes.[2] Effective teeth arrangement enhances students' comprehension of occlusal principles and the functional dynamics of the masticatory system. This knowledge is paramount in prosthodontics, where precise alignment of dental prostheses is critical to ensuring proper function, comfort, and aesthetics.[3] Furthermore, proficiency in teeth arrangement fosters a deep understanding of the interplay between form and function, allowing future practitioners to create restorations that not only restore oral health but also enhance the overall quality of life for their patients.[4] Learning difficulties in preclinical teeth arrangement can stem from various factors, including the complexity of techniques, lack of effective tools, and insufficient pedagogical approaches. Addressing these challenges is crucial for enhancing students' skills in dental education.[5] This study focuses on the learning difficulties in pre-clinical teeth arrangement among dental students.

Materials and Methods :

This study employed a cross-sectional design to assess learning difficulties in pre-clinical teeth arrangement among dental students. Conducted over one month, from September 2024 to October 2024, the research involved data collection, statistical analysis, and report preparation. The focus was on dental students from a private dental college, with approval obtained from the Department of Prosthodontics, Crown and Bridge, and ethical clearance granted by the Institutional Review Board. A convenience sample of 160 participants was selected, and demographic information was collected. A questionnaire consisting of 20 questions was distributed via Google Forms, and informed consent was secured to ensure confidentiality and privacy. Participants were briefed about the questions to encourage accurate responses. The data collected through Google Forms were transferred into an Excel format for analysis using IBM SPSS Statistics for Windows, Version 26.0 (Armonk, NY: IBM Corp). Descriptive statistics, including frequency and percentages, were calculated for all participant responses. Responses were compared across different educational qualifications using cross-tabulations, and statistical significance was evaluated using Pearson's chi-square test and Fisher's exact test. The level of statistical significance for this study was set at $p < 0.05$.

Results :

A total of 160 dental students participated in the study. The distribution of participants across different academic years was as follows: 36 students (22.5%) were in their first year, 63 students (39.4%) were in their second year, 39 students (24.4%) were in their third year, and 8 students (5.0%) were in their final year. Additionally, 14 interns (8.8%) also took part in the study. The research focused on maxillary and mandibular incisors, canines, premolars, and molars, examining specific principles related to inclination, occlusion, and alignment. The study investigated the difficulties faced by dental students in arranging various maxillary teeth, highlighting key challenges across different year groups. For maxillary central incisors, the "Labial inclination of 15 degrees" was identified as the most challenging principle, particularly by second-year (16.3%) and third-year students (11.3%), while first-year students struggled significantly with this aspect (44.4%). Final-year students (2.5%) and interns (3.1%) reported difficulties with "All of the above." However, overall analysis indicated no statistically significant differences among year groups, with a p-value of 0.266. Regarding maxillary lateral incisors, first-year students primarily faced challenges with "Labial inclination of 20 degrees" (12.5%), while second-year students found "All of the above" most difficult (19.4%). Third-year students identified "Labial inclination of 20 degrees" as challenging (10.6%), and final-year students had difficulties related to the "Long axis mesially inclined towards midline" (1.9%). Statistical analysis showed significant differences across year groups with a p-value of 0.013. When arranging maxillary canines, first-year students found "Prominent than the incisal portion" challenging (8.8%), followed by second-year students (23.8%) and third-year students (15.6%). Final-year students and interns reported fewer difficulties (2.5% and 3.1%, respectively). The analysis revealed a significant difference in difficulties among year groups, with a p-value of 0.041. In arranging maxillary first premolars, first-year students struggled with "Palatal cusp 1 mm short of occlusal plane" (11.3%), while second-year students identified "All of the above" as equally difficult (22.5%). Third-year students again found "Palatal cusp 1 mm short of occlusal plane" most challenging (15.6%), but no significant differences were noted across year groups (p-value of 0.202). For maxillary second premolars, first-year students reported "All of the above" (7.5%) as the most difficult principle, while second-year students noted "None of the above" as a significant challenge (21.3%). This trend continued with third-year students (11.3%), and significant differences were noted with a p-value of 0.000. Finally, in arranging maxillary first molars, first-year students found "Mesiopalatal cusp contacts occlusal plane" challenging (10.6%), while second-year students (15.6%) and third-year students (11.3%) noted similar challenges. No significant differences were found across year groups (p-value of 0.266). In arranging maxillary second molars, first-year students found "Mesiopalatal cusp closer to horizontal plane" challenging (7.5%), while second-year students reported "Steeps distally than the first molar" as the most significant challenge (16.9%). Again, statistical analysis showed no significant differences (p-value of 0.468). Overall, while various difficulties were reported across the principles and year groups, the statistical significance varied, highlighting specific challenges at each educational level.

The study assessed the difficulties encountered by dental students in arranging mandibular teeth, emphasizing principles of occlusion and alignment. For mandibular central incisors, "To coincide with the midline of maxillary anteriors" was identified as the most challenging principle, showing significant differences among year groups. In contrast, no significant differences were found in the difficulties reported for mandibular lateral incisors and canines. For mandibular first premolars, students struggled with "The contact of the mesial margin of the upper first premolar," although there were no significant differences across year groups. The most difficult principle for mandibular second premolars was "Buccal cusp contacts the fossa between the two maxillary premolars," revealing significant differences among year groups. In arranging mandibular first molars, the challenge of ensuring that the "Mesiobuccal cusp occludes in the fossa between maxillary second premolar and first molar" showed a trend toward significance in differences among year groups. Similarly, for mandibular second molars, "Mesiobuccal cusp contacts the fossa between the maxillary first and second molars" was noted as the most difficult principle, though no significant differences were found. In posterior occlusion, "Achieving maximum intercuspation in posterior" was the most challenging, demonstrating significant differences among year groups. Additionally, the molar as well as canine key of occlusion principle in overbite and overjet presented significant differences among year groups. The findings show the consistent struggles of students, particularly in aligning mandibular teeth with maxillary counterparts, achieving incisal edge height, and maximizing intercuspation, highlighting the necessity for targeted instruction and practice to enhance dental students' skills in pre-clinical tooth arrangement.

Discussion :

It is crucial for students to grasp essential knowledge during their early learning phases, particularly in the pre-clinical years. The pre-clinical curriculum for complete denture removable prosthodontics includes the teaching and learning of fundamental laboratory and clinical procedures. Karthigeyan Jeyapalan's research indicates that students, who received initial exposure to live demonstrations accompanied by video-assisted instruction, achieved significantly higher scores in the teeth arrangement process. The study recommends that each pre-clinical practice commence with a live demonstration to enhance immediate comprehension, followed by lectures using PowerPoint presentations and group discussions to support knowledge retention and memory recall.[6] In a study by Kamal and Shigli, students reported that preclinical teeth arrangement poses challenges due to the subject's complexity, difficulties in visualizing concepts, and a lack of clinical exposure. This situation highlights the need for improved teaching methods and earlier clinical experiences.[7] The findings align with those of Sukotjo C et al. and Aragon CE, where most students felt that conventional didactic approaches were insufficient for effective skill acquisition.[8,9] Elangovan S et al. recommended that involving students in case discussions and seminars, rather than traditional lectures, would enhance the development of their analytical skills.[10] The findings from our study emphasize the necessity for targeted instruction and practice in pre-clinical tooth arrangement. There are clear patterns of difficulty that vary by year group, showing the importance of tailoring educational strategies to the specific challenges faced by students at different stages of their training. The need for enhanced pedagogical approaches, including increased hands-on practice, simulations, and targeted feedback, is paramount to improve students' skills in this essential area. Additionally, the significant differences found in posterior occlusion principles, such as "Achieving maximum intercuspation," highlight the complexities of occlusion that students grapple with as they progress through their education. Incorporating advanced techniques, such as the use of dental technology and models, may aid in reinforcing these concepts and improving student competency.[11] The introduction of a simplified clinometer has proven beneficial for students in achieving bilateral symmetry in teeth arrangement, thereby making the learning process more systematic.[12] A new digital approach enables students to practice teeth arrangement via web-based platforms, offering a structured learning environment that caters to individual skill levels as said by Giugliano

et al.[13] Innovative teaching modules that incorporate active learning and clinical relevance have emerged, shifting the focus from passive learning to hands-on practice, which significantly enhances students' psychomotor skills (Obrez et al.).[14] While these innovations are promising, some educators maintain that traditional methods still hold value, underscoring the importance of mastering foundational skills before moving on to digital platforms. A balance between both approaches may provide the most effective support for students struggling with preclinical teeth arrangement.[15]

Conclusion :

Overall, the study identified several key areas where dental students struggle in pre-clinical teeth arrangement. These include specific principles related to tooth inclination, occlusion, and alignment, particularly in the maxillary and mandibular canines, premolars, and molars. The findings highlight the need for targeted instruction and practice to address these challenges and improve dental students' skills in pre-clinical tooth arrangement.

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