

# Frequency of Errors in Factors Affecting Complete Denture Satisfaction - A Tertiary Care Hospital Study

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## ABSTRACT

**Aim:** To find out the frequency of errors made by dental undergraduate students in factors affecting denture satisfaction (retention, stability, support and esthetics) and find out the association of errors with patient age and gender.

**Study design:** Cross sectional Observational study

**Place and duration:** Prosthodontic Dept. of Lahore Medical & Dental College, Lahore, From March 8<sup>th</sup> 2024 till June 8<sup>th</sup> 2024.

**Methodology:** A total of 124 dentures (62 maxillary dentures and 62 mandibular complete dentures) were included in the study. The dentures fabricated by BDS 3<sup>rd</sup> year and 4<sup>th</sup> year students; clinically assessed by senior doctors were selected. The patients were comfortably seated in the dental chair at the final insertion stage of the denture and the factors affecting denture satisfaction (retention, stability, support and esthetics) were clinically evaluated. Denture retention was assessed on 3 parameters; 1) over extended buccal or lingual flanges, 2) under extended buccal and lingual flanges, 3) inadequate post dam area. The denture stability was assessed on 3 parameters i.e.; 1) correct set up of teeth, 2) occlusal interferences, 3) correct flanges extension in sulci. Denture support was assessed on 3 parameters; 1) Adaptation to underlying tissue, 2) Adequate denture on favorable, 3) impression accuracy. 3 parameters for esthetics; 1) polished surface finishing, 2) tooth shape and shade selection, 3) accurate arrangement of teeth.

**Results:** The percentage of errors in all parameters of retention and denture support were less. The parameters determining denture stability i.e.; correct tooth setup and accurate flanges extension had a smaller number of errors, however percentage of errors of occlusal interference was found to be maximum; 64.0%. The parameters determining denture esthetics i.e.; correct tooth selection shade/shape and accurate teeth arrangement had less errors however the polished surface finishing had the maximum number of errors; 75.2%. The association of all the errors in parameters determining denture satisfaction with patient gender showed insignificant results;  $p < 0.05$ ; except parameter determining denture support (extension on favorable tissues)  $p < 0.05$ . The correlation of age with all the parameters of factors determining patient satisfaction with dentures was insignificant, however the parameter of esthetics (tooth shape and shade selection) was found to have a significant correlation  $p < 0.05$ .

**Conclusion:** It can be concluded that the most frequently made errors in denture fabrication process by undergraduate students that affect patient satisfaction with the dentures were errors in parameters determining denture stability i.e.; occlusal interferences and denture esthetics i.e.; poor finishing and polishing of the polished surfaces.

**Keywords:** Complete dentures, Denture retention, Denture esthetics, Denture stability, Errors, Gender, Undergraduates.

## INTRODUCTION

Complete dentures are indeed a cost effective and an efficient solution for patients who have lost teeth and tissues is the most economical yet effective prosthesis<sup>1</sup>. A well fabricated denture prosthesis requires a combination of extensive theoretical knowledge and good clinical hands-on skills.<sup>1</sup> Theoretical knowledge helps clinicians diagnose and understand the patient's needs, while clinical skills enable them to take accurate impressions, jaw relations and final denture insertion<sup>1,2</sup>. Patient acceptance of denture is when dentures meet their functional, aesthetic and psychological needs. Executing the denture fabrication process with precision and accuracy is the daunting job for many clinicians. Completing the various steps of denture fabrication with accuracy is indeed a significant challenge. Any error or inaccuracy at any stage can compromise the overall efficiency and functionality of the denture<sup>3</sup>. The errors incorporated at any stage greatly affect the health of mucosal soft and hard tissues. Denture qualities like denture retention, denture stability, denture support and denture esthetics are major factors that determine patient satisfaction with dentures<sup>1,4</sup>. It has been documented in the dental literature that lack of experience and poor clinical skills have resulted in patient rejection of the prosthesis<sup>5</sup>. The frequently made complaints of edentulous patients are related to traumatic ulcers made by dentures, denture

retention failure, food accumulation under the dentures and difficulty in speech and swallowing<sup>6</sup>. Studies have reported pain and discomfort as a commonest problem of a new denture patient whereas others have documented poor denture retention and stability as an objectional factor in denture wearing<sup>7</sup>.

The edentulous patients with poor oral health may exhibit a range of tissue related issues including atrophic alveolar ridges, inflamed and irritated mucosa, bone loss, insufficient attached mucosa that undermines the denture retention and stability. The frequently registered problems found in the poorly fabricated dentures of completely edentulous patients are related to errors in denture retention, stability, support and esthetics<sup>8,9</sup>. Complaint of poor denture retention and frequent dropping of a denture is the foremost reason why patients reject to use dentures. Denture stability is another denture quality to resist lateral and horizontal forces and if compromised it will result in denture failure<sup>8</sup>. Prolonged edentulism period compromises the denture load bearing oral mucosal and it greatly affect the denture support. All the oral tissues problems with advancing age requires efficient prosthodontic treatment modalities so that denture construction faults can be minimized and prevented<sup>9,10</sup>.

Teaching and training of complete denture course is a mandatory part of the dental curricula in dental colleges across the globe. However, variation in the grades of teaching methodologies and learning goal has been found in different parts of the world and the experience of denture fabrication by dental graduates varies. To achieve high quality denture care, focus on teaching students how to diagnose, treatment plan and execute denture therapy that

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meets the unique needs of each patient is needed that require structured, supervised and effective training<sup>11</sup>.

By incorporating these properties into teaching methodologies and skills, health care professionals can optimize treatment outcomes, improve patient satisfaction and enhance the overall quality of care<sup>12</sup>.

The current study was carried out as an attempt to identify the frequently made complete denture fabrication errors made by undergraduate BDS students. This will help in identifying the most troublesome steps of complete denture fabrication by dental undergraduate students. The study will help in designing teaching methodologies and students clinical training of dental colleges rationally and strategically to help students overcome poor clinical skills. This will not only result in well-fitting functional dentures that will improve patient satisfaction, their life quality but will also streamlining the treatment process reducing chair time.

The objective of the current study was to find out the frequency of errors made by dental undergraduate students in factors affecting denture satisfaction (retention, stability, support and esthetics) and find out the association of errors with patient age and gender.

## METHODOLOGY

The cross-sectional observational study was carried out in Department of Prosthodontic Lahore Medical & Dental College, Lahore From March 8<sup>th</sup> 2024 till June 8<sup>th</sup> 2024. The study was conducted in the span of 6 months. The sample sized included maxillary and mandibular dentures of 62 completely edentulous patients; a total of 124 dentures (62 maxillary dentures and 62 mandibular complete dentures). The dentures were fabricated by 75 undergraduate students of both gender during their duty in the department. Non probability consecutive sampling was used for sample selection. The sample size was calculated by RAO Soft Epi Calculator against 5.1% patient prevalence who were not satisfied with functions of their dentures<sup>13</sup>, keeping margin of error 5% and 95% confidence interval. The patients with complete loss of teeth within the age ranged from 40 to 80 years were included in the study. The dentures fabricated by BDS 3<sup>rd</sup> year and 4<sup>th</sup> year students; clinically assessed by senior doctors were selected. Those patients who refused to take part in the study were excluded. Informed consent was taken. The ethical clearance was obtained from College Ethical Review Board.

The patients were comfortably seated in the dental chair at the final insertion stage of the denture and the factors affecting denture satisfaction (retention, stability, support and esthetics) were clinically evaluated for maxillary and mandibular dentures by 2 senior prosthodontists. Denture retention was assessed on 3

parameters; 1) over extended buccal or lingual flanges, 2) underextended buccal and lingual flanges, 3) inadequate post dam area. The denture stability was assessed on 3 parameters i.e.; 1) correct set up of teeth, 2) occlusal interferences and 3) correct flanges extension in sulci. Denture support was assessed on 3 parameters; 1) Adaptation to underlying tissue, 2) Adequate denture on favorable and 3) impression accuracy. Denture esthetics was assessed on 3 parameters; 1) polished surface finishing, 2) tooth shape and shade selection, 3) accurate arrangement of teeth.

Data was entered and analyzed by SPSS Version 26. Descriptive statistics (frequency and %age) was done for qualitative variable like gender and all the parameters of factors affecting complete denture satisfaction. For quantitative variables like patients age, mean and  $\pm$ SD was calculated. Pearson's Chi square test was used to find out the association of number of errors in parameters of factors of complete denture satisfaction with patients' gender. Pearson's correlation was found between age and the errors in parameters.  $P < 0.05$  was set as Significance level.

## RESULTS

A total of 125 complete dentures made by 75 dental undergraduates were assessed for number of errors in factors that affect the patient satisfaction with complete dentures. 43; 34.4% male and 82; 65.6% were female patients. The age ranged from 40 to 80 years with mean age 57.72  $\pm$ SD9.624. Frequency distribution of errors found in factors affecting patient satisfaction with dentures is shown in Table I. The percentage of errors in all the parameters of denture retention and denture support were less. The parameters of denture stability i.e.; correct tooth setup and accurate flanges extension had smaller number of errors, however percentage of errors of occlusal interference was found to be maximum. 80; 64.0% (Table II).

The parameters determining denture esthetics i.e.; correct tooth selection shade/shape and accurate teeth arrangement had less errors however the polished surface finishing had the maximum number of errors; 94; 75.2%. Table I. The association of all the errors in parameters determining denture satisfaction with patient gender showed insignificant results;  $p < 0.05$ ; except parameter determining denture support (extension on favorable tissues)  $p < 0.05$ . Table II. The correlation of age with all the parameters of factors determining patient satisfaction with dentures was insignificant, however the parameter of esthetics (tooth shape and shade selection) was found to have a significant correlation  $< 0.05$  (Table III).

Table I: Frequency distribution of errors in factors affecting complete dentures satisfaction (n=125).

| Factors   | Parameters                     |                       |                                |                       |                            |                          |
|-----------|--------------------------------|-----------------------|--------------------------------|-----------------------|----------------------------|--------------------------|
|           | Retention                      | Over extended flanges |                                | Underextended flanges |                            | Inadequate post dam area |
|           | Yes                            | No                    | Yes                            | No                    | Yes                        | No                       |
|           | 43(34.4)                       | 82(65.6)              | 19(15.2)                       | 106(84.8)             | 11(8.8)                    | 114(91.2)                |
| Stability | Correct tooth set up           |                       | Occlusal interference          |                       | Accurate flange extension  |                          |
|           | Yes                            | No                    | Yes                            | No                    | Yes                        | No                       |
|           | 92(73.6)                       | 33(26.4)              | 80(64.0)                       | 45(36.0)              | 109(87.2)                  | 16(12.8)                 |
| Support   | Good tissue Adaptation         |                       | Extension on favorable tissues |                       | Impression accuracy        |                          |
|           | Yes                            | No                    | Yes                            | No                    | Yes                        | No                       |
|           | 97(77.6)                       | 28(22.4)              | 98(78.4)                       | 27(21.6)              | 96(76.8)                   | 29(23.2)                 |
| Esthetics | Polished surface well finished |                       | Correct tooth shape/shade      |                       | Accurate teeth arrangement |                          |
|           | Yes                            | No                    | Yes                            | No                    | Yes                        | No                       |
|           | 31(24.8)                       | 94(75.2)              | 115(92)                        | 10(8.0)               | 97(77.6)                   | 28(22.4)                 |

Table II: Association of errors in factors of denture satisfaction with gender (n=125).

| Parameters |                                |     | Gender   |           | Chi square |
|------------|--------------------------------|-----|----------|-----------|------------|
|            |                                |     | Male     | Female    |            |
| Retention  | Overextended borders           | yes | 21(48.8) | 22(51.2)  | 0.01       |
|            |                                | no  | 22(26.8) | 60(73.2Z) |            |
|            | Under extended borders         | yes | 4(21.1)  | 15(78.9)  | 0.18       |
| Stability  | Inadequate post dam area       | yes | 6(54.5)  | 5(45.5)   | 0.14       |
|            |                                | no  | 37(32.5) | 77(67.5)  |            |
|            | Adequate length of flanges     | Yes | 37(38.1) | 60(61.9)  | 0.10       |
| Support    | Occlusal interferences         | Yes | 25(31.3) | 55(68.8)  | 0.32       |
|            |                                | no  | 18(40.0) | 27(60.0)  |            |
|            | Accurate setup of teeth        | Yes | 33(35.9) | 59(64.1)  | 0.56       |
| Esthetics  | Good tissue adaptation         | Yes | 37(38.1) | 60(61.9)  | 0.10       |
|            |                                | no  | 6(21.4)  | 22(78.6)  |            |
|            | Extension on favorable tissues | Yes | 29(29.6) | 69(70.4)  | 0.03       |
| Support    | Impression accuracy            | Yes | 30(31.3) | 66(68.8)  | 0.17       |
|            |                                | no  | 13(44.8) | 16(55.2)  |            |
|            | Polished surface well finished | Yes | 9(29.0)  | 22(71.0)  | 0.46       |
| Esthetics  | Correct tooth shape/shade      | Yes | 42(36.5) | 73(63.5)  | 0.09       |
|            |                                | no  | 1(10.0)  | 9(90.0)   |            |
|            | Accurate teeth arrangement     | Yes | 34(35.1) | 63(64.9)  | 0.77       |
| Esthetics  | Correct tooth shape/shade      | no  | 9(32.1)  | 19(67.9)  | 0.77       |
|            |                                | no  | 9(32.1)  | 19(67.9)  |            |

Significance value; p<0.05.

Table III: Correlation of errors in factors of denture satisfaction with age (n=125).

| Parameters |                                | Pearson correlation | Significance (2 tailed) |
|------------|--------------------------------|---------------------|-------------------------|
| Retention  | Overextended borders           | -0.06               | -0.48                   |
|            | Under extended borders         | 0.14                | 0.11                    |
|            | Inadequate post dam area       | 0.05                | 0.51                    |
| Stability  | Adequate length of flanges     | -0.15               | 0.10                    |
|            | Occlusal interferences         | -0.03               | 0.71                    |
|            | Accurate setup of teeth        | 0.08                | 0.36                    |
| Support    | Good tissue adaptation         | -0.07               | 0.41                    |
|            | Extension on favorable tissues | 0.04                | 0.67                    |
|            | Impression accuracy            | 0.14                | 0.13                    |
| Esthetics  | Polished surface well finished | -0.06               | 0.45                    |
|            | Correct tooth shape/shade      | 0.27                | 0.00                    |
|            | Accurate teeth arrangement     | -0.17               | 0.06                    |

Significance value; p<0.05, (2 tailed).

## DISCUSSION

The current study was conducted on 125 complete dentures made by 75 under graduate dental students to find out the frequent errors in factors determining patient satisfaction of complete dentures. In the study 34.4% male patients and 65.6% female patients were included. In our region the female patients are more concerned about their health and beauty as compare to male counterparts that explains the high percentage of female patients attending the prosthodontic clinic<sup>14</sup>. In contrast the study done by Aamir<sup>15</sup> and Memon<sup>16</sup> had reported more male patients in their study stating the fact that female patients are home bound and seek less treatments.

Complete denture retention is the quality of the denture to resist the displacing forces that are exerted in the direction opposite to the path of denture insertion<sup>17</sup>. The success of a denture greatly depends on the amount of retention that a denture offers<sup>18</sup>. In the current study minimum errors had been found in all 3 parameters used to assess denture retention. 65.6% dentures were not having over extended borders and 84.8% had no under extended border. Post dam area recording was also accurate in 91.2% dentures. Maximum dentures made by undergraduates were well retentive. Swarthy<sup>19</sup> and coworkers done a study to evaluate the confidence of dental undergraduates in performing

different steps of denture making. 68% of their students reported confidence in recording primary impression and 40% were confident in recording secondary impressions. Both these impressions determine the retention of the dentures. Likewise good denture retention was found in the study carried out by Thilakumara<sup>20</sup> and coworkers.

Stability of the denture is an important factor in the denture acceptance and satisfaction of a patient.<sup>20-22</sup> It is the quality of a denture to be firm and stable when horizontal forces are applied. Out of the three main parameters determining the denture stability i.e.; correct tooth set up, occlusal interferences and accurate flange extensions, maximum errors in occlusal interferences were found 64% and only 36.0% had no interference. Whereas, only 26.4% dentures did not have correct tooth setup and only 12.8% denture were not having accurate dental flanges. When compared the parameters errors with respect to gender and age insignificant results were obtained. Similarly, Nikolopoulou<sup>23</sup> and coworker reported maximum procedural errors during establishing denture occlusion and poorly recorded post dam area and seal while taking secondary impressions. Swarthy<sup>19</sup> and coworkers in contrast to the result of current study stated that 52% confidence was found in undergraduate students when they used anthropometric method of teeth selection. Vasanti Lagari<sup>24</sup> and coworkers however reported only 20% students confident in replacing artificial teeth. The contrasting results may be due to the difference in teaching methodologies that could affect the outcome.

Denture support is the resistance of a denture against the vertical forces of mastication and other forces towards the denture base area.<sup>25</sup> Good denture support was observed in the complete dentures. 77.6% dentures made by students were found having good tissue adaptations. Similarly, 78.4% dentures were fabricated on favorable tissues. Denture impressions were accurately recorded in maximum case i.e.; 76.8%. When this parameter was compared with respect to gender significantly better results; p<0.05 were found in female patients i.e.; 70.4% as compared to males 29.6%, however with respect to age insignificant results were obtained.

Denture esthetics is a key factor in patient satisfaction of a denture prosthesis<sup>20</sup>. Out of all three parameters of esthetics, 57.2% dentures were found with poor denture polished surfaces. In contrast Bacali<sup>25</sup> and coworkers reported 55.35% students confident in denture finishing and polishing and only 44.7% showed contrasting results. In the current study the parameter of denture esthetics like accurate tooth shape/shade selection was having less errors and 92% denture were having good teeth selection; similarly accurate teeth arrangement was found in maximum dentures; 77.6%. Insignificant age and gender association with esthetic determining parameters was seen except for tooth shape/shade selection where age had significant association p<0.05. This finding could be explained on the fact that aging greatly affects the residual ridges and associated anatomical structures thus complicates the selection of accurate tooth size and shape selection<sup>17</sup>.

Honey<sup>26</sup> and coworkers documented that students clinical skills are more polished in performing simple procedures or in those complex procedures where meticulous attention during teaching was given. Punya<sup>27</sup> and coworkers reported 100% confidence in their students when fabricating a denture however, Bacali<sup>20</sup> and coworker found 68.2% students having moderate difficulty in fabricating prosthesis. Sukotjo<sup>28</sup> and coworker stated that stress levels in students performing preclinical and lab exercises of denture fabrication are higher. Likewise, Eswaran<sup>29</sup> conducted a study on students in different colleges of Chennai India and found poor knowledge and confidence in patient diagnosis and prosthesis fabrication and concluded that the students needed improvement.

There are contrasting results regarding errors made by dental undergraduate students when diagnosing and fabricating complete dentures. Reliable methods to predict outcome of

complete denture errors is not present<sup>28</sup>. However this study was an attempt to highlight the most commonly made errors by dental students while fabricating dentures that affect patient satisfaction and acceptance of the prosthesis. This will help in teachers and supervisors to focus on those steps and procedures that need improvement and decrease post insertion denture complaints.

## CONCLUSION

It can be concluded that the most frequently made errors in denture fabrication process by undergraduate students that affect patient satisfaction with the dentures were errors in parameters determining denture stability i.e.; occlusal interferences and denture esthetics i.e.; poor finishing and polishing of the polished surfaces.

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**Author contribution:** **MHR:** Literature Review, **IF:** Conceived idea, **SN:** Statistical analysis, **RUK:** Data collection, **S:** Manuscript writing, **KQ:** Manuscript proof reading, **HW:** Data collection, **TM:** Literature review/designed research

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