

# A Hospital-based Cross-sectional Study to Assess the Pattern and Trends of Partial Edentulism in BPKIHS and its Teaching Districts

Prakash Kumar Parajuli<sup>1</sup> • Bishal Babu Basnet<sup>1</sup> • Indra Kumar Limbu<sup>1</sup> • Pramita Suwal<sup>1</sup>

## Abstract

**Background:** Partial edentulism is the state of loss of one or more but not all natural teeth. Edentulism can affect the esthetics of an individual and can have a negative psychological impact. Recording the frequency of partial edentulism and its nature along with its association with different socio-demographic parameters helps to plan the treatment need and goals of the population in that locality. This cross-sectional study was conducted to find out the frequency of partial edentulism among the patients visiting the dental college of BPKIHS and its teaching district hospitals.

**Methods:** Two hundred partially edentulous patients were selected from four hospitals by purposive sampling and their socio-demographic parameters recorded. Intra-oral examination was done to classify partial edentulous spaces according to the Kennedy-Applegate system. Data was analyzed in SPSS version 11.5 and chi-square test was used to determine the association between independent (age-group, gender, socioeconomic status) and dependent variables (number of missing teeth).

**Results:** In both the arches, Kennedy's class III was the most prevalent type of edentulism. In the maxillary arch, 44.5% had Kennedy's class III edentulism whereas in the mandibular arch 34.5% had Class III. Kennedy's class IV was least common (4% in maxillary arch and 6.5% in mandibular arch). Forty-five partially edentulous patients above 50 years of age had  $\geq 4$  teeth missing and 140 were from medium socio-economic status.

**Conclusion:** Kennedy's class III partially edentulous arches were the most prevalent type of edentulousness with periodontal disease as major etiology. It was also seen that people with medium socio-economic status were more affected by tooth loss.

**Keywords:** Kennedy-Applegate classification, partial edentulism, socio-demographic, socio-economic

The quality of life of an individual is markedly affected by oral health.<sup>1</sup> Poor oral health and loss of teeth result in reduced dietary intake and cause nutritional deficiency; which ultimately affects general health.<sup>2</sup> Partial edentulism is the loss of some of the teeth due to reasons such as decay, periodontal disease, trauma, orthodontic or pre-prosthetic extraction. The impact of partial edentulism can range from simple difficulty in eating to drifting of adjacent teeth, over-eruption of opposing teeth, problems in speech, and low self-esteem. It can also be noted that residual ridge and supporting structures can be compromised due to a prolonged state of edentulism. Kennedy's classification has been consid-

ered as the most commonly used classification for its easy understanding and use.<sup>3</sup> In many parts of the world partial edentulism has been widely studied and the burden of this disease has been explored.<sup>1,4-6</sup> Few studies have shown that partial edentulism is a major oral health problem among others.<sup>7,8</sup>

The status and pattern of edentulism can be the mirror image of prosthodontic treatment needs. With the diagnosis of the different patterns of edentulism prevalent in our community, the focus on similar modern dental practice can be instituted. The primary objective of the study was to determine the frequency of different types of partial edentulism as per Kennedy's classification in the patients visiting the university hospital of B. P. Koirala Institute of Health Sciences (BPKIHS) and its teaching districts. The secondary objectives were to determine the association with age, gender, and self-reported socioeconomic status and to find the major causes of tooth loss in

 **Prakash Kumar Parajuli**  
drprakashparajuli@gmail.com

<sup>1</sup> Department of Prosthodontics, College of Dental Surgery, BP Koirala Institute of Health Sciences, Nepal

the study population.

## METHODS

This cross-sectional study was conducted in Province no. 1 including four hospitals. Ethical approval was obtained from the Institutional Review Committee, BPKIHS. A total of 200 adult patients were selected by purposive sampling method and written consent was obtained before their enrollment. The sample size was calculated based on a previous study<sup>7</sup> in the central region of Nepal where the prevalence ( $p$ ) of partial edentulism was 84%. To achieve 90% power and 5% level of significance, the desired precision ( $d$ ) was 8.4. Thus, using the formula, minimum sample size ( $n$ ) =  $Z^2 p(1-p)/d^2$  (value of  $Z = 1.96$  at 95% confidence interval), to which 20% more patients were added to minimize the non-response and other biases. The sample was drawn from the BPKIHS ( $n = 80$ ) and its teaching outreach centers ( $n = 40$  each from three hospitals). The hospitals were selected amongst teaching districts of BPKIHS by lottery method which included Dhankuta District hospital, Dhankuta, Morang District Hospital, Rangeli, and Ilam District Hospital, Ilam.

The patients visiting for oral rehabilitation or extraction of one or more permanent teeth were included in the study. However, patients with missing or extracted third molars were not considered. Patients missing all teeth in one of the arches or patients undergoing serial extractions for receiving complete denture in one of the arches were also excluded. The dentists from BPKIHS posted at outreach centers were trained to interview and record the information using the pre-designed questionnaire which included the demographic details and intraoral examination. The part of the questionnaire which relates to demographic and intraoral examination included a regular tool of history taking. The socioeconomic part was adapted from a modified scale.<sup>9</sup>

The Kennedy's classification with Applegate rules describes partially edentulous arches into four categories: Class I (Bilateral edentulous areas located posterior to remaining natural teeth), Class II (Unilateral edentulous area located posterior to remaining natural teeth), Class III (Unilateral edentulous area bounded anteriorly and posteriorly by natural teeth) and Class IV (Single anterior edentulous area that crosses the midline of the dental arch).<sup>10,11</sup>

Data were entered into Microsoft excel and further analyzed using SPSS 11.5. The chi-square test was used to determine the association between independent (age-group, gender, socioeconomic status) and dependent variables

(number of missing teeth).

## RESULTS

In this study, there was no missing data. The mean age of participants was  $43.46 \pm 16.51$  years and females constituted 57.5% of the sample population and males 42.5%. Among them, 32% had partial edentulism in the maxillary arch, 34% had it in the mandibular arch and remaining 34% had in both arches. The distribution according to the number of missing teeth is shown in table 1 where a majority of the samples showed four or more missing teeth.

**Table 1.** Distribution of samples according to number of missing teeth

Number of missing teeth	Number of Subjects	Percentage
1	61	30.5
2	45	22.5
3	25	12.5
4 or more	69	34.5
Total	200	100

In both the arches, Kennedy's class III was the most prevalent type of edentulism: 44.5% in maxillary arch and 34.5% in mandibular arch. The least reported edentulism was Kennedy's class IV. Maximum edentulousness (Kennedy's Class I, II and III) were without modification spaces. In maxillary arches, Kennedy class III modification 1 was the most prevalent type. The distribution of edentulism according to Kennedy-Applegate classification has been depicted in table 2.

As the relationship between the number of missing teeth and socio-demographic variables were tested with chi-square test, gender did not show a significant association ( $p = 0.19$ ) with the status of edentulism but the age group was found significantly associated ( $p < 0.001$ ), most of them being above 50 years. Similarly, the socioeconomic status was also significantly associated ( $p = 0.01$ ), maximum having medium status. The different associations are presented in table 3.

As reported by the participants decay accounted for etiology of tooth loss in 146 individuals (73%), and periodontal diseases in only 60 individuals (30%) but the periodontal cause was significantly associated with the number of missing teeth ( $p < 0.001$ ). Dental decay ( $p = 0.33$ ) and trauma ( $p = 0.39$ ) were not significantly associated with the number of missing teeth (Table 4).

**Table 2.** Distribution of partial edentulism (n = 200) according to Kennedy-Applegate classification

Kennedy's classification	Maxillary arch		Total (%)	Mandibular arch		Total (%)
Class I	Without modification	12	13 (6.5)	Without modification	10	15 (7.5)
	Modification 1	1		Modification 1	5	
Class II	Without modification	15	32 (16.0)	Without modification	17	29 (14.5)
	Mod 1	13		Mod 1	7	
	Mod 2	3		Mod 2	4	
	Mod 3	1		Mod 3	1	
Class III	Without modification	56	89 (44.5)	Without modification	49	69 (34.5)
	Mod 1	27		Mod 1	15	
	Mod 2	6		Mod 2	4	
	Mod 3	0		Mod 3	1	
Class IV			8 (4.0)			13 (6.5)

**Table 3.** Association of number of missing teeth to gender, age group and socioeconomic status (n = 200)

Variables	Number of missing teeth					Chi-square statistic ( <i>p</i> value)
	One	Two	Three	Four or more	Total	
Gender						
Female	31	32	14	38	115	4.71 ( <i>p</i> = 0.19)
Male	30	13	11	31	85	
Age group						
Below 30 years	27	14	5	8	54	36.22 ( <i>p</i> < 0.001)
30-50 years	17	21	11	16	65	
Above 50 years	17	10	9	45	81	
Socio-economic status						
High	14	8	4	4	30	16.83 ( <i>p</i> = 0.01)
Medium	44	31	18	47	140	
Low	3	6	3	18	30	

## DISCUSSION

Being edentulous might be associated with multiple factors but it definitely hampers the quality of life of an individual in this esthetics-concerned society. Besides affecting oral health, edentulism may be associated with decreased self-esteem of a person, particularly when it is

in the esthetic zone. It has been found that with increasing age, the sense of taste and smell decrease that might influence oral health but can't solely deteriorate it.<sup>12</sup> Socio-economic status, psychological depression, anxiety or isolation have been reported as contributing factors leading to negligence in maintaining personal hygiene and oral health.<sup>13</sup> Even after advances in prevention, restorative

**Table 4.** The relationship with the reported causes and number of missing teeth in the participants (n = 200)

Etiology of edentulism		Number of missing teeth				Total	Chi-square ( $\chi^2$ ) test
		One	Two	Three	Four or more		
Decay	Yes	45	37	16	48	146	3.40 ( <i>p</i> = 0.33)
	No	16	8	9	21	54	
Periodontal	Yes	7	8	8	37	60	31.55 ( <i>p</i> < 0.001)
	No	54	37	17	32	140	
Trauma	Yes	9	2	3	9	23	3.00 ( <i>p</i> = 0.39)
	No	52	43	22	60	177	

techniques, and dental materials, tooth loss is still a reality in both, industrialized, and developing countries.<sup>14,15</sup> This study was conducted to obtain an idea about the frequency of edentulism among the patients visiting the out-patient department of prosthodontics, College of Dental Surgery, BPKIHS and its three teaching district hospitals. Our findings showed partially edentulous females were slightly more in number than males, though not statistically significant which is similar to previous studies.<sup>11,16</sup> A higher priority for esthetic concerns among females could be the reason for this finding. Another possible reason for females being more edentulous might be their inability to afford the needed treatment to save the natural teeth as stated by Shah N et al.<sup>1</sup> Most of the edentulous subjects were above 50 years of age, however subjects in the age range of 30 to 50 years were also quite frequent. This may be attributed to the treatment needs for esthetics and functions that brought them to the hospital. Many factors including difficulty to perform oral hygiene procedures due to systemic diseases or functional disability leads to edentulism in old age.<sup>17</sup>

Most of the partially edentulous subjects were from medium socio-economic status; the possible reasons for this could be lack of time, money, and priority to visit dental hospitals for needed treatment in the lower socio-economic population while higher socio-economic status population may have had more affordable access to preventive measures and dental care.

Kennedy's Class III edentulism was more frequent in current study similar to findings from the previous studies<sup>16,18-20</sup> but in contrast to the study by Gad et al. which reported Class I as the most prevalent.<sup>21</sup> Gender was not associated with number of missing teeth in our study but Fauda et al. also found the number of missing teeth significantly higher among males.<sup>18</sup>

The current study showed higher frequency of dental decay (73%) as etiology of partial edentulism similar to findings from previous studies in Nepal but in contrast to an Indian study where periodontal cause was reported high (51.04%).<sup>19,20,22</sup> Since dental decay and periodontal diseases are preventable diseases, more preventive programs are needed in this region of the country.

This study has some limitations. Firstly, it is a hospital-based study and cannot clearly demonstrate the status of community. Secondly, sample size is relatively small. The recall biases regarding the past dental history are another limitation of this study. In this study, socioeconomic status was determined by self-reporting about the different parameters of modified scale by the patients.<sup>9</sup> This can also be a limiting factor as participants may not reveal ac-

tual income or economic conditions.

## CONCLUSION

This study shows that most of the partially edentulous patients visiting the dental department for prosthodontic treatments had Kennedy's class III spaces. More females reported having partial edentulism than males however this finding was statistically not significant. Dental caries was the most common etiology for partial edentulism; however, periodontal diseases were significantly associated with a greater number of teeth loss. About one-third of patients had four or more teeth missing. Most of those partially edentulous population were above 50 years of age and with medium socio-economic status.

## DECLARATIONS

**Ethics approval and consent to participate:** Ethical approval obtained from the Institutional Review Committee, B.P. Koirala Institute of Health Sciences (BPKIHS). Written informed consent taken from each participant before enrollment.

**Consent for publication:** Not applicable

**Availability of data and materials:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request. All relevant data are within the manuscript and its supporting information files.

**Competing interest:** None

**Funding:** None

**Author's contributions:** PKP: concept, design, manuscript preparation, and manuscript editing/ review. BBB: concept, design, data collection, statistical analysis, and manuscript review/ approval. IKL: concept, design, and manuscript review/ approval. PS: concept, design, and manuscript review/ approval.

**Acknowledgement:** We acknowledge the support from Dr Bhumesh Kafle, Dr Siddharth Rai, and Dr Devraj Neupane in collecting data from outreach centers of BPKIHS.

## REFERENCES

1. Shah N, Parkash H, Sunderam KR. Edentulousness, denture wear and denture needs of Indian elderly: a community-based study. *J Oral Rehabil.* 2004;31:467-76.
2. Chauncey HH, Muench ME, Kapur KK, Wayler AH. The effect of the loss of teeth on diet and nutrition. *Int Dent J.* 1984;34:98-104.
3. Miller E. Systems for classifying partially dentulous arches. *J Prosthet Dent.* 1970;24:25-40.
4. Caldas AF. Reasons for tooth extraction in a Brazilian population. *Int Dent J.* 2000;50:267-73.

5. Ong G, Yeo JF, Bhole S. A survey of reasons for extraction of permanent teeth in Singapore. *Community Dent Oral Epidemiol.* 1996;24:124–7.
6. Fayad M, Baig M, Alrawaili A. Prevalence and pattern of partial edentulism among dental patients attending College of Dentistry, Aljouf University, Saudi Arabia. *J Int Soc Prevent Communit Dent.* 2016;6(Suppl 3):S187-91.
7. Basnyat KC, Sapkota B, Shrestha S. Epidemiological survey on edentulousness in elderly Nepalese population. *Kathmandu Univ Med J (KUMJ).* 2014;12(48):259-63.
8. Sapkota B, Adhikari B, Upadhaya C. A study of assessment of partial edentulous patients based on Kennedy's classification at Dhulikhel hospital, Kathmandu University hospital. *Kathmandu Univ Med J (KUMJ).* 2013;11(14):325–7.
9. Ghosh A, Ghosh T. Modification of Kuppaswamy's socioeconomic status scale in context to Nepal. *Indian Pediatr.* 2009;46(12):1104–5.
10. McGivney G, Carr A. *McCracken's removable partial prosthodontics.* 10th ed. St. Louis (MO):Elsevier; 2000.
11. Phoenix R, Cagna D, DeFreest C. *Stewart's clinical removable partial prosthodontics.* 4th ed. Hanover Park (IL):Quintessence Pub.; 2008.
12. Epstein S. Importance of psychological and behavioral factors in food ingestion in the elderly and their ramification on oral health. *Gerodontology.* 1987;3(1):23-5.
13. Locker D, Slade G. Association between clinical and subjective indicators of oral health status in an older adult population. *Gerodontology.* 1994;11(2):108-14.
14. Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol.* 2003;31 Suppl 1:S3–23.
15. Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral disease and risks to oral health. *Bull World Health Organ.* 2005; 83(9):661-9.
16. Rana SB, Acharya B, Bhochhibhoya A, Sharma R, Acharya J, Mainali A. Patterns of partial edentulism based on Kennedy's classification among patients reporting to Nepal Medical College and Teaching Hospital. *Journal of Kathmandu Medical College.* 2018;74(26):153-7.
17. Avlund K, Holm-Pedersen P, Schroll M. Functional ability and oral health among older people: a longitudinal study from age 75 to 80. *Journal of the American Geriatrics Society.* 2001;49(7):954–62.
18. Fouda SM, Al-Harbi FA, Khan SQ, Virtanen JI, Raustia A. Missing teeth and prosthetic treatment in patients treated at College of Dentistry, University of Dammam. *Int J Dent.* 2017;2017:7593540.
19. Shrestha P, Bhagat T. Partial edentulism in patients visiting the dental out-patient department at the tertiary care centre in the eastern part of Nepal. *Journal of Nepalese Prosthodontic Society.* 2018;1(1):33-7.
20. Bhandari A, Manandhar A, Manandhar P. Partial edentulousness in patients visiting the dental out-patient department of Gandaki Medical College, Pokhara, Nepal. *Journal of Gandaki Medical College-Nepal.* 2019;12(2):28-31.
21. Gad MM, Abualsaud R, Al-Thobity AM, Al-Abidi KS, Khan SQ, Abdel-Halim MS, et al. Prevalence of partial edentulism and RPD design in patients treated at College of Dentistry, Imam Abdulrahman Bin Faisal University, Saudi Arabia. *Saudi Dent J.* 2020;32(2):74-9.
22. Vadavadagi SV, Srinivasa H, Goutham GB, Hajira N, Lahari M, Reddy GT. Partial Edentulism and its Association with Socio-Demographic Variables among Subjects Attending Dental Teaching Institutions, India. *J Int Oral Health.* 2015;7(Suppl 2):S60-3.

#### How to Cite

Parajuli PK, Basnet BB, Limbu IK, Suwal P. A hospital-based cross-sectional study to assess the pattern and trends of partial edentulism in BPKIHS and its teaching districts. *JBPKIHS.* 2020;3(2): 13-17.