

## ORIGINAL ARTICLE

# CORRELATION OF PREVALENCE OF VARIOUS KENNEDY'S CLASSES OF PARTIALLY EDENTULOUS CONDITIONS WITH THE PATTERN OF TOOTH LOSS - A CROSS SECTIONAL STUDY

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### ABSTRACT:

**Background:** In the past ten decades, the incidence and pattern of tooth loss has expectingly changed due to tremendous improvement in the dental health as a result of increased awareness and availability of modern materials and treatment modalities. So far not even a single study done in Indian population has been documented. This study is taken to correlate the prevalence of various Kennedy's classes of partially edentulous conditions with the pattern of tooth loss in the patients attending the Department of Prosthodontics, Crown and bridge. **Materials and methods:** Patients were examined thoroughly with the mouth mirror and probe for the missing teeth and will be classified according to Kennedy's classification. The patient is intervened to find out age. The collected data will be subjected to statistical analysis using test of proportion. **Results and Conclusion:** The most common class of partial edentulousness in the studied subjects irrespective of age and sex was Kennedy's class III. The incidence of partial edentulism in the mandible was more common than partial edentulism in the maxilla. The maximum incidence of Class III was encountered in age group lying between 18-30 years.

**Key words:** Removable partial denture classification, Kennedy's classification.

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## INTRODUCTION

Dr. Edward Kennedy in 1923 put forth a classification system that gained universal acceptance. In 1958, Applegate introduced a set of rules to govern the application of Kennedy's classification. Since then the Kennedy-Applegate classification has enjoyed undisputable acceptance and popularity worldwide. The classification was based on position of edentulous areas in relation to remaining teeth in the individual arch. In addition, the numbering of the classes, that is, Class I, II, III and IV

was based on the incidence of partially edentulous situations encountered clinically in those days.<sup>3</sup> At that time the most often encountered clinical scenario was that of bilateral edentulous spaces with no teeth remaining posterior to the edentulous spaces. Thus this pattern of edentulism was labelled as Class I and so on.

Today, it is important to emphasis that the work of stalwarts like Kennedy and Applegate, was put forth almost a century ago when the common denominator for the treatment of all dental problems was

extraction. Since then the dental profession has progressed with dramatic treatment options.<sup>8-11</sup>

Education, improved quantity and quality of dental services, changing attitudes towards teeth and health and an ever increasing dental IQ have ushered in this decline in edentulism, which at the current moment is most relevant to and evident in the developed countries.<sup>4,7</sup> Not only has the level of edentulism decreased, more importantly the pattern of edentulism has witnessed a changing trend.<sup>12-14</sup>

The level of edentulism and treatment needs have and must travel parallel roads. The bridge between the two has been the classification systems. When both the prior parameters are undergoing a constant change, the logical succession would be that the link between the two must also evolve. Here in arises the need for this study.

The present study was undertaken in the Department of Prosthodontics, KLE VK Institute of Dental

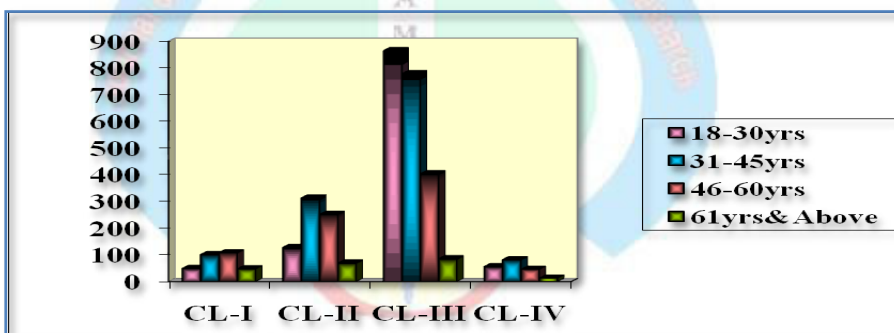
Sciences, Belgaum to correlate the prevalence of various Kennedy's classes of partially edentulous conditions with the existing pattern of tooth loss in the patients attending the Department of Prosthodontics, Crown and bridge. We also compared the prevalence of various classes in maxilla and mandible and further related the prevalence of various classes to age and sex.

**MATERIAL AND METHOD**

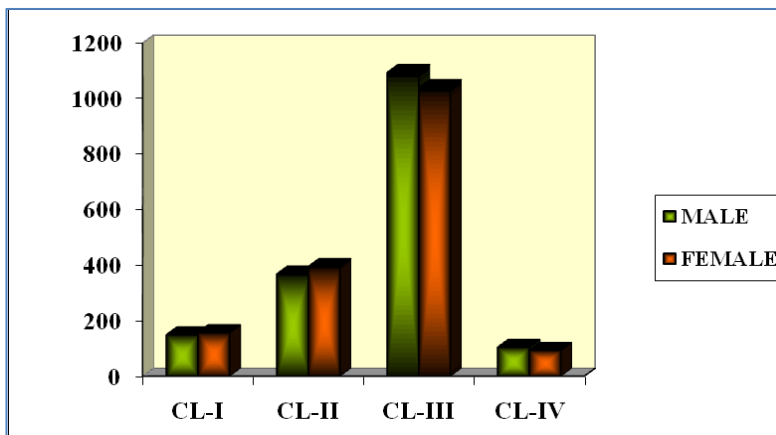
Partially edentulous subjects attending the Department of Prosthodontics and Crown and Bridge, KLE VK Institute of Dental Sciences, Belgaum, over a period of 2 years, on an out patient basis. Partially edentulous patients reporting to the Department of Prosthodontics and Crown and Bridge over a period of 2 years were included in the study. The data obtained was subjected to statistical analysis. The quantitative data was collected and analyzed. The categorical data was analyzed using 't' test.

**RESULTS**

**Graph 1:** Prevalence of Kennedy's classes in different age groups



**Graph 2:** Prevalence of partial edentulism in males and females.



**Table 1:** Variation of Kennedy’s classes in maxilla and mandible

MAXILLARY		MANDIBULAR	
CL-I	138	CL-I	168
CL-II	388	CL-II	375
CL-III	1064	CL-III	1070
CL-IV	78	CL-IV	119

**Table 2:** The prevalence of Kennedy’s classes in the study group

	CLASS-I	CLASS-II	CLASS-III	CLASS-IV
<b>ARCH</b>				
1. MAXILLARY	138	388	1064	78
2. MANDIBLE	168	375	1070	119
<b>AGE</b>				
1. 18-30yrs	49	128	865	56
2. 31-45yrs	101	313	779	82
3. 46-60yrs	108	252	404	46
4. 61yrs and Above	48	70	86	13
<b>SEX</b>				
1. MALE	149	368	1094	104
2. FEMALE	157	395	1040	93

**DISCUSSION**

A classification system that satisfied all the requirements was introduced in 1923 by Dr Edward Kennedy. Following its introduction, Applegate introduced a set of rules in 1958, to govern the application of Kennedy’s classification. Since that time Kennedy-Applegate classification has gained universal acceptance due to its simplicity. This classification system which is popular worldwide was based on two parameters. The first was the position of edentulous areas in relation to remaining teeth. The second important parameter was the prevalence of partially edentulous conditions encountered in a clinical setting.<sup>3</sup>

The cause of loss of teeth is most often reported to be caries, followed by periodontal disease. The teeth most commonly attacked by caries are the posteriors. This is because the morphology of these teeth is conducive to harboring caries producing bacteria. In times gone by, dental science, technique, material and experience were limited. The first line of treatment was extraction, thus accounting for the large number of cases with missing posterior teeth. Patients also had less motivation and awareness and they presented to the clinic only when their masticatory efficiency was significantly impaired due to bilateral missing posterior teeth. Since the prevalence of cases with bilateral missing posterior teeth was maximum, this

pattern of tooth loss was classified by Kennedy as class-I.

In recent times, there has been a dramatic fall in the level of edentulism in individuals. From 1970 onwards, organized preventive care has seen a marked decrease in the caries activity which in turn has resulted in an actual increase in the mean number of intact teeth per person. Probably the most important single factor in the declining caries activity has been the use of fluorides, both systemic and topical. Along with the use of fluoride, a strong emphasis on dental education and preventive care which is collaborated by advances in dental technology, have ushered in a new era of declining edentulism. The general population is also more aware, motivated and has better dental IQ than their counter parts of yester years. They thus have a desire to keep their own natural teeth. This positive attitude towards maintenance is the reason behind regular dental attendance. It also is the reason why extractions are now considered as a “last resort” treatment modality.<sup>1</sup> Another reason for the declining popularity of extractions is that today dentists have a wide array of treatment options available to them.<sup>1</sup> Thus, the prevalence of the pattern of partial edentulism is slowly changing. The pattern most commonly encountered in the past, unilateral and bilateral posterior edentulous spaces, is no longer the predominant pattern of tooth loss. An individual in

today's modern setting is more likely to present with one or two missing posterior teeth, thus making the class-III pattern of tooth loss more prevalent. Based on this assumption, the current study was undertaken to establish the validity and relevance of this observation.

The results of this study were in concurrence with this analogy (Refer table:1&2) Of the 2500 subjects surveyed, the number of cases having partial edentulism in maxilla was 1668. 138 of them fell under class I, 388 under class II, 1064 under class III and 78 under class IV. The number of cases having partial edentulism in mandible was 1732. 168 of these fell under class I, 375 under class II, 1070 under class III and 119 under class IV. Thus, it was seen that the order in which the different classes were encountered was Class III > Class II > Class I > Class IV.

There have been very few studies which have studied the prevalence of partial or complete edentulism in the general population. Thus there is a dearth of data on this subject. A significant study was carried out by Palmer in 1957 which surveyed a large employed group. This study showed that the patients having several missing teeth and thus needing removable partial dentures were in a majority as compared to those having fewer missing teeth and thus needing fixed partial dentures.<sup>19</sup> This study concluded that a greater number of individuals needed Kennedy's Class I and II dentures than Kennedy's Class III and IV.<sup>18</sup> The observations of the present study were in contrast to those of the previous two studies, showing a predilection towards a class III pattern of edentulism as compared to the other classes.

Recent studies carried out in developed countries, have shown that not only has there been a decline in the level of edentulism but the pattern of edentulism has also witnessed a changing trend. The posteriors still remain the most commonly lost or extracted teeth. However, with the increasing emphasis on education, improved dental services, changing attitudes towards teeth and their health and a superior dental IQ, patients no longer wait till they have lost all their posterior teeth before reporting to a dental facility. Thus the clinical scenario most commonly encountered in dental practices today is that of one or two missing posterior teeth bounded anteriorly and posteriorly by remaining natural teeth.<sup>4,6</sup>

The study also attempted to streamline its observations and correlate the findings with the age of the subjects. The subjects were categorized into 4 groups based on age. These were the 18-30, 31-45,

46-60 and above 61 years age groups. A common finding in all 4 groups was that Kennedy's class-III was the most prevalent pattern of tooth loss, followed by class-II, class-I and class-IV patterns. Despite the maximum prevalence of Kennedy's class-III in all age groups, there was a relative change in trends in the 46-60 and above 60 years age group. In these two age groups the class I pattern of edentulism was relatively more than in the 18-30yrs and 31-45yrs age group. The reason behind this variation in the pattern of edentulousness could possibly be the cause of loss of teeth in the different age groups. (Graph 1&2) The main cause of tooth extraction in individuals below the age of 45 years was caries while for individuals of older age group there was a considerable shift towards periodontal disease. Caries is a localized or generalized dental disease which can be approached by a multimodal treatment approach. Thus teeth lost to caries will generally be singular, showing a class III tooth loss pattern and are easily replaced prosthodontically. Severe loss of periodontal attachment in the older age groups is more commonly a generalized dental disease. The treatment approach to severe periodontal disease is inevitably eventual tooth loss or intentional tooth extraction. Thus patients afflicted with severe, generalized periodontal disease are more commonly associated with class I and II tooth loss patterns.<sup>6,8</sup>

The age groups of 18-30 and 31-45 years show an undisputed and distinct predominance of class-III pattern of tooth loss. Thus, these age groups display the most evident need for a change in the numbering of the classification system to favor the more prevalent pattern of tooth loss. The age group of 46-60 years and above 60 years show a relative increase in number of class-I and class-II pattern of tooth loss as compared to the previous 2 age groups. At face value, this appears to favor the original Kennedy's classification. However, this data was cross sectional and thus we must be cautious about attributing causality to the results.<sup>2</sup>

With regard to gender the results of this study did not show a major variation with regard to males and females. Both males and females showed a similar distribution of pattern of edentulousness. Females showed distinct prevalence of Kennedy's Class III pattern of loss in 18-30 and 36-45 age group. In the age groups above 46 years the class I and II patterns are more than in the previous age groups, however, the class-III pattern remains most prevalent. The class-IV pattern is the least prevalent in all age

groups. Males showed a similar pattern. The only difference was that the number of women attending the dental clinic was less than the number of men attending the clinic.<sup>7, 8, 9, 10</sup> The reasons for this could be that the Indian population is male dominated due to the age old preference for a male child in all social classes, religions and casts in India. Also, the female child has less exposure to health, nutrition and education, as it is still considered a waste in a vast segment of Indian society. However in recent years the trend seems to be changing due to longer life expectancy at birth and changing trends in mortality favoring women.<sup>32</sup>

Thus the results of this study show a distinct, though slow change in the trend in the pattern of edentulism. The most prevalent pattern of tooth loss has changed from Kennedy's I to Kennedy's class III. The order of classes now is class III > Class II > Class I > Class IV. The Kennedy's classification numbered the different classes as I, II, III and IV based on prevalence of each pattern of tooth loss seen in clinical settings. Since the prevalence of Kennedy's classification has changed, this indicates the need to change the numbering of Kennedy's classification to favor current conditions.<sup>11-14</sup>

However, the chief limitation of this study was that it was limited to a small target population. Also comprehensive comparison with previous surveys has not been established. Thus increasing or decreasing trends cannot be addressed accurately and specifically.<sup>7</sup> These limitations will have to be overcome to allow for a large scale application and acceptance the proposition put forth in this study.

## CONCLUSION

The most common class of partial edentulousness in the studied subjects irrespective of age and sex was Kennedy's class III. The incidence of partial edentulism in the mandible was more common than partial edentulism in the maxilla. The maximum incidence of Class III was encountered in age group lying between 18-30 years.

## REFERENCES:

1. Ainamo A, Ainamo J. The dentition is intended to last a lifetime. *Int Dent J* 1984; 34: 87-92.
2. Ettinger RL, Beck JD, Jakobsen J. Removable prosthodontic treatment needs. *J Prosthet Dent* 1984; 51: 419-427.
3. Curtis DA, Curtis TA, Wagnild GW, Finzen FC. Incidence of various classes of removable partial dentures. *J Prosthet Dent* 1992; 67: 664-667.
4. Ross CR. Oral health status in New Zealand. *Int Dent J* 1984; 34: 266-270.
5. Wall CH. Oral health status and tradition in Australia. *Int Dent J* 1984; 34: 271-277.
6. Reich E, Hiller KA. Reasons for tooth extraction in western states of Germany. *Community Dent Oral Epidemiol* 1993; 21: 379-383.
7. Brown LJ. Trends in tooth loss among U.S. employed adults from 1971-1985. *J Am Dent Assoc* 1994; 125: 533-540.
8. Morita M, Kimura T, Kanegae M, Ishikawa A, Watanabe T. Reasons for extraction of permanent teeth in Japan. *Community Dent Oral Epidemiol* 1994; 22: 303-306.
9. Takala L, Utriainen P, Alanen P. Incidence of edentulousness, reasons for full clearance, and health status of teeth before extractions in rural Finland. *Community Dent Oral Epidemiol* 1994; 22: 254-257.
10. Steele JG, Walls AWG, Ayatollahi SMT, Murray JJ. Major clinical findings from a dental survey of elderly people in three different English communities. *Br Dent J* 1996; 180: 17-23.
11. Suominen-Taipale AL, Alanen P, Helenius H, Nordblad A, Uutela A. Edentulism among Finnish adults of working age, 1978-1997. *Community Dent Oral Epidemiol* 1999; 27: 353-365.
12. Caldas AF. Reasons for tooth extraction in a Brazilian population. *Int Dent J* 2000; 50: 267-273.
13. Reich E. Trends in caries and periodontal health epidemiology in Europe. *Int Dent J* 2001; 51: 392-398.
14. Haugejorden O, Klock KS, Trovik TA. Incidence and predictors of self reported tooth loss in a representative sample of Norwegian adults. *Community Dent Oral Epidemiol* 2003; 31: 261-268.
15. Gamboa VT. Oral health status and traditions of the Philippines. *Int Dent J* 1984; 34: 257-260.
16. Majid ZA. Dental health in Malaysia. *Int Dent J* 1984; 34: 261-265.
17. Vignarajah S. various reasons for permanent tooth extractions in a Caribbean population-Antigua. *Int Dent J* 1993; 43: 207-212.
18. Mulay VB, Master SB. The prosthodontic needs of the Indian population. *J Indian Dent Ass* 1976: 175-180.
19. Palmer BB, Moen BD. A dental survey of an urban, unemployed population. *J Am Dent Assoc* 1957; 54: 56-68.
20. Kay EJ, Blinkhorn AS. The reasons underlying the extraction of teeth in Scotland. *Br Dent J* 1986; 160: 287-290.
21. Agerholm DM, Sidi AD. Reasons given for extraction of permanent teeth by general dental practitioners in England and Wales. *Br Dent J* 1988; 164: 345-348.
22. Harvey WL, Hoffman W. Ten year study of trends of removable prosthodontic service. *J Prosthet Dent* 1989; 62: 644-666.

23. Kalk W, M van Rossum GMJ, J van Waas MA. Edentulism and preventive goals in the treatment of mutilated dentition. *Int Dent J* 1990; 40: 267-274.
24. Pamlqvist S, Soderfeldt B, Arnbjerg D. Explanatory models for total edentulousness, presence of removable dentures and complete dental arches in a Swedish population. *Acta Odontol Scand* 1992; 50: 133-139.
25. Jepson NJA, Thomason JM, Steele JG. The influence of denture design on patient acceptance of partial dentures. *Br Dent J* 1995; 178: 296-300.
26. Brodeur JM, Benigeri M, Naccache H, Olivier M, Payette M. Evolution of edentulism in Quebec from 1980 to 1993. *J Dent Que* 1996; 62: 159-166.
27. Xie Q, Ainamo A. Association of edentulousness with systemic factors in elderly people living at home. *Community Dent Oral Epidemiol* 1999; 27: 202-209.
28. Trovik TA, Klock KS, Haugejorden O. Trends in reasons for tooth extractions in Norway from 1968-1998. *Acta Odontol Scand* 2000; 58: 89-96.
29. Jansson L, Lavstedt S. Influence of smoking on marginal bone loss and tooth loss- a prospective study over 20 years. *J Clin Periodontol* 2002; 29: 750-756.
30. Sadig WM. Removable Partial Denture Design: A study of a Selected Population in Saudi Arabia. *J Contemporary Dental Practice* 2002 November; 3(4): 40-53.
31. Shah N. Gender issues and oral health in elderly Indians. *Int Dent J* 2003; 53:475-484.
32. Paulander J, Axelsson P, Lindhe J, Wennstrom JL. *Acta Odontol Scand* 2001; 62: 214-222.
33. Allen F, Burke F, Jepson N. Development and evaluation of a self report measure for identifying type and use of removable partial dentures. *Int Dent J* 2005; 55: 13-16.
34. Oginni FO. Tooth loss in a sub urban Nigerian population: causes and pattern of mortality revisited. *Int Dent J* 2005; 55: 17-23.



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