

# Partial edentulousness in a rural population based on Kennedy's classification: An epidemiological study

Original Article

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## ABSTRACT

Edentulousness falls in a special category among the various conditions of dental origin. Tooth loss is the dental equivalent of mortality. A simple estimation of the proportion of the partial edentulous persons is a rough indication of the prevalence of dental diseases and the success or failure of dental care. The epidemiological features of partial edentulousness of one community or one village can be evaluated on the basis of a cross-sectional house-to-house survey. In this study a cross-sectional house-to-house survey was carried out at Herga village of Udupi District, Karnataka, India. The aim of this study is to evaluate the epidemiological features of partial edentulousness in the age group of 35-44 years in a rural population based on the Kennedy classification. Chi-square test was conducted and results were obtained and  $P$  value  $< 0.05$  was considered statistically significant.

**KEY WORDS:** Epidemiological features, gender, Kennedy classification, oral hygiene, partial edentulousness, socioeconomic status, survey, tooth loss

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## INTRODUCTION

Edentulousness falls in a special category among the various conditions of dental origin. Tooth loss is the dental equivalent of mortality. In a country like India with various and diversified cultures, different levels of socioeconomic status combined with the non-availability of resources for dental treatment leave much to be desired especially where the treatment of partial edentulousness is concerned. People living in rural and remote areas may follow a form of healthcare based on ancient traditions, beliefs and cultural habits. A major challenge for the dental profession will be to plan oral healthcare for this group of patients, and the attitudes of adults to healthcare and acceptance of treatment will be of fundamental interest. To organize and implement adequate strategies for the prevention and treatment of oral diseases more information is required about the reasons for extraction of permanent teeth. The frequency of partial edentulousness seems to vary widely between different countries. The prevalence and patterns of tooth

loss have been studied to a certain extent in western countries and a few such studies have been carried out in this country. A simple estimation of the proportion of partially edentulous persons is a rough indication of the prevalence of dental diseases and the success or failure of dental care. This forms a background for the assessment of treatment needs. Owing to the large Indian population, a nationwide survey cannot be done. However, the epidemiological features of partial edentulousness of one community or one village can be evaluated on the basis of a cross-sectional house-to-house survey.

## AIMS AND OBJECTIVES

1. To study the epidemiological features of partial edentulousness in the age group 35-44 years in a rural population based on the Kennedy classification.
2. To evaluate the incidence of various Kennedy's classes of partial edentulousness.
3. To assess the gender ratio among the partially edentulous subjects.

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4. To correlate the gender difference and socioeconomic parameters in partial edentulousness and their awareness for replacement.

## MATERIALS AND METHODS

This cross-sectional house-to-house survey was carried out at Herga village of Udipi District, Karnataka, India. It is situated 4 km from Manipal College of Dental Sciences, Manipal. According to the 2001 census, the total population of the village is 10,984. Total number of males is 5,647 and females are 5,337. The group studied is 35 to 44 years, constituting 2,200 of the total population. A majority of the population was found to have a mixed diet. The survey was conducted on 350 individuals who were considered to be residents of the area. Among them 147 (42%) were males and 203 (58%) were females.

The following criteria were used in sample selection.

- Individuals in the age group of 35-44 years were considered in the study.
- Only permanent dentition was considered.
- The study population was divided into two clusters.
- Sample size proportional to size was selected from each of the two clusters.
- A list of houses with people in the age group of 35-44 years was prepared from each cluster.
- The individuals were selected by a simple random sampling.

A pre-tested pro forma was used, which included name, age, sex, socioeconomic status and particulars regarding personal history and dental history. Data were collected by a house-to-house survey. On-the-spot oral examination was carried out by the same examiner.

Criteria used for recording the data in the study:

### Socioeconomic status

- i. Income: For evaluation patients were grouped into different categories according to their monthly income, representing the lower, middle and higher income of social status in our country.
- ii. Education: It is divided into three categories.
  - Illiterate – People who do not know how to read or write.
  - Basic Primary education – People who can read and write, or sign their names
  - Secondary education and above – People who are educated.
- iii. Occupation: Divided into unemployed and employed.

### Oral hygiene

It is divided into 3 categories.

1. Good: No visible food debris, calculus and stains on the teeth surface.
2. Fair: No visible food debris, flecks of calculus is seen on the lingual surfaces of lower anterior.
3. Poor: Generalized calculus, stains, generalized visible food debris is seen on the tooth surface.

## RESULTS

Data was analyzed using statistical package SPSS. Chi-square test was conducted and results were obtained and  $P$  value  $< 0.05$  was considered statistically significant. The survey included 350 individuals in the age group of 35-44 years. There were 203 (58%) female and 147 (42%) male participants in the survey. As per the family monthly income, 34 (9.7%) individuals came from families with income less than Rs 2000, 136 (38.9%) from income Rs 2000-5000 and the remaining 180 (51.4%) individuals were from monthly income group above Rs 5000. As per the educational status 5 (1.4%) individuals never attended school, 95 (27.1%) had basic primary education and the remaining 250 (71.4%) had secondary education or above. According to their employment status, 95 (27.1%) were not employed and the remaining 255 (72.9%) were employed. Among the surveyed population there were 261 partially edentulous constituting 74.6% of the total population. The remaining 89 (25.4%) patients were dentulous.

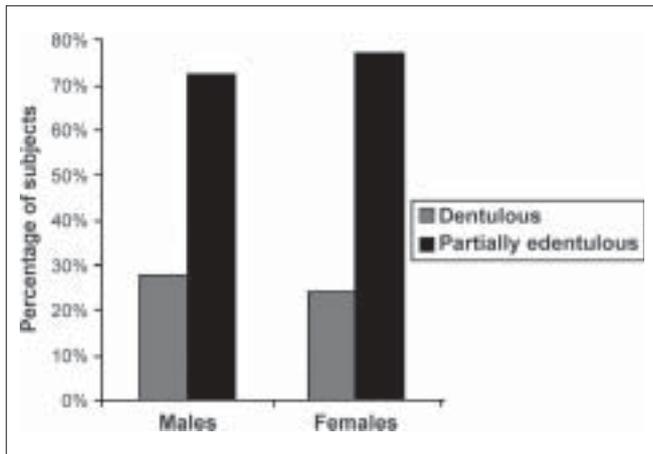
Figure 1 shows distribution of dentulous and partially edentulous subjects according to sex. Out of 147 male subjects, 106 (72.1%) were partially edentulous and the remaining 41 (27.9%) were dentulous. Out of total 203 females, 155 (76.4%) were partially edentulous and the remaining 48 (23.6%) were dentulous. There was no statistically significant difference between partial edentulism and gender.

Figure 2 shows the correlation between different socioeconomic parameters and partial edentulism. There was a statistically significant correlation between monthly family income and partial edentulism ( $P = 0.005$ ). As income increases, the incidence of partial edentulism decreases.

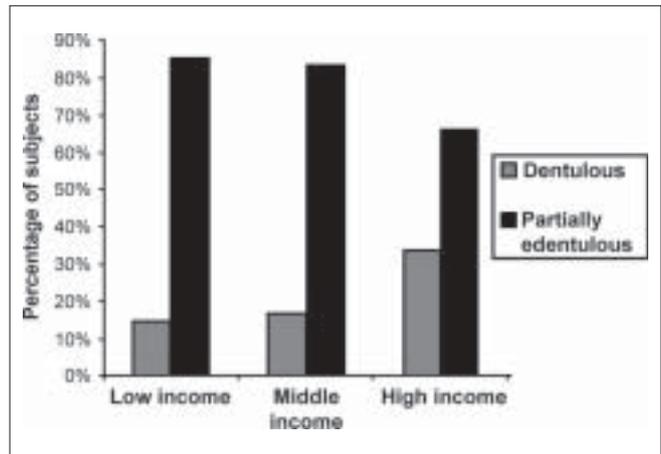
There was no statistically significant correlation between partial edentulism and educational status ( $P$  value 0.132).

Table 1 shows correlation between employment and partial edentulism. There is a significant correlation between employment and partial edentulism ( $P = 0.001$ ), suggesting partial edentulism is less in the employed compared to the unemployed group.

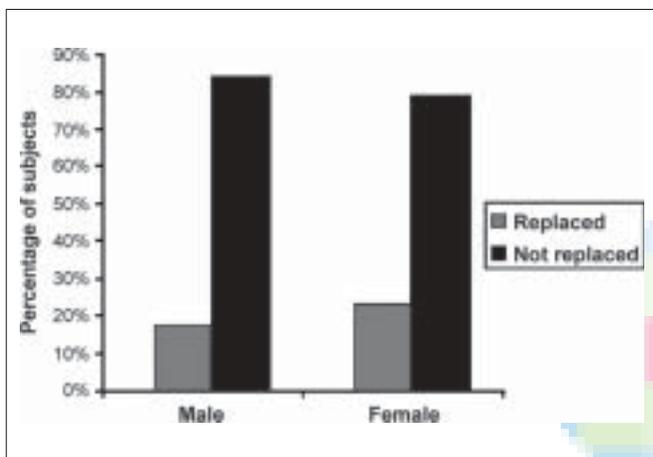
Figure 3 shows there is no statistically significant correlation between replacement of missing teeth and gender ( $P = 0.242$ ).



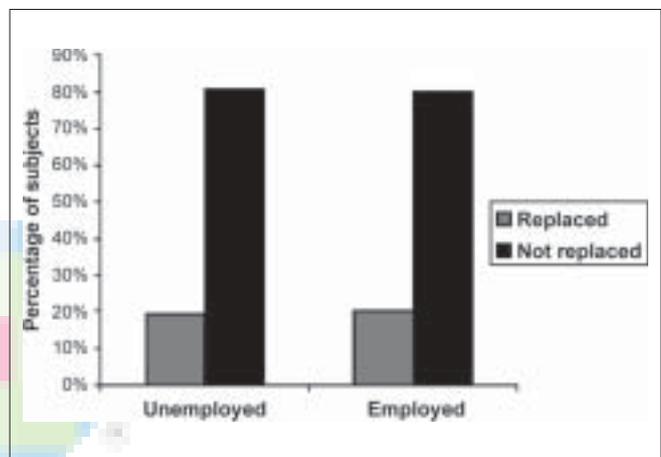
**Figure 1:** Distribution of dentulous and partially edentulous subjects by sex



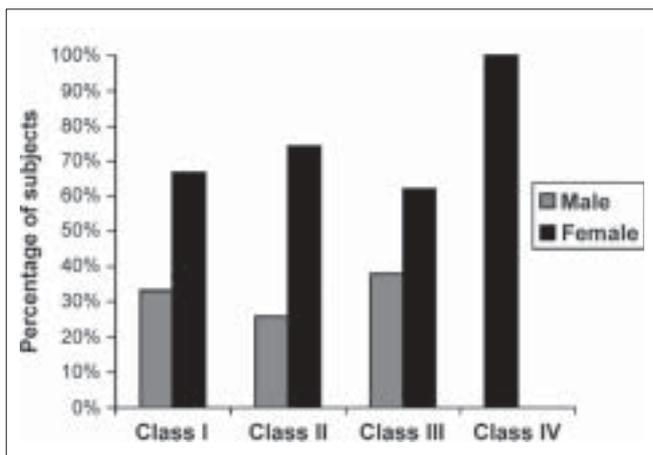
**Figure 2:** Distribution of partially edentulous subjects by income group



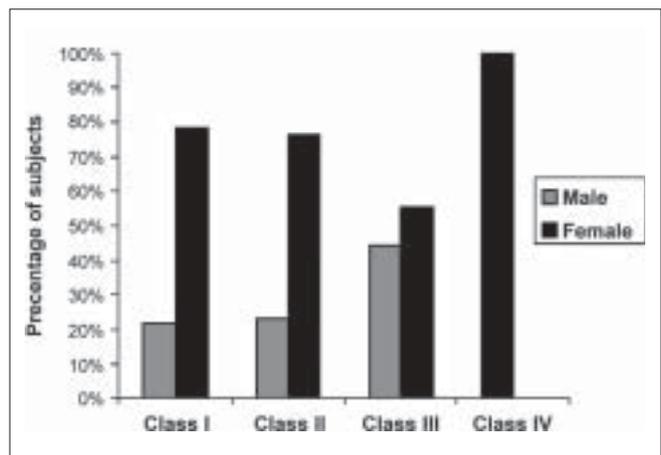
**Figure 3:** Distribution of partially edentulous subjects correlating replacement of missing teeth and gender



**Figure 4:** Distribution of partially edentulous subjects correlating replacement of missing teeth and employment



**Figure 5:** Distribution of partially edentulous subjects by gender and Kennedy classification of upper arch



**Figure 6:** Distribution of partially edentulous subjects by gender and Kennedy classification of lower arch

Table 2 shows the correlation between replacement of missing teeth and income. The correlation between income and replacement of missing teeth is statistically

significant ( $P = 0.026$ ).

Table 3 shows the correlation between replacement of

**Table 1: Distribution of partially edentulous subjects according to occupation**

	Unemployed (%)	Employed (%)	Total (%)
Dentulous	11 (11.6)	78 (30.6)	89 (25.4)
Partial edentulism	84 (88.4)	177 (69.4)	261 (74.6)
Total	95 (100)	255 (100)	350 (100)

**Table 3: Distribution of partially edentulous subjects correlating replacement of missing teeth and education**

	Not attended school (%)	Only primary education (%)	Secondary education or above (%)	Total (%)
Replaced	1 (20)	4 (5.3)	46 (25.7)	51 (19.7)
Not replaced	4 (80)	71 (94.7)	133 (74.3)	208 (80.3)
Total	5 (100)	75 (100)	179 (100)	259 (100)

**Table 4: Partial edentulous subjects classified according to Kennedy's classification**

Kennedy's class	Upper arch (%)	Lower arch (%)	Total (%)
I	15 (9.1)	32 (13.5)	47 (11.5)
II	31 (18.8)	30 (12.5)	61 (15)
III	118 (71.5)	175 (72)	293 (72)
IV	1 (0.6)	5 (2)	6 (1.5)
Total	165 (100)	242 (100)	407*

\*Total number is 407 (more than 350) as some patients had both upper and lower arch teeth missing

**Table 7: Distribution of surveyed subjects by their oral hygiene status**

	Good (%)	Fair (%)	Poor (%)	Total (%)
Dentulous	30 (66.7)	40 (16.9)	19 (27.5)	89 (25.4)
Partially edentulous	15 (33.3)	196 (83.1)	50 (72.5)	261 (74.6)
Total	45 (100)	236 (100)	69 (100)	350 (100)

missing teeth and education. This suggests a higher probability of replacement in persons with secondary education and above compared to other groups ( $P = 0.001$ ).

Figure 4 shows the correlation between replacement of missing teeth and employment. There was no statistically significant correlation between replacement of missing teeth and employment status.

Table 4 shows the incidence of missing teeth according to various Kennedy's classifications.

Figure 5 shows the correlation between gender and various classes of partial edentulous according to Kennedy classification of the upper arch. There is statistically significant correlation between gender and various classes of partial edentulousness in the upper arch.

**Table 2: Distribution of partially edentulous subjects correlating replacement of missing teeth and income**

	Low income (%)	Middle income (%)	High income (%)	Total (%)
Replaced	1 (3.4)	20 (18.0)	30 (25.2)	51 (19.7)
Not replaced	28 (96.6)	91 (82.0)	89 (74.8)	208 (80.3)
Total	29 (100)	111 (100)	119 (100)	259 (100)

**Table 5: Distribution of partially edentulous subjects by the reasons for loss of teeth**

	Frequency	Percent
Periodontal	39	11.1
Caries	254	72.6
Trauma	7	2
Others	1	0.3

**Table 6: Distribution of partially edentulous subjects by the reasons for non-replacement**

	Frequency	Percent
Socioeconomic status	13	3.7
Ignorance	12	3.4
Occupational timings	28	8
No motivation	135	38.6
Bad experience in the past	20	5.7

Figure 6 shows the correlation between gender and various classes of partial edentulousness in the lower arch. There was a significant correlation found between gender and various classes of partial edentulous situations in lower arch as shown by the statistical significance ( $P = 0.001$ ).

Table 5 shows partially edentulous subjects by reasons for loss of teeth. Most subjects lost their teeth due to caries and the next common factor is periodontal breakdown.

Table 6 shows partially edentulous subjects by reasons for non-replacement. The single important reason for not replacing their missing teeth is lack of motivation.

Table 7 shows distribution of dentulous and partially edentulous subjects according to oral hygiene status. There was a statistically significant correlation between oral hygiene status and partial edentulism ( $P = 0.001$ ); as oral hygiene status deteriorates partial edentulousness increases.

## DISCUSSION

Persons of age group 35 to 44 years were surveyed. This age group was chosen as per the WHO guidelines as this category exhibited maximum partial edentulousness. It was seen that the number of partially edentulous females, 155 (76.4%), outnumbered the males, 106 (72.1%). This is in accordance with earlier studies,

which have reported more females than males having partial edentulousness.<sup>[1-4]</sup> Females in this surveyed group had a lower level of education and employment status, because of which they had to depend on the male members of the family to take them for treatment. This could be a possible reason for more females being partially edentulous. A higher proportion of males (41, 27.9%) were dentulous compared to females (48, 23.6%). This could be because most males were employed and had better access to treatment. This is in agreement with the study by Udani.<sup>[5]</sup> Some earlier studies have also shown significant gender difference in edentulism with more males becoming edentulous than females.<sup>[6,7]</sup> These authors attributed it to the fact that males are more active than females and do not pay much attention to oral care. It is observed that the percentage of population who are in the lower and middle income groups exhibited a greater proportion of partial edentulousness (85.3%, 83.1%) as compared to the high income group (66.1%). This could be attributed to the fact that the lower income group people could not have afforded treatment procedures that would have saved their tooth in question and therefore opted for extraction, which contributed to high percentage of tooth loss. This is in correlation to the findings of Palmer and Moen,<sup>[8]</sup> Ronald<sup>[9]</sup> and Pallegedara.<sup>[10]</sup> The population who had basic primary education or less had a higher percentage of partially edentulous people than those who had secondary education or above. Similar observations were made by Ronald,<sup>[9]</sup> Micheelis,<sup>[11]</sup> Hogijorgen,<sup>[12]</sup> Shah<sup>[13]</sup> and Pallegedara.<sup>[10]</sup> This could be due to lack of awareness about oral health among less educated people. It was observed that more unemployed people were partially edentulous (88.4%) than employed (69.4%). This could be due to the fact that employed people being more concerned about their teeth and appearance, seeking dental treatment and advice more often. Similar observations were recorded by Ronald.<sup>[9]</sup> Dental caries was the most important reason for tooth loss in our study population. It constituted about 254 (72.6%) followed by periodontal disease 39 (11.1%), trauma 7 (2.0%) and others 1 (0.3%). This finding confirmed that caries remains a problem in adults of this age group (35-44 years). This finding agreed with other studies.<sup>[14-17]</sup> The fact that dental caries is the leading cause of tooth loss may be attributed to the changes in dietary patterns, a departure from coarse/tough and fibrous diet to more cariogenic refined carbohydrate-rich food, socioeconomic background and lifestyle of the people over the years.

The percentage of replacement was higher in females. This could be because women had a better health seeking behavior and are more conscious of their appearance. In our study replacement of missing teeth

is associated more with the higher income group. This could be because the high income group could afford the dental treatment. This finding correlates with the findings of Hobdel *et al.*,<sup>[18]</sup> Ettinger,<sup>[9]</sup> Shah<sup>[13]</sup> and Pallegedara.<sup>[10]</sup> In this study it was found that the lower the level of education, the fewer people have gone for replacement of their missing teeth. This could be because those with higher education are more informed about their health needs and may seek dental treatment earlier and more often than those of lower educational status who may only seek dental treatment when there is apparent morbidity. This is in agreement with Brodeur *et al.*,<sup>[19]</sup> and Pallegedara.<sup>[10]</sup> In our study population those individuals who have not gone for replacement gave various reasons. Among them, out of 208, 135 (38.6%) have not replaced their missing teeth due to lack of motivation, about 8% because of their occupational time constraints, 5.7% due to bad experience in the past, 3.7% due to low socioeconomic status and about 3.4% due to ignorance. According to Pallegedara (2005), among the non denture wearers who perceived a need for dentures, a majority had cited "cost" as the main barrier for obtaining dentures.<sup>[10]</sup> The oral hygiene status was assessed visually. With respect to the dentulous population, a greater number exhibited good or fair oral hygiene status while in the partially edentulous subjects, a greater number had either fair or poor oral hygiene status. This could be one of the reasons for the loss of teeth in the partially edentulous subjects. This result is in agreement with the study done by Burt *et al.*, in 1985.<sup>[20]</sup> In the present study, Kennedy's class III is the most frequent type of partial edentulousness (72%), followed by class II (15%), class I (11.5%) and lastly class IV (1.5%) in the age group 35-44 years. It was also noted that partial edentulousness was more common in the mandible as compared to the maxilla. This could be due to the fact that awareness is better in subjects of the age group surveyed in this study and also since the molar is the first tooth to erupt in the oral cavity, having a higher caries percentage and a higher chance of the tooth being extracted. Mandibular teeth were lost early because lower teeth erupt earlier in the oral cavity and this is probably related to the general pattern of tooth loss. Of the various classes of partial edentulousness a higher number of subjects with a Kennedy class IV situation got their teeth replaced which could be attributed to esthetic reasons. This was followed by class I and class II situations; the main reason could be for masticatory purposes. However subjects with class III situations had the least percentage of replacement, which could be because they had a higher option of getting their teeth replaced with a fixed partial denture or an implant which might have been beyond their affordability.

## CONCLUSION

The present study was carried out in a rural population of Herga village, Udupi district, Karnataka, India. A total of 350 subjects of age group 35-44 years were surveyed. Among them 147 (42%) were males and 203 (58%) were females. The incidence of partial edentulousness, relationship with gender, socioeconomic parameters like income, education and occupation, awareness to replace teeth and the incidence of various classes of partial edentulousness were studied. Among the surveyed population 261 (74.6%) were partially edentulous and the remaining 89 (25.4%) were dentulous.

The following were the conclusions drawn from this study:

1. Kennedy class III is the most common class of partial edentulousness in the age group of 35-44 years.
2. Mandibular partial edentulism is more common than maxillary partial edentulism.
3. There is no significant correlation between gender and partial edentulism.

4. There is reduction in partial edentulousness with higher income and higher education status.
5. There was a relationship between subjects who got their teeth replaced and their gender status with females having a higher percentage of replacement.
6. Socioeconomic parameters like education, occupation and income have a direct influence upon awareness for replacement. Lack of motivation was found to be the most common reason for not seeking treatment.
7. Poor oral hygiene is associated with higher incidence of partial edentulousness. As low family income, lower literacy and lack of motivation are associated with higher partial edentulism, dental professionals should try to educate these groups of people more intently. A greater awareness regarding proper dental hygiene and timely replacement of the missing teeth needs to be stressed among the general public. With increasing level of literacy and positive social changes, the prosthodontist should brace to face the challenges that may arise from an increased removable partial denture demand.

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