

Original Article

Prevalence and Pattern of Partial Edentulism Among Kennedy Classification

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Abstract

Objective: To determine the prevalence and distribution of Kennedy classification of partial edentulism among patients visited in the Department of Prosthodontics, Combined Military Hospital, Quetta.**Methodology:** This cross-sectional study was conducted in the Department of Prosthodontics, Combined Military Hospital, Quetta. It was conducted from October 2024 to March 2025. 173 patients aged 18-65 years of both genders with partial edentulism were included. Participants were recruited using consecutive sampling. We excluded patients with missing 3rd molars and those who were totally edentulous. We obtained demographic and clinical data after informed consent. We conducted oral examinations and categorized arches with no teeth into Kennedy Classes I-IV. We analyzed data using SPSS version 26. Quantitative variables were expressed as mean $\pm$ standard deviation, and categorical variables as frequencies and percentages. We analyzed data using the chi-square test or Fisher's exact test; $p \leq 0.05$ was considered significant.**Results:** The mean age was 42.6 ± 11.8 years. Of 173 participants, 98 (56.6%) were male, and 75 (43.4%) were female. The mandibular arch was affected in 101 (58.4%) patients and the maxillary arch in 72 (41.6%). Kennedy Class III was most prevalent, occurring in 61 (35.3%) patients, followed by Class I in 58 (33.5%), Class II in 40 (23.1%), and Class IV in 14 (8.1%). Kennedy classification was significantly associated with age ($p=0.018$), gender ($p=0.041$), and dental arch ($p<0.001$).**Conclusion:** Kennedy Class III was the most common pattern, while Kennedy Class IV was the least common. Significant associations with age, sex, and dental arch indicate differences in partial edentulism and may help plan and allocate prosthodontic resources.

Introduction

Teeth are integral parts of the stomatognathic system and play a vital role in functions such as mastication, speech, facial esthetics, nutrition, and oral health. Partial edentulism is a common oral health problem seen in prosthodontic practice when one or more natural teeth are lost. Etiological factors of tooth loss include dental caries, periodontal disease, trauma, neoplastic or cystic lesions, and other pathological conditions. The effects of tooth loss extend beyond the missing tooth/teeth and can result in functional, biological, aesthetic, psychological, and social issues [1]. Oral balance can be disturbed when a person has partial dentition loss. Anterior tooth loss can significantly affect speech and facial appearance, while posterior tooth loss can negatively impact mastication and cause changes in eating habits. Leaving edentulous spaces untreated can also lead to drifting or tilting of surrounding teeth, overeruption of opposing teeth, loss of the "proximal contacts", food trapping, and progressive changes in the supporting alveolar bone. These changes can make subsequent prosthodontic rehabilitation more difficult and may affect the type of removable prosthesis chosen and designed [2]. Partial dentition loss may also affect a person's quality of life. Chewing difficulty can limit food choices and may also affect nutritional status. Tooth loss, especially in the anterior region, can negatively affect self-confidence, communication, and social participation. Therefore, correct tooth loss distribution and pattern are essential for adequate planning for prosthodontic services and formulating prevention strategies [3,4]. Several classification systems describe partially edentulous arches. Of these, the Kennedy classification is one of the most commonly used as it is easy to understand, clear, and clinically useful. Edward Kennedy proposed the classification in 1925, and it is divided into four major classes based on the location of edentulous areas. Kennedy Class I is the bilateral edentulous area behind the natural teeth. Class II is a single edentulous area in the posterior quadrant of the mouth. Class III denotes a single edentulous space on one jaw with natural teeth on both sides, and Class IV denotes one edentulous anterior space that spans the midline [5]. Knowledge of the distribution of Kennedy classes is important for prosthodontic treatment planning because they present different biomechanical and clinical challenges. The Kennedy Class I and Class II are typically associated with distal extension bases and support, stability, and retention. Class III cases are typically tooth-supported and may offer relatively favorable conditions for constructing removable partial dentures. In Class IV cases, replacing the anterior tooth raises concerns about aesthetics, phonetics, and patient expectations [6]. Past research in other populations has shown wide variation in Kennedy class proportions. Variations may be due to age, gender, oral hygiene practices, access to dental care, socioeconomic factors, diet, cultural or tooth extraction practices. Variability in the prevalence of partial edentulism in the two arches and different Kennedy classes has also been reported in studies conducted in Pakistan and other populations in South Asia [7]. This local information matters because prosthodontic treatment needs may differ by population and healthcare setting. Analyzing different types of Kennedy classification among patients attending the Department of Prosthodontics at Combined Military Hospital, Quetta, could provide useful data on the clinical burden of partial edentulism and treatment needs. This can help clinicians with treatment planning, patient counseling, patient education on prosthodontics, and determining the proper use of clinical resources [8]. Therefore, the present study aimed to determine the prevalence and distribution of partial edentulism according to the Kennedy classification among patients attending the Department of Prosthodontics at Combined Military Hospital, Quetta. The authors also assessed the distribution of Kennedy classes based on relevant demographic and

clinical factors [9].

Materials and Methods

Study Design & Setting

This cross-sectional study was conducted in the Department of Prosthodontics, Combined Military Hospital, Quetta. It was conducted from October 2024 to March 2025.

Participants

We included partial edentulous patients aged 18 to 65 years of both sexes using a non-probability consecutive sampling technique, for a total of 173 patients. After informed consent, we included eligible patients who met the criteria and presented to the Department of Prosthodontics. We excluded patients with missing third molars and those with complete dentition.

Ethical Approval Statement: The study synopsis was approved by the Research Evaluation Unit under Ref. No. CPSP/REU/DSG-2023-002-4544, dated September 23, 2024, before commencement of the study.

Sample Size Calculation

We determined the sample size using the WHO sample size calculator. The previously reported frequency was 12.9%, and we used a 95% confidence level with a 5% margin of error. The calculated required sample size was 173 patients, as stated in the approved synopsis.

Inclusion Criteria

- Patients aged 18–65 years.
- Male and Female patients.
- Individuals with partial edentulism as defined for the study.
- Patients ready to participate and provide informed consent.

Exclusion Criteria

- Patients who do not have any third molars.
- Completely dentate patients.

Diagnostic and Management Strategy

We obtained informed consent and collected demographic and clinical data on a structured proforma. The examination was conducted orally under proper clinical conditions, and we identified and classified partially edentulous arches as Kennedy Class I, II, III, or IV based on the classification system.

Statistical Analysis

We collected and analyzed data using SPSS version 26. We used the Shapiro–Wilk test to assess the normality of quantitative variables, which were then expressed as mean ± standard deviation or median (25–75 percentiles). Categorical variables were presented as frequencies (and percentages). Where appropriate, we used the chi-square test or Fisher's exact test. We considered $p < 0.05$ significant.

Results

We evaluated 173 patients with partial edentulism during the study period. The mean age was 42.6 ± 11.8 years. Of the participants, 98 (56.6%) were male, and 75 (43.4%) were female. Regarding the affected dental arch, 72 (41.6%) patients had maxillary partial edentulism, 80 (46.2%) had mandibular involvement, and 21 (12.1%) had partial edentulism involving both arches. According to the Kennedy classification, Class III was the most frequently observed pattern, comprising 61 (35.3%) patients, followed by Class I (58, 33.5%), Class II (40, 23.1%), and Class IV (14, 8.1%). The distribution of Kennedy classification showed a statistically significant association with age group ($p=0.018$). Kennedy Classes I and II were more common among older participants, whereas Class III was more common among younger and middle-aged patients. Gender was also significantly associated with Kennedy classification ($p=0.041$). A statistically significant association was observed between dental arch and Kennedy classification ($p<0.001$), with posterior edentulous patterns occurring more frequently in the mandibular arch. Overall, Kennedy Class III was the predominant pattern, whereas Class IV was the least frequently observed classification among the study population.

Table 1. Demographic characteristics of the study participants (n=173)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	Mean ± SD	42.6 ± 11.8	—
Gender	Male	98	56.6
	Female	75	43.4
Total		173	100.0

Data are presented as frequency and percentage for categorical variables and mean ± standard deviation (SD) for age.

Table 2. Distribution of partially edentulous dental arches (n=173)

Dental arch involved	Frequency (n)	Percentage (%)
Maxillary arch	72	41.6
Mandibular arch	80	46.2
Both arches	21	12.1
Total	173	100.0

Data are presented as frequency and percentage. Mandibular partial edentulism was the most frequently observed arch involvement, followed by maxillary involvement and involvement of both arches.

Table 3. Distribution of patients according to Kennedy classification

(n=173)

Kennedy classification	Frequency (n)	Percentage (%)
Class I	58	33.5
Class II	40	23.1
Class III	61	35.3
Class IV	14	8.1
Total	173	100.0

Data are presented as frequency and percentage. Kennedy Class III was the most prevalent pattern, whereas Class IV was the least frequently observed classification.

Table 4. Association of Kennedy classification with age, gender, and dental arch

Variable	Category	Class I n (%)	Class II n (%)	Class III n (%)	Class IV n (%)	p-value
Age group	18–30 years	6 (10.3)	4 (10.0)	18 (29.5)	4 (28.6)	0.018
	31–45 years	14 (24.1)	8 (20.0)	24 (39.3)	5 (35.7)	
	46–60 years	25 (43.1)	18 (45.0)	15 (24.6)	4 (28.6)	
	61–65 years	13 (22.4)	10 (25.0)	4 (6.6)	1 (7.1)	
Gender	Male	39 (67.2)	27 (67.5)	27 (44.3)	5 (35.7)	0.041
	Female	19 (32.8)	13 (32.5)	34 (55.7)	9 (64.3)	
Dental arch	Maxillary	18 (31.0)	12 (30.0)	34 (55.7)	8 (57.1)	<0.001
	Mandibular	40 (69.0)	28 (70.0)	23 (37.7)	6 (42.9)	
	Both arches	0 (0.0)	0 (0.0)	4 (6.6)	0 (0.0)	

Values are presented as frequency and percentage. We assessed associations between Kennedy classification and age group, gender, and dental arch using the chi-square test or Fisher's exact test, as appropriate. We considered $p \leq 0.05$ statistically significant. Kennedy classification was significantly associated with age ($p=0.018$), gender ($p=0.041$), and dental arch ($p<0.001$).

Discussion

Although partial edentulism is not an overwhelming challenge for prosthodontists, it is a significant clinical issue because it affects mastication, speech, esthetics, occlusal stability, and oral health-related quality of life. The present study analyzed 173 partially edentulous patients who visited the Department of Prosthodontics, Combined Military Hospital (CMH), Quetta, and grouped them into Kennedy classifications based on their edentulous arches. This provided insight into the prosthodontic treatment needs of the observed population and could be compared with recent evidence from Pakistan and other countries [10]. The current results should first be understood in relation to the characteristics of the population studied. The mean age of patients was [insert mean ± SD] years, and the age group most commonly

encountered was in patients with partial edentulism. This pattern is more clinically relevant because cumulative exposure to dental caries, periodontal disease, tooth fracture, and extraction increases with age. A Pakistani study at Punjab Dental Hospital, Lahore, of 300 patients reported a mean age of 53.54±10.80 years, with 53.67% of patients being female. Importantly, Kennedy Class II was the most common, followed by Class III, then Class I and Class IV. [11]The distribution of Kennedy classes in the present study can be compared with results from other Pakistani populations. A more recent Pakistani Study confirmed significant differences in the most prevalent Kennedy class, indicating that factors such as study population, age distribution, socioeconomic status, dental attendance, and tooth extraction habits influence the prevalence of partial edentulism. A 2022 study published in the Pakistan Armed Forces Medical Journal noted that Kennedy Class II in the maxilla and Classes I and III in the mandible were prevalent among patients needing cast partial dentures. The authors highlighted the significance of the edentulism pattern and its importance for removable partial denture design. [12]But there is also wide geographical variation internationally. In 2021, a study conducted in Saudi Arabia identified Class I (45.0%), Class III (26.2%), Class II (23.3%), and Class IV (5.4%) as the most common classes, respectively. The investigators also observed a trend for both Classes I and II to occur with age [13]. The results indicate that posterior tooth loss and distal-extension patterns may be more important in older patients. This Saudi study confirmed that Class I was the most frequent pattern and Class IV was the least frequent, consistent with the significance of posterior tooth loss in the prosthodontic population. [14]Recent literature also shows differences in dental arches. Class I and Class II patterns are usually associated with posterior tooth loss and distal extensions, while Class III is associated with an edentulous space bounded by teeth. The maxillary/mandibular distribution ratio therefore has direct implications for the support, stability, retention, and connector type needed for the prosthesis. Recent findings from Afghanistan revealed that Class I was most common (46.3%), followed by Class III (25.6%), Class II (21.3%), and Class IV (6.7%). Class III and IV were more common in the maxilla, while Class I and II were more common in the mandible. [15]. Variations between studies may reflect methodological differences. Some investigations rely on clinical examination; others on dental casts, laboratory records, or past patient records [16]. The prevalence of individual Kennedy classes may vary with sample size, age range, inclusion criteria, application of Applegate's rules, and whether modification spaces are included. This study used consecutive sampling and clinical classification, which may explain differences from retrospective laboratory studies [17]. These findings have clinical implications that go beyond epidemiology. Identifying the predominant Kennedy classes may help prosthodontists predict treatment needs and choose the right design for removable partial dentures. Furthermore, a contemporary study showed that treating Kennedy Class I edentulism can affect oral function, subjective symptoms, and oral health-related quality of life, highlighting the importance of proper management of such distal-extension cases. [18]Recently, advances in technology have again underscored the enduring importance of the Kennedy classification. In 2024, researchers from Pakistan conducted a study to assess the effectiveness of automated classification using artificial intelligence on an orthopantomogram. They found high classification accuracy, though a few classes were more difficult because of the limited number of available examples. Therefore, clinical classification remains important not only for traditional treatment but also for modern digital dentistry and automated diagnosis systems [19,20]. The present study provides local evidence on partial edentulism among the patients attending the prosthodontic service of Quetta. The findings of this study may not be representative of the larger Pakistani population as it was conducted at only one tertiary care hospital in Quetta. Selection bias may have occurred because the sampling

method was consecutive non-probability sampling. The cross-sectional design did not allow for assessment of temporal relationships and long-term prosthodontic outcomes. In addition, the study did not comprehensively evaluate socioeconomic and behavioral factors.

Conclusion

Partial edentulism is an important prosthodontic problem faced by patients at CMH Quetta. Using the Kennedy classification offers a practical way to identify common patterns of tooth loss and help plan removable partial dentures. Awareness of local patterns can help guide treatment plans, preventive dental care, and proper allocation of prosthodontic resources.

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