

# Development and Validation of a Questionnaire to Assess Clinicians' Preferences for Flexible Dentures: A Cross-sectional Study

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## ABSTRACT

**Introduction:** The 1950's saw the introduction of thermoplastic resin dentures, frequently referred to as flexible dentures. Nevertheless, up to this point, methyl methacrylate has been the most widely utilised denture base material. A number of denture-base materials made of thermoplastic resin that have higher physical properties and better clinical performance have been available since 2007. In addition to being more aesthetically pleasing than cast partial dentures, these materials are also more economical. Flexible dentures are becoming more and more popular among dentists and dental technicians, despite the fact that thermoplastic resin partial dentures are typically not covered in depth in the dental school undergraduate course curriculum.

**Aim:** To develop and validate a questionnaire to assess the preferences of clinicians regarding the use of thermoplastic resin made removable dentures over conventional dentures to rehabilitate partially edentulous patients.

**Materials and Methods:** In this cross-sectional study, conducted in the Department of Prosthodontics and Crown and Bridge, in Guru Nanak Institute of Dental Sciences and Research, Kolkata, private dental College and Hospital, West Bengal, India from January 2024 to September 2024, the initial draft questionnaire

was constructed from the earlier studies available through literature review. The draft questionnaires were evaluated for three rounds by a committee of eight subject matter experts. The final questionnaire contains 12 items, assigned to one of the three domains. The validity, reliability and repeatability of the questionnaire were assessed thereafter.

**Results:** Content validity was estimated by Content Validity Index (CVI) and Cronbach's alpha was used to assess internal consistency. Scale level CVI/average (S-CVI/Ave) and Scale level CVI based on Universal Agreement (S-CVI/UA) S-CVI/Ave and S-CVI/UA of the final questionnaire was estimated 0.97 and 0.75. Minimum Item-CVI (I-CVI) of all the items was more than 0.88. To assess reliability, responses from 120 participants (1:10 item-participants ratio) were considered. The calculated Cronbach's alpha was 0.7708. There was no significant difference between average domain scores and overall scores of two sets of responses given by a same cluster of participants at an interval of 30 days.

**Conclusion:** The developed questionnaire was a validated reliable tool, which can be employed for a larger population. Clinician's preference can be calculated from domain scores (clinician's preference=positive concerns+applicability- negative concerns) and its range is from -20 to +28.

**Keywords:** Content validity, Flexible denture, Reliability, Removable denture, Thermoplastic resin

## INTRODUCTION

It is now an evidence-based fact that loss of teeth may lead to the deterioration of Oral Health-related Quality of Life (OHRQoL) [1]. Apart from causing functional impairments like difficulty in chewing, speech problems, and changes in appearance, edentulism also affects social status, self-confidence, psychological well-being, and dietary habits [1-3]. For a patient's overall physical and mental well-being, prosthodontic rehabilitation is essential, regardless of whether he or she is fully or partially edentulous [2,3].

When treating a patient who is partially edentulous, a dentist has an array of treatment options at his or her disposal, such as removable partial dentures, conventional fixed partial dentures, implant-supported prostheses, and unconventional options like fiber-reinforced composite bridges [4]. Every treatment option has a unique set of benefits and drawbacks, as well as indications and contraindications.

In an earlier survey conducted on 402 dental professionals concerning their clinical preferences during rehabilitation of partially edentulous patients, only 7.96% preferred removable partial dentures as the treatment of choice [4]. Yet, removable dentures are a widely used form of rehabilitation, regardless of the preferences of clinicians. The same study also revealed that 45.53% of dentists preferred cast partial dentures over other removable choices, whereas 37.06% preferred flexible dentures and only 17.41% preferred all-acrylic partial dentures [4].

Compared to all acrylic resin dentures, cast partial dentures provide a number of advantages. It has been observed that a cast partial denture offers superior results in terms of stability, comfort, masticatory efficiency, retention, and periodontal health of the abutment when proper oral hygiene is maintained [2]. However, there are still a few drawbacks such as the cost, metal display, need for specialised clinical training, and good laboratory support [2,4].

The most affordable removable treatment option is still an all-acrylic resin denture, which is especially helpful for those from poor socioeconomic backgrounds [2-4].

The 1950's saw the introduction of thermoplastic resin dentures, frequently referred to as flexible dentures [5]. Nevertheless, up to this point, methyl methacrylate has been the most widely utilised denture base material [3,6]. A number of denture-base materials made of thermoplastic resin that have higher physical properties and better clinical performance have been available since 2007. Among them are well-known commercial products like De-flex (United Kingdom), Lucitone FRS (Densply, Germany), Valplast (Novoblast, USA), and Bre-flex (Bredent, Germany) [5-7].

In addition to being more aesthetically pleasing than cast partial dentures, these materials are also more economical. They can be inserted easily when there is a significant undercut. However, these materials also have a number of drawbacks, such as surface discolouration, frequent tooth de-bonding, gradual loss of flexibility,

etc., [3,6,7]. But one thing is certain: these flexible dentures have the potential to replace all-acrylic dentures in the future [6-10].

Flexible dentures are becoming more and more popular among dentists and dental technicians, despite the fact that thermoplastic resin partial dentures are typically not covered in depth in the dental school undergraduate course curriculum [10-13]. The aim of the study was to create a validated English-language questionnaire to assess clinicians' preferences for using flexible dentures in the rehabilitation of partially edentulous patients in order to ascertain the extent to which dental professionals favour the use of flexible thermoplastic resin dentures as opposed to conventional Removable Partial Dentures (RPD).

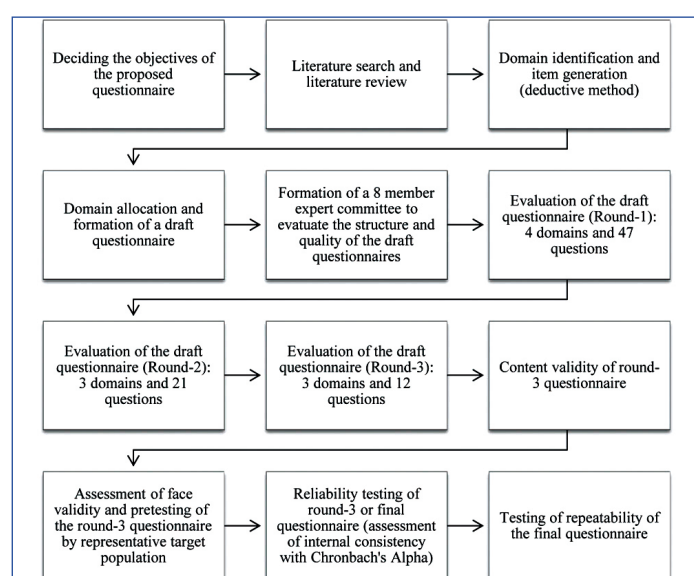
## MATERIALS AND METHODS

A cross-sectional study was conducted in the Department of Prosthodontics and Crown and Bridge at Guru Nanak Institute of Dental Sciences and Research, Kolkata, West Bengal, India. The study commenced in January 2024 and was carried out over a period of nine months ending in September 2024. following ethical approval from the Institutional Ethics Committee (IEC No. GNIDSR/IEC/2025/54).

**Inclusion and Exclusion criteria:** The target population comprised dental practitioners across India; however, for ease of accessibility, the study population was limited to Dental Council of India (DCI)-registered practitioners from West Bengal, specifically alumni of the Institution. Practitioners with less than two years of clinical experience were excluded from participation.

## Study Procedure

The authors carried out a thorough literature search in order to construct a draft questionnaire through the deductive method. Initially, a search was conducted on the electronic databases (Pubmed, Google Scholar, DOAJ, and EBSCO Host) to explore previous studies on flexible dentures or removable partial dentures made of thermoplastic resins. Several questionnaires were obtained, which were created earlier by different authors, and the tools were developed and implemented in different countries, including Libya, Greece, Croatia, Malaysia, Chennai (India), New Zealand, and Romania [11-16]. Based on the literature search and discussion with subject matter experts (inductive method), a preliminary draft questionnaire with 47 items in total and four chosen domains were created. There were questions with multiple-choice answers, questions with dichotomous answers, and questions constructed to get responses on a Likert scale. The steps are summarised in [Table/Fig-1] in a flowchart.



[Table/Fig-1]: Questionnaire development process.

The authors set up an expert committee on the topic, which included two representatives from the Department of Public Health Dentistry,

four from the Department of Prosthodontics and Crown and Bridge, and two general dental practitioners (one with more than ten years of clinical experience and the other with more than two but less than ten years of experience). The draft questionnaire was sent to the members of the expert committee to evaluate. Though the allotted time for this round was 15 days, it took over a month to receive detailed responses from all the members. A strict 15-day time constraint was enforced, starting with the following rounds. As there were 47 questions/items in round one but those questions were not properly framed and most of them were taken from existing literature, based on that 1<sup>st</sup> draft copy of questionnaire (after getting expert opinion and elaborate discussion with the experts), the 2<sup>nd</sup> round questionnaire was formed after taking recommendations from the expert committee members, a second draft questionnaire with 21 items, assigned in three domains, was developed. It was properly framed and arranged in proper sequence.

This time, there were statements rather than questions, and the answers were based on a five-point Likert scale (strongly disagree, disagree, not sure, agree, and strongly agree). The expert committee members received the second questionnaire and a response sheet with four options for each question: useless, somewhat relevant, relevant, and highly relevant. The CVI for the scale and each item was calculated by asking the experts to provide a response for every statement. The questionnaire had to be modified once more since the CVI scores were unacceptable. R2Q3, R2Q14, R2Q16, R2Q17 were eliminated unanimously as those questions received CVI score of 0 and considered irrelevant by all the judges. R2Q5, R2Q6 and R2Q10 were removed after thorough discussion. None of these questions received more than 0.78 CVI score. R2Q11 was merged with R2Q7 and paraphrased into new item no R3Q11. R2Q12 was merged with R2Q20 and paraphrased into new item no R3Q10 [Table/Fig-2].

Twelve questions, divided into three domains (applicability, positive concerns, and negative concerns), made up the third edition of the questionnaire that was sent for further evaluation. All of the experts approved the third-round questionnaire, and the authors made the decision to submit it to a group of thirty representative participants (dental practitioners having at least more than two years of clinical experience) for face validation and pre-testing. Pen-and-Paper Interviews (PAPIs) were conducted to get the participants' responses. The thirty participants were asked to fill out the questionnaire as well.

The items underwent minor modifications following face validation and pre-testing, and the completed questionnaire was ready for reliability testing. After a thirty-day interval, the same questionnaire was sent to the same thirty individuals with a different statement sequence. To assess the proposed questionnaire's repeatability, the overall and domain-wise scores between two sets of responses from the same group of people were compared.

As there were 12 items in the questionnaire, it was decided to collect responses from 120 participants (1:10 ratio) to check internal consistency. The target population was registered dental practitioners in India; the study population was the alumni of a DCI-recognised dental college in West Bengal, India, and study participants were selected randomly. Systematic randomisation was done where an excel sheet was prepared with the names of alumni passed in the last 15 years and practicing in West Bengal, arranged according to their surname. Every third person from the list was selected until reaching the required number of participants. None of the participants denied answering the questionnaire, and the internal consistency was assessed using Cronbach's alpha. The final questionnaire was acceptable to be used for further studies on the target population. The I-CVI value was calculated as 0.88.

## RESULTS

The CVI for each of the 21 items in the round two questionnaire was estimated using the expert panel members' opinions [Table/Fig-2] The CVI based on universal agreement (S-CVI/UA) was 0.43,

| R2-Item no.<br>(in round 2)     | R2<br>Q<br>1 | R2<br>Q<br>2 | R2<br>Q<br>3 | R2<br>Q<br>4 | R2<br>Q<br>5 | R2<br>Q<br>6 | R2<br>Q<br>7  | R2<br>Q<br>8 | R2<br>Q<br>9 | R2<br>Q<br>10 | R2<br>Q<br>11 | R2<br>Q<br>12 | R2<br>Q<br>13 | R2<br>Q<br>14 | R2<br>Q<br>15 | R2<br>Q<br>16 | R2<br>Q<br>17 | R2<br>Q<br>18 | R2<br>Q<br>19 | R2<br>Q<br>20 | R2<br>Q<br>21 |
|---------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| I-CVI (in round 2)              | 1            | 1            | 0            | 1            | 0.6          | 0.6          | 1             | 1            | 0.3          | 0.6           | 0.1           | 0.1           | 0.5           | 0             | 0.4           | 0             | 0             | 1             | 1             | 1             | 1             |
| R3-New item no.<br>(in round 3) | R3<br>Q<br>1 | R3<br>Q<br>2 | X            | R3<br>Q<br>4 | X            | X            | R3<br>Q<br>11 | R3<br>Q<br>3 | R3<br>Q<br>5 | X             | R3<br>Q<br>11 | R3<br>Q<br>10 | R3<br>Q<br>9  | X             | R3<br>Q<br>8  | X             | X             | R3<br>Q<br>6  | R3<br>Q<br>7  | R3<br>Q<br>10 | R3<br>Q<br>12 |

[Table/Fig-2]: I-CVI of round 2 questionnaire items.

the S-CVI was 0.58. The minimal I-CVI of 0.88 for each item [Table/Fig-3] and the S-CVI of 0.90, which are the fundamental criterion for excellent content validity, were met by the third round questionnaire [17-19]. S-CVI/UA was 0.75, and S-CVI was 0.97.

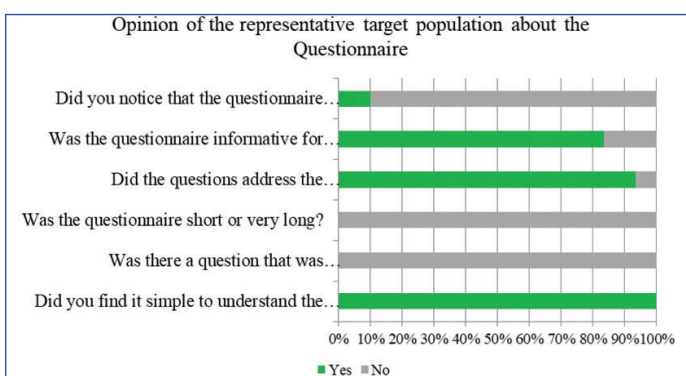
The internal consistency of the round three questionnaire was good (Cronbach's alpha 0.7708). The reliability of the questionnaire is displayed in [Table/Fig-9] after each item is eliminated one at a time. To determine the questionnaire's repeatability, the domain

| Expert | R3Q1            | R3Q2            | R3Q3            | R3Q4            | R3Q5            | R3Q6            | R3Q7            | R3Q8            | R3Q9            | R3Q10           | R3Q11           | R3Q12           |
|--------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1      | Highly relevant | Highly relevant | Relevant        | Highly relevant | Highly relevant | Highly relevant | Highly relevant | Highly relevant | Relevant        | Relevant        | Highly relevant | Highly relevant |
| 2      | Relevant        | Highly relevant | Relevant        | Highly relevant | Relevant        | Highly relevant | Highly relevant | Highly relevant | Relevant        | Highly relevant | Highly relevant | Highly relevant |
| 3      | Highly relevant | Highly relevant | Highly relevant | Highly relevant | Relevant        | Highly relevant | Highly relevant | Relevant        | Relevant        | Relevant        | Highly relevant | Highly relevant |
| 4      | Highly relevant | Highly relevant | Relevant        | Highly relevant | Relevant        | Highly relevant | Highly relevant | Relevant        | Relevant        | Relevant        | Highly relevant | Highly relevant |
| 5      | Highly relevant | Highly relevant | Highly relevant | Highly relevant | Relevant        | Highly relevant | Highly relevant | Highly relevant | Relevant        | Highly relevant | Highly relevant | Highly relevant |
| 6      | Less relevant   | Highly relevant | Relevant        | Highly relevant | Relevant        | Highly relevant | Highly relevant | Highly relevant | Relevant        | Relevant        | Highly relevant | Highly relevant |
| 7      | Highly relevant | Highly relevant | Less relevant   | Highly relevant | Highly relevant | Highly relevant | Highly relevant | Relevant        | Relevant        | Less relevant   | Highly relevant | Highly relevant |
| 8      | Highly relevant | Highly relevant | Relevant        | Highly relevant | Highly relevant | Highly relevant | Highly relevant | Highly relevant | Highly relevant | Relevant        | Highly relevant | Highly relevant |
| I-CVI  | 0.88            | 1.00            | 0.88            | 1.00            | 1.00            | 1.00            | 1.00            | 1.00            | 1.00            | 0.88            | 1.00            | 1.00            |

[Table/Fig-3]: I-CVI of round 3 questionnaire items.

The round three questionnaires comprised three domains: applicability, positive concerns, and negative concerns. The applicability domain was assigned to items 1, 2, 10, and 12; the positive concerns domain was assigned to items 3, 4, 6, 7, and 9, while the negative concerns domain was assigned to items 5, 8, and 11.

A group of 30 representative participants evaluated the face validity of the round three questionnaire [Table/Fig-4]. The third round of the questionnaire was approved as the final version after some minor grammatical corrections [Table/Fig-5].



[Table/Fig-4]: Assessment of structure and quality of the final questionnaire.

The statistical analysis was done by BlueSky statistics which is a Graphical User Interface (GUI) of R software. The responses provided by 120 study participants were used to evaluate the questionnaire's reliability. The clinical experience of the participants is represented in [Table/Fig-6]. Out of the participants, 16.67% had two years of clinical experience, 45% had two to ten years, and 38.33% had more than ten years of experience. [Table/Fig-7] displays the proportion of participants who were trained in the use of flexible dentures and those who deliver flexible dentures frequently in clinical practice. [Table/Fig-8] demonstrates that 67.95% of participants believe the type of material affects how well flexible dentures perform.

level and overall mean scores of two sets of responses from the thirty representative participants were compared [Table/Fig-10]. The clinician's preference [Table/Fig-11] for flexible denture is {(positive concerns score - negative concerns score)+applicability score}.

The main purpose of the questionnaire is to figure out whether flexible dentures are the preferred treatment option for clinicians (Are you going to use thermoplastic resin dentures in your clinic? If yes, then in which situation/s?), and these preferences are based on clinicians' positive and negative concerns (opinions) about the advantages and disadvantages of thermoplastic resin dentures. Applicability refers to whether or not a specific treatment option is preferred in a specific clinical scenario. These three terms together helps to comprehend a clinician's perspective on the use of thermoplastic resin dentures.

The maximum score showing positive mind-set of the clinician's towards the use of flexible partial dentures can be 28 (20 from positive concerns domain+0 from negative concerns domain+8 from applicability domain), whereas the minimum preference score can be 20 (0 from positive concerns domain+12 from negative concerns domain+8 from applicability domain). Item No. Q1 and Q10 are the items where higher score means less clinical preference. Thus, the range is +28 to -20 (total 48 point scale).

## DISCUSSION

The process for developing a new questionnaire is challenging and involves several steps [20]. After three rounds of revisions, a team of eight subject matter experts created the final questionnaire. The final questionnaire was divided into two sections. The first section is to collect the participants' basic demographic data along with four additional questions concerning the clinicians' experience and knowledge of flexible dentures.

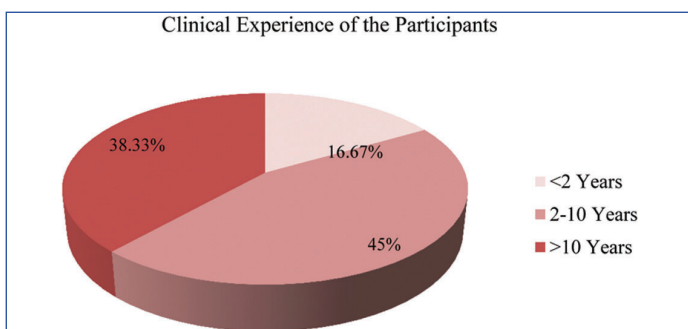
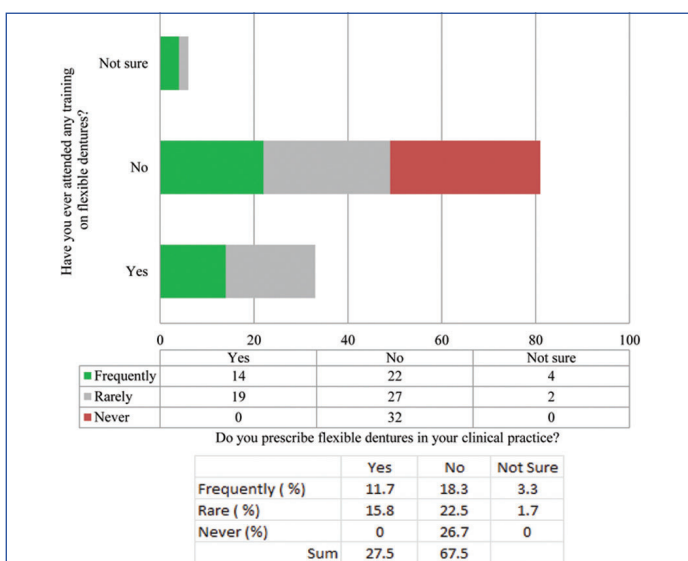
In the present study, 67.50% of the participants never received any instruction or training on flexible dentures. More significantly, in

**Questionnaire: Part 1**

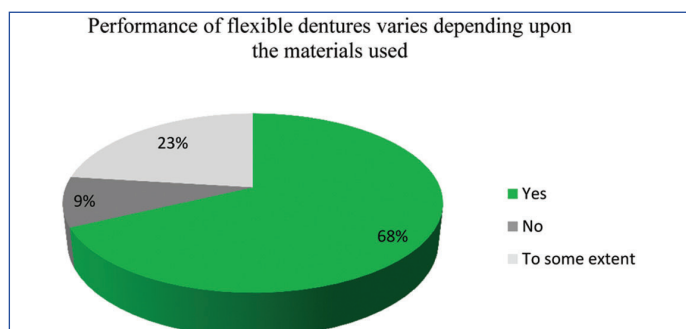
|                                                                                                                |            |          |                |
|----------------------------------------------------------------------------------------------------------------|------------|----------|----------------|
| How many years have you been practicing?                                                                       | <2 yrs     | 2-10 yrs | >10 yrs        |
| In your daily practice, do you use flexible dentures for the partially edentulous patients?                    | Frequently | Rarely   | Never          |
| Have you ever participated in a training course or instructional program on flexible dentures?                 | Yes        | No       | Not sure       |
| Do you believe that the performance and quality of flexible dentures vary substantially between manufacturers? | Yes        | No       | To some extent |

**Questionnaire: Part 2**

|     | Statement                                                                                                                                                                                                  | Strongly agree | Agree | Not sure | Disagree | Strongly disagree |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|----------|----------|-------------------|
| 1.  | A flexible denture should only be used as a temporary or interim prosthesis.                                                                                                                               | 0              | 0     | 0        | 0        | 0                 |
| 2.  | Flexible dentures can be used as a substitute to cast partial dentures in most of the situations.                                                                                                          | 0              | 0     | 0        | 0        | 0                 |
| 3.  | Flexible dentures adapt better to the oral tissues than all-acrylic dentures.                                                                                                                              | 0              | 0     | 0        | 0        | 0                 |
| 4.  | Flexible dentures are more satisfactory to partially edentulous people than acrylic dentures.                                                                                                              | 0              | 0     | 0        | 0        | 0                 |
| 5.  | Acrylic dentures have a higher cost-benefit ratio than flexible dentures.                                                                                                                                  | 0              | 0     | 0        | 0        | 0                 |
| 6.  | Flexible denture delivery requires less expertise from the clinician than acrylic resin denture.                                                                                                           | 0              | 0     | 0        | 0        | 0                 |
| 7.  | Flexible dentures are aesthetically better than acrylic and cast partial dentures.                                                                                                                         | 0              | 0     | 0        | 0        | 0                 |
| 8.  | Flexible dentures lose their flexibility over time, resulting in a gradual decline in denture performance and patient satisfaction.                                                                        | 0              | 0     | 0        | 0        | 0                 |
| 9.  | Flexible dentures are less traumatic to the gingiva and surrounding soft tissue structures.                                                                                                                | 0              | 0     | 0        | 0        | 0                 |
| 10. | Flexible dentures should be avoided in patients with no vertical-stop occlusion and in situations with less amount of inter-occlusal clearance.                                                            | 0              | 0     | 0        | 0        | 0                 |
| 11. | Flexible dentures have many drawbacks, including frequent tooth de-bonding, discoloration of the denture base, the need for a separate set of armamentarium, and the inability to repair a broken denture. | 0              | 0     | 0        | 0        | 0                 |
| 12. | Flexible dentures are usually preferable in situations with severe undercuts that necessitate extensive mouth preparation for delivery of any denture with a rigid framework.                              | 0              | 0     | 0        | 0        | 0                 |

**[Table/Fig-5]:** Third round of questionnaire.**[Table/Fig-6]:** Clinical experience of the participants.**[Table/Fig-7]:** Formal training versus actual practice.

their professional practice, 27.16% of those participants who never received any training frequently use flexible dentures to rehabilitate patients. This result is consistent with what Polyzois G et al., [15]. They reported in their study that only one dental practitioner out of six received training on the concept and usage of flexible dentures, though one out of three provided flexible dentures to the partially

**[Table/Fig-8]:** Performance of flexible dentures varies depending on the materials used.

edentulous patients. Knowledge and practice are thus not aligned appropriately.

The second part is the main questionnaire, which consists of 12 items, each assigned to one of the three domains. The items in the domain of positive concerns show the positive notions of the clinicians towards flexible dentures. Therefore, a high score in this domain, along with the applicability domain, shows flexible dentures as a preferred treatment option for clinicians. However, negative concern items disapprove of the use of flexible dentures. A high score in this domain reduces the clinician's preference. The third round of the questionnaire has 12 questions, each with I-CVI score greater than 0.88.

The second round of the questionnaire had 21 items. Two of the nine questions from the second phase of the questionnaire were merged with another two questions, and four were rejected unanimously. Following a thorough discussion with the experts, three of the 21 items (R2Q5, R2Q6, and R2Q10) were removed from the round three questionnaire. Despite being unanimously agreed upon as a relevant item in the first round of the questionnaire, R2Q10 was the only item that received an I-CVI score of 0.6 in the second round and was eventually eliminated from the third round item list. R2Q3, R2Q14, R2Q16, R2Q17 were eliminated unanimously as those questions received CVI score of 0 and considered irrelevant by all the judges. R2Q5, R2Q6 and R2Q10 were removed after thorough

| Cronbach's alpha                  | Cronbach's standardised alpha | Guttman's lambda 6            | Average_R          | S/N       | Ase    | Mean±SD       | Median_R |        |
|-----------------------------------|-------------------------------|-------------------------------|--------------------|-----------|--------|---------------|----------|--------|
| 0.7708                            | 0.7759                        | 0.8332                        | 0.2239             | 3.4614    | 0.0307 | 2.7833±0.4425 | 0.238    |        |
| Reliability if an item is dropped |                               |                               |                    |           |        |               |          |        |
| Item no.                          | Cronbach's alpha              | Cronbach's standardised alpha | Guttman's lambda 6 | Average_R | S/N    | Alpha se      | Var.R    | Med.R  |
| Q1                                | 0.7603                        | 0.7683                        | 0.8198             | 0.2316    | 3.3153 | 0.0324        | 0.0276   | 0.2406 |
| Q2                                | 0.7593                        | 0.7652                        | 0.8183             | 0.2286    | 3.2597 | 0.0324        | 0.0272   | 0.2464 |
| Q3                                | 0.763                         | 0.7672                        | 0.8223             | 0.2305    | 3.2947 | 0.0316        | 0.0296   | 0.2464 |
| Q4                                | 0.7703                        | 0.7763                        | 0.8183             | 0.2398    | 3.4706 | 0.0307        | 0.0252   | 0.2491 |
| Q5                                | 0.7483                        | 0.754                         | 0.8165             | 0.2179    | 3.0645 | 0.034         | 0.0296   | 0.235  |
| Q6                                | 0.7443                        | 0.7535                        | 0.8059             | 0.2174    | 3.0563 | 0.0348        | 0.0282   | 0.2353 |
| Q7                                | 0.777                         | 0.782                         | 0.824              | 0.246     | 3.5881 | 0.0299        | 0.0243   | 0.247  |
| Q8                                | 0.7367                        | 0.7423                        | 0.8115             | 0.2075    | 2.8802 | 0.0355        | 0.03     | 0.2133 |
| Q9                                | 0.7568                        | 0.7585                        | 0.8167             | 0.2221    | 3.1415 | 0.0327        | 0.0293   | 0.2353 |
| Q10                               | 0.7517                        | 0.7569                        | 0.8085             | 0.2206    | 3.1139 | 0.0333        | 0.0238   | 0.235  |
| Q11                               | 0.7317                        | 0.7375                        | 0.8006             | 0.2034    | 2.8091 | 0.0362        | 0.0255   | 0.223  |
| Q12                               | 0.7555                        | 0.7573                        | 0.8145             | 0.221     | 3.1202 | 0.0327        | 0.029    | 0.2406 |

[Table/Fig-9]: Reliability assessment.

| 1 <sup>st</sup> dataset | Mean±SD   | Sum | 2 <sup>nd</sup> dataset | Mean±SD   | Sum  | p-value |
|-------------------------|-----------|-----|-------------------------|-----------|------|---------|
| Domain 1                | 10.3±1.95 | 309 | Domain 1                | 10.6±1.82 | 318  | 0.5403  |
| Domain 2                | 14.2±2.19 | 426 | Domain 2                | 14.2±2.19 | 427  | 1.0000  |
| Domain 3                | 8.4±1.25  | 252 | Domain 3                | 8.6±1.19  | 259  | 0.5281  |
| Total                   | 32.9±3.89 | 987 | Total                   | 33.5±4.01 | 1004 | 0.5587  |

[Table/Fig-10]: Repeatability assessment.

Due to divergent viewpoints among the experts, item R2Q5 (Flexible dentures induce more residual ridge resorption) was excluded. It was determined that, although not adhering to the fundamental biomechanical principles of conventional removable partial denture design, the properties of flexible dentures varies greatly between different thermoplastic resin materials [5,7,8]. Therefore, it might, though not always, enhance residual ridge resorption. But, it cannot be taken as a generalised statement.

| Method of calculation: Maximum and minimum score {range is +28 to -20 (total 48 point scale)}                                     |                                                                                                                                                                                                            |                          |      |      |
|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
|                                                                                                                                   | Statements                                                                                                                                                                                                 |                          | Max. | Min. |
| 1.                                                                                                                                | A flexible denture should only be used as a temporary or interim prosthesis.                                                                                                                               | Applicability domain     | 0    | 4    |
| 2.                                                                                                                                | Flexible dentures can be used as a substitute to cast partial dentures in most of the situations.                                                                                                          |                          | 4    | 0    |
| 10                                                                                                                                | Flexible dentures should be avoided in patients with no vertical-stop occlusion and in situations with less amount of inter-occlusal clearance.                                                            |                          | 0    | 4    |
| 12                                                                                                                                | Flexible dentures are usually preferable in situations with severe undercuts that necessitate extensive mouth preparation for delivery of any denture with a rigid framework.                              |                          | 4    | 0    |
| 3.                                                                                                                                | Flexible dentures adapt better to the oral tissues than all-acrylic dentures.                                                                                                                              | Positive concerns domain | 4    | 0    |
| 4.                                                                                                                                | Flexible dentures are more satisfactory to partially edentulous people than acrylic dentures.                                                                                                              |                          | 4    | 0    |
| 6.                                                                                                                                | Flexible denture delivery requires less expertise from the clinician than acrylic resin denture.                                                                                                           |                          | 4    | 0    |
| 7.                                                                                                                                | Flexible dentures are aesthetically better than acrylic and cast partial dentures.                                                                                                                         |                          | 4    | 0    |
| 9.                                                                                                                                | Flexible dentures are less traumatic to the gingiva and surrounding soft-tissue structures.                                                                                                                | Negative concerns domain | 4    | 0    |
| 5.                                                                                                                                | Acrylic dentures have a higher cost-benefit ratio than flexible dentures.                                                                                                                                  |                          | 0    | 4    |
| 8.                                                                                                                                | Flexible dentures lose their flexibility over time, resulting in a gradual decline in denture performance and patient satisfaction.                                                                        |                          | 0    | 4    |
| 11                                                                                                                                | Flexible dentures have many drawbacks, including frequent tooth de-bonding, discoloration of the denture base, the need for a separate set of armamentarium, and the inability to repair a broken denture. |                          | 0    | 4    |
| Total score calculation<br>{(positive concerns score-negative concerns score)+(applicability score)}.                             |                                                                                                                                                                                                            |                          | 28   | 20   |
| Maximum preference score {20 from positive concerns domain+0 from negative concerns domain+8 from applicability domain}=Total 28. |                                                                                                                                                                                                            |                          |      |      |
| Minimum preference score {0 from positive concerns domain+12 from negative concerns domain+8 from applicability domain}=Total 20. |                                                                                                                                                                                                            |                          |      |      |

[Table/Fig-11]: Questionnaire- Part 2.

discussion. R2Q11 was merged with R2Q7 and paraphrased into new item no R3Q11. R2Q12 was merged with R2Q20 and paraphrased into new item no R3Q10.

The statement (R2Q10) was "Flexible dentures can be used in patients with allergy to acrylic or metal". Reason for exclusion: If a patient already has an allergy to metal or acrylic, the clinician will need to find a substitute. As a result, even if it might not be the clinician's first choice, they must pursue it. The item concerned clinicians' knowledge of flexible dentures more than anything else. According to Fueki K et al., the initial dentures made of polyamide resin were developed to address allergic reactions to the acrylic resin's residual monomer content after polymerisation [7].

Item R2Q6 (Flexible dentures should only be used in short span Kennedy's Class III or Class IV partially edentulous situations) was also rejected because experts felt that flexible dentures could potentially be utilised in a variety of clinical situations provided they were chosen carefully and used with a metal occlusion rest. Furthermore, this item did not fit within the applicability domain and had a negative impact on the clinician's preference calculation.

Among the 12 items, item number two- that flexible dentures should not be relied on as a substitute for cast partial dentures- was the most interesting one. In a prior survey [4], 55.72% of dentists- mostly general practitioners- answered "yes" when asked whether flexible or acrylic partial dentures could serve as substitutes for cast

partial dentures. Most prosthodontists disagreed with it. To prevent such contradictory results, though the expert committee consisted of four prosthodontists, still prosthodontists were excluded from the list of participants.

The final questionnaire exhibits acceptable repeatability and good internal consistency.

## Limitation(s)

The authors accept that the study has few limitations. There were only 120 participants in the reliability assessment. Even though a 1:10 item-respondent ratio is thought to be adequate for content validation, a higher sample size might produce more accurate outcomes. At first, it was intended to use a Google form to collect responses after the questionnaire was constructed. Approximately, 150 members of a closed WhatsApp group received the Google form for pre-testing. However, only 23 replies could be obtained in 15 days, even after repeated requests. Thus, in order to get responses, the authors made the decision to discard the responses and physically meet with the participants to not only get the immediate response, but also to discuss face to face about the quality of the questionnaire. In the same line, physical mode of data collection was done to assess reliability. However, there is an opportunity for a follow-up study to use a Google form to distribute the questionnaire and collect responses from a much larger population. A factor analysis could then be employed to revalidate the questionnaire's content. Like-wise, a bigger sample size and the intraclass correlation coefficient could be used to evaluate the questionnaire's repeatability.

## CONCLUSION(S)

The entire process was able to generate a valid and reliable questionnaire to understand clinicians' preferences for flexible removable partial dentures. The questionnaire was neither too lengthy nor too short. It consisted of two parts. The first part is customisable, though it has four fixed questions, each with three options to choose from. The second part consists of 12 items whose responses are to be taken on a 5-point Likert scale. Clinician's preference can be calculated from the domain scores (Clinician's preference=positive concerns+applicability - negative concerns).

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### AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

### PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Nov 16, 2024
- Manual Googling: Dec 19, 2025
- iThenticate Software: Dec 22, 2025 (3%)

### ETYMOLOGY: Author Origin

EMENDATIONS: 7

Date of Submission: Nov 13, 2024

Date of Peer Review: Mar 06, 2025

Date of Acceptance: Dec 26, 2025

Date of Publishing: May 01, 2026