ORIGINAL ARTICLE

ASSESSMENT OF DENTAL STUDENTS' AND DENTISTS'KNOWLEDGE ON THE DESIGN OF REMOVABLE PARTIAL DENTURES

Mihaela-Roxana Brătoiu[1], Veronica Mercuț[1], Sanda Mihaela Popescu[2], Petcu Cristiana[1], Ioana Mitruț[1,*], Andreea Stănuşi[1], Diana-Elena Vlăduțu[1], Marinescu Roxana Iulia[2], Andreea Brigitte Chiffu[3], Monica Scrieciu[1]

[1] Department of Prosthetic Dentistry, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, 200349 Craiova, Romania
[2] Department of Oral Rehabilitation, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, 200349 Craiova, Romania
[3] Private Dental Practice, Craiova, Romania

All authors contributed equally to this work.

[*] Corresponding author:
Ioana Mitruț, Department of Prosthetic Dentistry, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, 200349 Craiova, Romania
Email: ioana.mitrut@umfcv.ro

Abstract: *Background*: Removable partial dentures (RPD) remain a current treatment option, although dental implant therapy is increasingly used; (2) *Methods*: The study was conducted using a questionnaire method, consisting of 14 questions, the analyzed material being represented by the answers obtained to the questionnaire questions; (3) *Results*: The questionnaire-based study analyzed responses to questions obtained from 45 participants of both genders, dentists and students; Out of 45 participants, 84.4% (n=38) answered that the factors that influence the design are support, retention, stability, 46.7% (n=21) ticked the dento-periodontal status as an answer to the question. Another 46.7% of participants (n=21) opted for the muco-osseous status. A percentage of 31.1% (n=14) ticked aesthetics as an answer, 28.9% (n=13) ticked age and 20% (n=9) chose the general health of the patient. Of the 45 participants, 86.7% (n=39) responded that the biodynamic RPD is superior to the acrylic total denture and 13.3% (n=6) stated that it is not(4) *Conclusions*: The study highlighted that, equally, doctors and students are interested in the principles and factors that govern the design of RPD, being aware of the challenges in their application.

Keywords: RPD, design, retention, support, stability.

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1. Introduction

Removable partial dentures (RPD) remain a current treatment option, although dental implant therapy is increasingly used. Certain considerations, such as the patient's fear of surgery, the need for an immediate therapeutic solution, alterations in the patient's general health and financial limitations, may indicate the need to use RPD for oral rehabilitation, even if other treatment options are available [1,2,3].

The design of the RPD is influenced by the biodynamic principles of this type of prosthesis, with the design of the RPD considering three key factors: retention, support, stability.

The major components of an RPD are: the major connector, minor connectors rest, direct retainers, indirect retainers and denture base and artificial teeth [4].

Retention is defined as the resistance to movement along the insertion trajectory of the RPD [5,6]. The RPD has both active and passive retention, with primary retention provided by clasps that anchor into the retentive areas of existing teeth. The retentive elements of the RPD have been classified according to the terminology of the Glossary of Prosthetic Terms (tenth edition): direct retainers (clasps and attachments of all types) and indirect retainers [7].

Passive retention is achieved by friction of the RPD components against the teeth with which they come into contact, with the possibility that muco-osseous retention zones may provide additional retention [5,8]. Active retention results from frictional forces during insertion and removal of the RPD and from RPD movements during dento-maxillary functions, as the distal areas of the retentive arms of the clasps create lateral force vectors on the teeth [5].

Support is defined as the resistance to vertical occlusal forces applied to the denture. Support can be obtained from the tooth structure and, to some extent, from muco-osseous tissues [5,6,9]. The achieved occlusal dental support is the main source of rigid support in the prosthetic field. Each prosthetic component that contacts the supracingular area of the crowns of the anterior teeth or the area above the equatorial line in the case of the crowns of the posterior teeth contributes to increasing support by limiting the movements of the removable partial denture. These components include the arms of the clasps that ensure reciprocity, the rigid portion of the retentive arms, and the opposing arms.

Stability of a denture is its resistance to displacement when subjected to functional, horizontal, and rotational stresses [5]. The stability of a RPD depends primarily on the overall quality of its adaptation to the supporting substrate, both in the horizontal and vertical planes, as well as on the intrinsic mobility of the teeth and soft tissues that form this substrate [5].

The long-term stability of a RPD depends on the relationship between the proximal metal components of the RPD and the adjacent existing teeth, which are a component of the guiding planes of the RPD. In addition, each component of the RPD that comes into contact with the teeth or edentulous ridge contributes to the stability of the RPD.

Advances in the materials used and in digital design, along with patient education, promise to expand the application of RPD and

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improve the quality of life of patients who need them. Future studies should evaluate new materials and design technologies for RPD, including long-term monitoring, with reference to health-related outcomes and those reported by patients [10].

Considering all these, it is essential that dental students and dentists have adequate knowledge of the design of RPD, to provide appropriate treatments.

The present study aims to assess dental students' and dentists' knowledge on some aspects of the RPD design.

2. Materials and method

The present study was conducted on a group of dental students from the University of Medicine and Pharmacy of Craiova and dental doctors also from Craiova. The participants were volunteers, anonymous, and agreed to be included in this study.

The study was approved by the Ethics Committee of the University of Medicine and Pharmacy of Craiova (no. 57/29.01.2024).

The study was conducted using a questionnaire method, consisting of 14 questions, the analyzed material being represented by the answers obtained to the questionnaire questions. The questionnaire included the following types of questions: questions regarding gender, age, year of study or professional experience and questions that evaluated the knowledge of the study participants regarding the design of the RPD. The questionnaire entitled "Questionnaire regarding the design of the removable partial denture (RPD)" was distributed online among students and doctors, for 2 weeks, using Google Forms. The questionnaire questions and the answer options used are presented in Table no. 1.

Table 1 – Questionnaire questions and answer options used

Number	Questions and answer options
1	What is your professional level?? Dentist; Student
2	If you are a doctor, please specify the number of years of experience? 0-5 years; 5-10 years; More than 10 years
3	If you are a student, please specify your year of study? 4th; 5th; 6th
4	Please specify which category you belong to? Feminine; Masculine.
5	Please specify if you participated in the preparation of a RPD? Yes; No
6	Which of the following factors are considered to influence the design of a RPD? Support, retention, stability Dento-periodontal status Muco-osseous status Aesthetics Age General health

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7	Do you consider that in a Kennedy class I or IV edentulous area, RPD is frequently indicated? Yes; No.
8	From an aesthetic point of view, will RPD provide the comfort necessary for a confident smile? Yes; No.
9	Specify what type of support does a removable partial denture have that treats a Kennedy class I edentulousness? Strict dento-periodontal support Strict muco-osseous support Mixed support
10	Do you think mixed support RPD are effective during mastication? Yes;No
11	Do you consider that mastication achieved with a RPD with attachments is superior compared to mastication achieved with a RPD with clasps? Yes;No
12	Do you consider the retention, support and stability of a RPD to be superior to that of a conventional full acrylic denture? Yes;No
13	Do you think that the insertion and removal of a removable partial denture with special systems will be easier for the patient than the insertion and removal of a RPD with clasps? Yes;No
14	In the case of Kennedy Class II edentulousness without modifications, if the patient's general health permits, which of the following prosthesis options would be more appropriate? Fixed prosthesis with implant support RPD with clasps

3. Results

The questionnaire-based study analyzed responses to questions obtained from 45 participants of both genders, dentists and students.

The first question referred to the category to which the 45 participants included in the study belonged. Thus, of the 45 respondents, 75.6% (n=34) were students, and 24.4% (n=10) were dentists (Fig. 1).

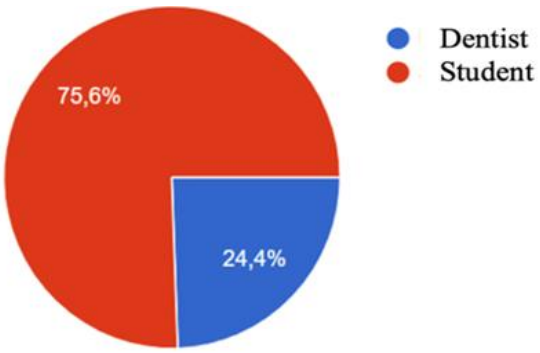

Figure 1. Distribution of study participants by professional category.

The second question investigated the distribution of study participants by years of experience. According to the graph, 58.8%

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(n=26) of the dentists declared that they had experience between 0-5 years, 35.3% (n=16) claimed that they had experience between 5-10 years, and 5.9% (n=3) of them mentioned that they had experience of over 10 years in the medical field (Fig. 2).

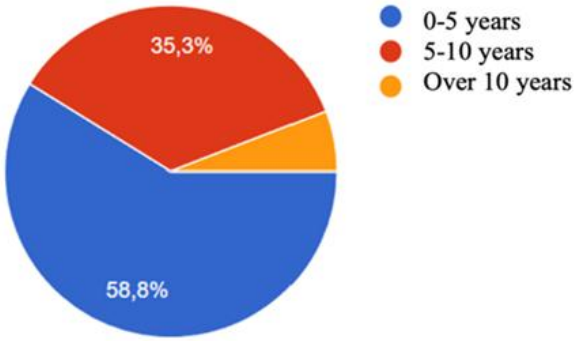

Figure 2. Distribution of study participants by number of years of experience.

Question number 3 was addressed to students and referred to the year of study. This question was answered by students in the 5th and 6th year, and the percentage shows that 87.9% (n=40) of the students were in the 6th year of study, as evidence of the greater interest in oral rehabilitation with the help of RPD, and 12.1% (n=5) were students in the 5th year (Fig. 3).

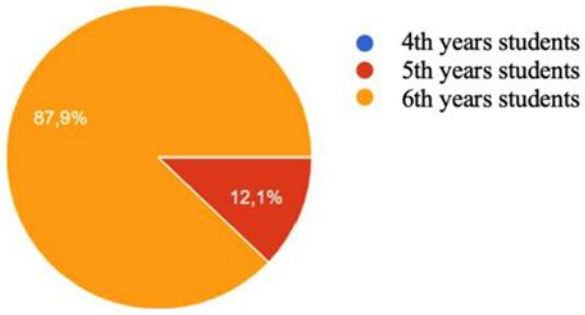

Figure 3. Distribution of students participating in the study by year of study.

Question number 4 referred to the gender category of each participant. Of the 45 participants, 68.9% (n=31) were female and 31.1% (n=14) were male (Fig. 4).

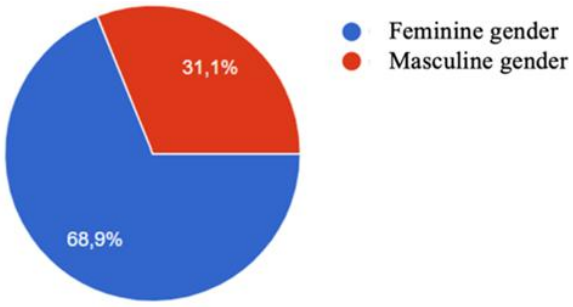

Figure 4. Distribution of study participants by gender category.

Question number 5 asked participants about their participation in the creation of a RPD. The results of the questionnaire for this question revealed that 73.3% (n=33) of the participants participated in the creation of a RPD, and 26.7% (n=12) did not participate in the creation (Fig. 5).

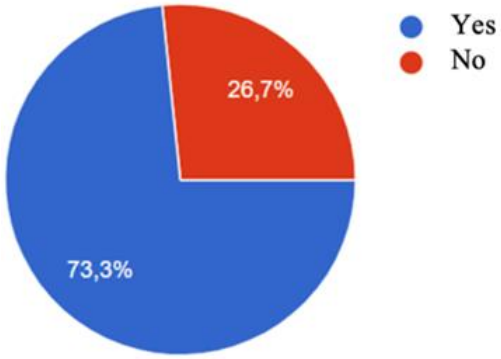

Figure 5. Distribution of participants considering participation in the creation of a RPD.

Question number 6 assessed the participants' knowledge regarding the factors that influence the design of a RPD. This question had multiple answers, with the distribution of answers in different percentages. Out of 45 participants, 84.4% (n=38) answered that the factors that influence the design are support, retention, stability, 46.7% (n=21) ticked the dento-periodontal

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status as an answer to the question. Another 46.7% of participants (n=21) opted for the muco-osseous status. A percentage of 31.1% (n=14) ticked aesthetics as an answer, 28.9% (n=13) ticked ageand 20% (n=9) chose the general health of the patient (Fig. 6).

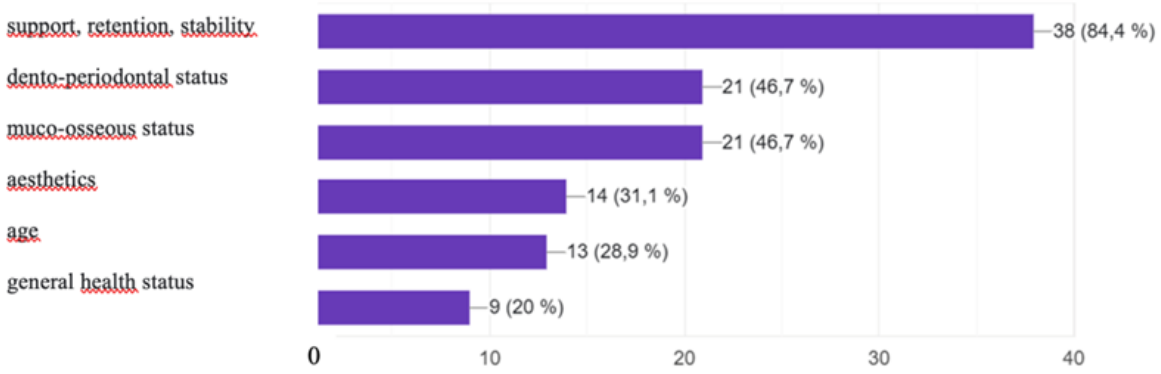

Figure 6. Distribution of participants according to their opinion on the factors influencing RPD design.

Question number 7 referred to the frequency of indication of a RPD in a Kennedy class I or IV patient. To this question, out of 45 participants, 57.8% (n=26) opted for yes, and 42.2% (n=19) chose the answer no (Fig. 7).

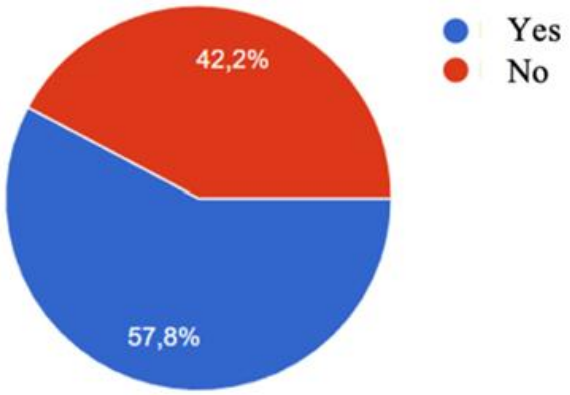

Figure 7. Distribution of participants according to RPD indications related to the type of edentulism.

Question number 8 referred to the recommendation of a RPD from an aesthetic point of view. Thus, out of 45 answers, 77.8% (n=35) were in favor of recommending a RPD from an aesthetic point of view, and 22.2% (n=10) were in favor of not (Fig. 8).

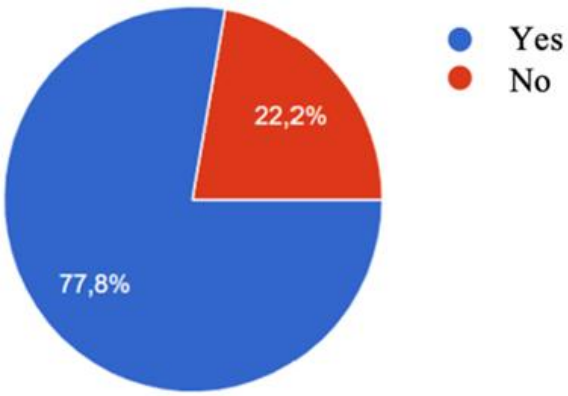

Figure 8. Distribution of responses according to opinion on ensuring the patient's aesthetics with a RPD.

Question number 9 referred to the type of support of a RPD in a Kennedy class I classification. The distribution of responses was as follows: 86.7% (n=39) of the responses indicated mixed supportand 13.3% (n=6) responses indicated strictly dento-periodontal support (Fig. 9).

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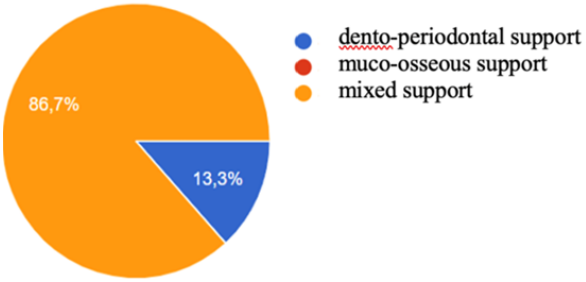

Figure 9. Distribution of responses regarding the type of support of a RPD.

Question number 10 referred to the masticatory efficiency of a mixed-support RPD. Analysis of the distribution of responses to this question indicated that 95.6% (n=43) of the participants considered that mixed-support RPDs are effective during mastication, and 4.4% (n=2) of them specified an unfavorable response (Fig. 10).

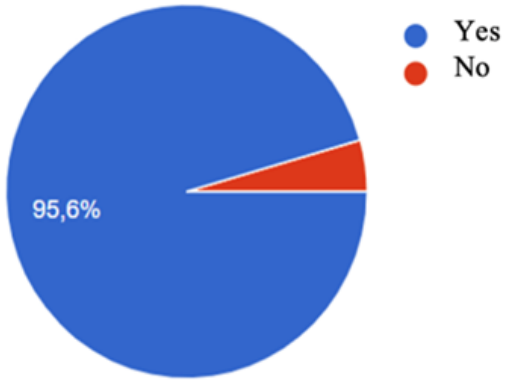

Figure 10. Distribution of responses regarding the effectiveness of RPD with mixed support during mastication.

Question number 11 referred to the quality of mastication, asking participants about the difference in the quality of mastication with RPD with attachments and with RPD with clasps. To this question, 84.4% (n=38) of the participants answered that mastication achieved with RPD with attachments is superior to mastication achieved with RPD with clasps, and 15.6% (n=7) stated that mastication achieved with RPD with attachments is no different from mastication achieved with RPD with clasps (Fig. 11).

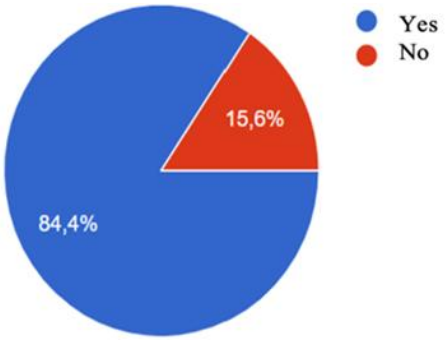

Figure 11. Distribution of responses regarding the difference between mastication with RPD with attachments and with RPD with clasps.

Question number 12 referred to the differences in terms of retention, support and stability of an RPD compared to a conventional acrylic complete denture. Of the 45 participants, 86.7% (n=39) responded that the biodynamic RPD is superior to the acrylic complete denture and 13.3% (n=6) stated that it is not (Fig. 12).

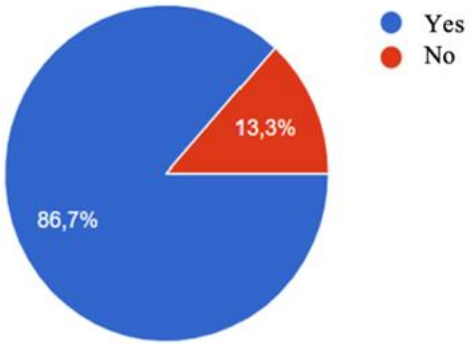

Figure 12. Distribution of responses according to opinion on the biodynamic differences of RPD and complete acrylic prosthesis.

Question number 13 referred to the ease of patient insertion and removal of a RPD with attachments compared to a RPD with clasps. Out of 45 responses, 75.6% (n=34) stated that insertion and removal of a RPD with a metal frame is easier, and 24.4% (n=11) considered it not (Fig. 13).

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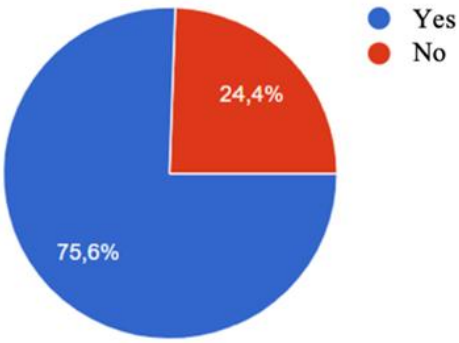

Figure 13. Distribution of responses according to opinion on the difference between insertion and removal of a RPD with attachment sand a RPD with clasps.

Question number 14 referred to the prosthetic treatment options indicated in a Kennedy class II edentulous patient, in the conditions of a healthy patient. Of the 45 participants, 88.9% (n=40) opted for fixed prosthesis with implant support and 11.1% (n=5) for RPD with clasps (Fig. 14).

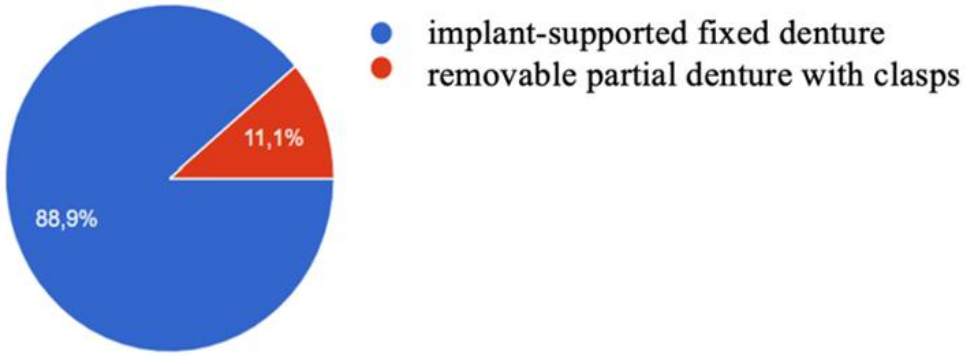

Figure 14. Distribution of answers according to the choice of a type of prosthesis in Kennedy class II.

4. Discussion

The design of RPD has always been a challenge, as each case requires an individualized prosthetic plan, depending on the morphological peculiarities of the prosthetic field. Brudvik et al. published a study describing an organized and systematized design method for RPD, resulting in a functional RPD for the patient. The authors argued that a systematic approach can lead to the achievement of several well-founded designs, one of which can be used based on biomechanical, aesthetic, patient needs and desires, and durability considerations [11].

There are numerous studies in the field that have analyzed the relationship between the ideal academic design and the realization of a RPD, as well as the relationship between the mechanical resistance of the RPD during use, trauma induced by prosthetic restorations, and patient satisfaction [8,12].

Several studies have reported differences between academically accepted RPD designs and clinically successful prosthetic designs that often did not follow an academically accepted format but did not cause trauma to patients [1,12]. A systematic approach to RPD design aims to ensure that every aspect and detail of the design is considered, to identify potential obstacles to achieving a functional RPD [5,8,9]. There is little evidence to support an association between patient-reported quality of life or satisfaction and the technical or biological parameters of the RPD [13].

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The results of this study can provide information about opinions, attitudes, and knowledge of dental students and dentists on the design of RPD.

In the present study, a large percentage of respondents were students, and the majority were in their 6th year, indicating that the topic was of interest primarily for final year students. This also could be explained by the fact that this questionnaire was distributed primarily in online student social groups. Interest in the topic was greater among doctors with 0-5 years of experience compared to those with 5-10 years of experience, respectively over 10 years. In a 2021 study, Srigopika et al. conducted a study on students' knowledge of RPD [14]. The authors observed that approximately 65-70% of final year and master's students were much more informed about RPD

In the current research, female respondents predominated (69%). Most studies addressing the knowledge and attitude of dentists and students regarding RPD have female respondents as the majority [15].

Throughout this study, 73.3% of respondents participated in the implementation of a RPD at least once, which supports the answers related to the factors influencing the design of the RPD (support, retention, stability, dento-periodontal status, muco-osseous status, aesthetics, age, general health status). The majority considered that the greatest influence on the design of the RPD were the retention, support and stability (84.4%) followed by the dento-periodontal status and muco-osseous status in equal percentages (46.7%). Similarly, several studies [14,16] analyzed the knowledge of dentists and students regarding the design of the RPD. The results of the study conducted by Srigopikaet al. [14] showed that most respondents, 86%, had knowledge regarding the design and implementation of the RPD.

In the present study, 77.8% of the respondents considered that the RPD can ensure the aesthetics of the patient. In a study conducted in 2025 [17], the authors stated that an adequate planning and design of the RPD will ensure functionality, aesthetics and comfort for the patient.

In the current research, the data resulting from the statistical processing of the responses showed that 84.4% of the respondents consider that mastication with a RPD is beneficial for food trituration [14]. Other studies have shown contrary results. In a study conducted in 2021[14], Autor et al. showed that 67% of the respondents considered that mastication will always be difficult in patients with RPD. On the contrary, the results of the study conducted in 2023 by Sakamn et al. [18] showed that RPD represents a practical option for improving masticatory performance and oral health-related quality of life.

Throughout this study, 86.7% of the respondents stated that the retention, support and stability of RPD with attachments is superior to RPD with clasps. Alageel et al. [19] reported in a 2020 study that patients were more satisfied with the RPD with attachments compared to the RPD with clasps in terms of mastication, aesthetics, and retention and support.

In the present study, 84.4% of participants responded that mastication achieved with the precision attachments RPD was superior to mastication achieved with the RPD with clasps. A 2025 study by Dula et al. [20] concluded that the RPD with attachments

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significantly improved masticatory efficiency, surpassing the RPD with clasps. However, over time, the improvement in masticatory function was consistent regardless of the type of RPD, with attachments or clasps.

In the present study, most respondents (76.6%) considered the insertion and removal of a RPD with attachments to be easier compared to that of a RPD with clasps. Contrary to these results, in a study conducted in 2023, El-Khamisy [21], most patients stated that the handling of RPD with clasps is easier, this difference in satisfaction being attributed to the difficulties involved in inserting and removing RPDs with more complex designs compared to the existence of simple clasps. These data suggest the idea that aspects regarding the insertion and removal of RPDs should be addressed more clearly and extensively in the academic curriculum.

Following the analysis of the responses obtained to the questionnaire questions, it can be stated that the participants knew the design of the RPD is influenced by a multitude of clinical, biomechanical and psychological factors. The results demonstrated that most respondents – whether students or physicians – know the essential elements of the support, stability and retention of a RPD. The participants in the study knew the RPDs used in Kennedy class I have muco-osseous support. These responses were correlated with knowledge regarding treatment indications for class II Kennedy patients, with most respondents opting for implant-prosthetic treatments.

It was also noted that respondents appreciated the aesthetic and functional value of attachments, compared to conventional clasps. The responses obtained underline the importance of rigorous theoretical and practical training in RPD design.

5. Conclusions

The study highlighted that, equally, doctors and students are interested in the principles and factors that govern the design of RPD, being aware of the challenges in their application.The study participants appreciated that aesthetics and mastication are better rehabilitated with RPD with attachments compared to RPD with clasps, considering that the insertion of RPD with attachments is easier than the insertion of RPD with clasps.

Knowledge and correct application of the notions about RPD are essential for the development of a curriculum that supports students and doctors in acquiring the knowledge necessary to create functional and aesthetic RPDs.

References

1. Lynch CD, Allen PF. Why do dentists struggle whit removable partial denture design? An assessment of financial and educational issues .Br Dent J 2006;200:277-281.
2. Froimovici FO, Butnărașu CC, Montanari M, Săndulescu M. Fixed Full-Arch Implant-Supported Restorations: Techniques Review and Proposal for Improvement. Dent J (Basel). 2024 Dec 13;12(12):408. doi: 10.3390/dj12120408. PMID: 39727465; PMCID: PMC11674276.
3. Akhtarkhavari M, Rajagopal P, Clovis Da Costa G, Aras M, Chitre V, Naik SG. Prosthodontic Rehabilitation of a Completely Edentulous Patient by Salvaging Ailing

Implants Using a Bar Retained Over Denture: A Case Report. Cureus. 2024 Jun 25;16(6):e63157.

4. Zhu Y, Hu J, Luo B, Yuan Y, Jiang Q. Biomechanical considerations in RPD design: application and perspective of finite element method in distal extension removable partial denture rehabilitation. Front Dent Med. 2025 Oct 3;6:1667504.
5. Carr AB, McGivneyGP, Brown DT. McCracken`s removable partial prosthodontics,ed,11.St.Louis : Mosby;2004.
6. The glossary of prosthodonticterms.JProsthet Dent 2005;94:10-92
7. The Glossary of ProsthodonticTerms 2023: Tenth Edition. J Prosthet Dent. 2023 Oct;130(4 Suppl 1):e1-e3. doi: 10.1016/j.prosdent.2023.03.003. PMID: 37914441.
8. Dahet T, Hall D, Goodacre CJ.Designing successful removable partial dentures. Compend Contin Educ Dent 2006;27:186-193.
9. Phoenix RD,Canga DR,DeFreest CF. Stewart`s clinical removable partial prosthodontics,ed.3.Chicago:Quintessence Publishing;2003.
10. Campbell SD, Cooper L, Craddock H, Hyde TP, Nattress B, Pavitt SH, Seymour DW. Removablepartialdentures: The clinicalneed for innovation. J Prosthet Dent. 2017 Sep;118(3):273-280. doi: 10.1016/j.prosdent.2017.01.008. Epub 2017 Mar 23. PMID: 28343666.
11. Wada S, Wakabayashi N,TanakaT,OhyamaT.Influence of abutment selection in maxillary Kennedy Class II RPD on elastic stress distribution in oral mucoasa: An FEM study. J Prosthodont2006;15:89-94.
12. Pallegama RW Namano S, AridomeK, Baba K, Purnaveja S, Ohyama T. Do patients have a preference for major connector design ? J Contemp Dent Pract 2006;7-71-79.
13. De Kok IJ, Cooper LF, Guckes AD, McGraw K, Wright RF, Barrero CJ, Bak SY, Stoner LO. FactorsInfluencingRemovablePartialDenture Patient-ReportedOutcomes of Quality of Life andSatisfaction: A Systematic Review. J Prosthodont. 2017 Jan;26(1):5-18. doi: 10.1111/jopr.12526. Epub 2016 Sep 6. PMID: 27598416.
14. Srigopika T, Abirami A. Knowledge And Awareness About Removable Partial Denture Among Dental Students- A Questionnaire Survey. Drugs and Cell Therapies in Hematology, 2021, 10(2), 517–529.
15. Khan M, Khan F, Lone M, Hussain M.W, Shaikh M, Shaikh I. Knowledge and Attitude Regarding Designing Removable Partial Denture Among Interns and Dentist; Dental Schools in Pakistan. Journal of the Pakistan Dental Association. 2020, 29. 66-70. 10.25301/JPDA.292.66.
16. Nassief S, Sharka R, Marghalani A, Faramawy A, Haitham A. Assessment of Removable Partial Denture Design Skills among Undergraduate Dental Students: A Cross-sectional Study,The Open Dentistry Journal, 2025,Volume 19.
17. Bogdan-Andreescu CF, Ionescu TP, Burcea A, Bănăţeanu AM, Albu CC, Bohîlţea LC. The role of removable partial dentures in contemporary dentistry. Romanian Journal of Oral Rehabilitation 17(1), 2025
18. Salman P, Bilgrami A, Bashir U, Jagirani SA, Chzchar ZH. Impact of removable partial denture on mastication and oral health related quality of life in patients with shortened dental arch. Biological and Clinical Sciences Research Journal. 2023. 228.
19. Alageel O, Ashraf N, Bessadet M, Nicolas E, Tamimi F. Evaluation of the design-driven prediction of removable partial denture retention. J Prosthet Dent. 2020 Sep;124(3):357-364.

20. Dula LJ, Shala KS, Stubljar D, Starc A, Kosumi S. Comparison of Increase in Masticatory Efficiency Between Removable Partial Dentures Retained With Clasps and Retained With Attachments. Clin Exp Dent Res. 2025 Apr;11(2):e70130.

21. El-Khamisy N. Clasp Retained Versus Attachment Retained Removable Partial Dentures for Treatment ofMandibular Distal Extension Cases: Patient Satisfaction and Oral Health-Related Quality of Life. Mans JDent. 2023; 11(1): 39-46.

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Conflict of interest statement

The authors declare no conflicts of interest concerning this study.

Data availability statement

Will be provided on request.

Ethics statement

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ORCID

Mihaela Roxana Brătoiu: https://orcid.org/0009-0002-9220-3616
Ioana Mitruț: https://orcid.org/0000-0002-4843-1278
Andreea Stănuși: https://orcid.org/0000-0003-2520-7967
Diana Elena Vlăduțu: https://orcid.org/0009-0007-6639-7847
Monica Scrieciu: https://orcid.org/0000-0003-0696-7100

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