Assessment of Pattern of Partial Edentulism and its Correlation with Age, Gender, Arch and Socioeconomic Status

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ABSTRACT

Background and Objectives: *The partial edentulism is the condition where one or few teeth are missing in one or both the dental arches of an individual. There are various reasons for the loss of teeth. In spite of advancement and conduction of awareness of dental treatment; there are still individuals with partial edentulism are present in the country. The correlation has been found between the partial edentulism and the different age groups, gender and according to socioeconomic status. So we also decided to conduct such kind of study in our institute. The aim of this study was to assess the pattern of partial edentulism according to Kennedy's classification its correlation of pattern of partial edentulism with age, gender, arch and socioeconomic status.* ***Methods:*** *A cross sectional survey was conducted among the partial edentulous patients visiting to institute. Kennedy's Classification with or without modifications was recorded after applying Applegate's rules to record the patterns of partial edentulism for over a period of one year.* ***Results:*** *Total 1965 dental arches were examined. In which 1036 were mandibular arches and 929 were maxillary arches. The Kennedy's classification of Class III was maximum i.e. 1055 (54%).* ***Conclusion:*** *Kennedy's Class III is the most common pattern of partial edentulism. There was a statistically significant correlation between the partial edentulism with age and socioeconomic status of the patients while correlation with arch and gender was found to be non-significant. Dental caries (54.35%) was the most common cause of tooth loss. Among 1461 patients; 1251 (85.62%) were without prosthesis.*

Keywords: Kennedy's classification, Age, Gender, Socioeconomic status, Arch, Nagpur

INTRODUCTION

If your teeth are in good condition, then your health is good. Loss of tooth/teeth causes various problems. Due to tooth loss there is a migration of adjacent teeth and supra eruption of opposite teeth occurs. At the same time speech gets altered and also there is a change in facial appearance and the person gets psychologically disturbed. The big impact of tooth loss is that it hampers the one's quality of life by affecting the confidence level, weight loss and restricted dietary and social activities [1,2].

An edentulous space means a gap in the dental arch which could've been engaged by one or more teeth. It can be complete or partial. A dental arch in which one or more but not all natural teeth are absent is partial edentulousness. There could be various causes for tooth loss among which; caries, periodontal diseases, and trauma are the ones commonly described. In the literature it is found that dental caries is the main reason for tooth loss; but, periodontal diseases have also been mentioned as a causative factor to tooth loss in families as well as elders [3,4].

Different methods of partial edentulism classification have been described in the books [5].

A classification of partially edentulous arches helps to identify relation of remaining teeth to edentulous ridges; and eases communication, discussion, and comprehension of the suggested prosthetic treatment among dentists, students and technicians [6].

At present, Kennedy's classification is the most commonly accepted and used because of its simplicity, ease of application to all partially dentulous arches, instant recognition of the type of tooth-borne and tooth-tissue-borne partial edentulism [7]. By various numbers of partially-edentulous combinations have been reduced to four main and simple groups namely Class I, Class II, Class III, and Class IV [8].

The various causes and patterns of tooth loss in the public assist in representing the levels of oral hygiene, dental health awareness and the management of exodontias [9].

There are many studies conducted throughout the world. Such type of surveys should be conducted regularly so that the awareness of the population can be getting it to notice and accordingly the treatment needs can be provided. So, the authors decided to conduct such type of survey in our institute who visited outpatient department for the treatment. In this survey we also assessed the patients who were already wearing prosthesis and also how many of them need prosthesis for the missing teeth.

AIMS AND OBJECTIVES

The aim of this study was to assess the pattern of partial edentulism according to Kennedy's classification and the objective of this study was:

- To assess the pattern of partial edentulism according to kennedy's classification.
- To assess the correlation of pattern of partial edentulism with age, gender, maxillary/ mandibular arch, socioeconomic status.
- To assess the causes of tooth loss.

MATERIAL AND METHODS

Study Design
A cross sectional study was designed.

Study Setting
This study was conducted at the Ranjeet Deshmukh Dental College & Research Centre (Formerly VSPM Dental College), Nagpur (MS), India, and Maharashtra.

Ethical Consideration
Institutional ethical committee approval was obtained with dated September 14, 2017 and reference number (IEC/VSPMDCRC/45/2017).

Participant's Selection Procedure
Partial edentulous patients visiting to outpatient department of institute for a period of one year were examined. The inclusion criterion was both male and female patients having partial edentulism either in maxillary or mandibular arch of the age of 17 and above. The exclusion criterion was completely edentulous patients, patient with full dentition and patients with extracted teeth for orthodontic purpose.

Study Size

A sample size of 1461 was obtained within the selected study period of one year (September 2017 to August 2017) as per the inclusion criteria of sample selection.

Study Procedure

The data was collected by visual examination by sitting the patient on dental chair and examined with the help of mouth mirror. The interns posted in the department were instructed to document the data on the study form which consists of patient's age, gender, Kuppuswamy's socioeconomic scale to know the socioeconomic status of the patients, number of missing teeth, causes of tooth /teeth loss, need of prosthesis and how many patients have prosthesis [9]. Kennedy's Classification with or without modifications was recorded after applying Applegate's rules to record the patterns of partial edentulism.

Statistical Methods

To get the result; the data was inserted in MS-excel and frequency was calculated on percentage basis and to find out the significance level; the chi square test was applied which was set at a $p \leq 0.05$ and ≤ 0.01 level.

RESULTS

There were about 1461 patients were examined during the one year period of the study. Out of 1461, 643 (44.01%) were female and 818 (55.98%) were male patients. About 425 (29%) of patients were having partial edentulism in upper arch, 532 (36%) in lower arch and followed by 504 (34%) in both arches.

Let us see the observations according to the objectives of the present study:

The Pattern of Partial Edentulism According to Kennedy's Classification

About 1965 partial edentulous arches were examined among 1461 patient. In that 929 arches were of maxilla and 1036 were of mandible. The frequency of Kennedy's classification of Class III was maximum ie 1055 (54%), followed by Kennedy's classification Class II; 471 (24%), Class I; 235 (12%) and lastly class IV; 204(10%). The detail classification with its modification is given in table 1.

Table 1 Kennedy's classification with its modification

Kennedy's Classification	Total Arches (1965)	%
Class I	150	7.63%
Class I modification 1	57	2.9%
Class I modification 2	19	0.97%
Class I modification 3	9	0.46%
Total	235	12%
Class II	262	13.33%
Class II modification 1	158	8.04%
Class II modification 2	38	1.93%
Class II modification 3	11	0.56%
Class II modification 4	2	0.1%
Total	471	24%
Class III	732	37.25%
Class III modification 1	274	13.94%
Class III modification 2	35	1.78%

Class III modification 3	12	0.61%
Class III modification 4	2	0.1%
Total	1055	54%
Class IV	204	10%

To Assess the Correlation of Pattern of Partial Edentulism with Maxillary/Mandibular Arch

Out of 1965 arches; the partial edentulism arches is outnumbered in mandibular jaw; 1036 (52.72%) as compare to 929 (47.27%) of maxillary arch. While comparing the distribution of Kennedy's classification; 540 (52%) of Kennedy's Class III classification is seen in mandibular arch as compare to 515 (55%) in maxillary arch.

While, 271 (26%) of Kennedy's Class II classification is seen in mandibular arch as compare to 200 (22%) in maxillary arch. At the same time Kennedy's Class I and Class IV classification is found near about same in both arches. Statistically; the correlation of pattern of partial edentulism with maxillary/ mandibular arch was found to be non-significant. The detailed result is given in table 2.

Table 2 To assess the correlation of the pattern of partial edentulous arches with maxillary and mandibular arch

Kennedy's classification	Maxillary arches	Mandibular arches	Total arches
Class I	110 (12%)	125 (12%)	235 (12%)
Class II	200 (22%)	271 (26%)	471 (24%)
Class III	515 (55%)	540 (52%)	1055 (54%)
Class IV	104 (11%)	100 (10%)	204 (10%)
TOTAL	929	1036	1965 (100%)

Interpretation of Chi square test: Calculated value: 6.523928923, Tabulated value/Critical value: 7.81, Degree of freedom: 03

As the calculated value is smaller than tabulated value the correlation is NON-SIGNIFICANT at 0.05 levels.

To Assess the Correlation of Pattern of Partial Edentulism with Age

The 1461 patients were distributed in seven age groups from 19 years and below to 70 years and above. The correlation is assessed with both arches. The frequency of distribution of Kennedy's classification of Class I is more frequent in age group of 60 years to 69 years i.e. 46 (22.54%) in maxillary arch and 13 (21.66%) in age group of 70 years to 79 years in mandibular arch. The Kennedy's Class II arches was found more frequent in age groups of 70 years to 79 years in maxillary arch 22 (41.50%) while, 71 (30.75%) was seen in age group of 60 years to 69 years in mandibular arch. The frequency of The Kennedy's Class III arches was found in 20 years to 29 years age group i.e. 57 (69.51%) in maxillary arch and 8 (66.66%) arches were found in age group of below 20 years in mandibular arch. The frequency Kennedy's Class IV arches was found below 20 years age group which is 5 (50%) and in mandibular arch it is about 10 (13.69%) in age group of 20 years to 29 years.

Statistically; the correlation of pattern of partial edentulism with age with both maxillary & mandibular arch was found to be significant at 0.01 levels as shown in detail in table 3(a) and table 3(b).

Table 3(a) To assess the correlation of the pattern of partial edentulous arches with age-maxillary arch

Kennedy's classification	Below 20 years	20 years-29 years	30 years-39 years	40 years-49 years	50 years-59 years	60 years-69 years	70 years and Above
Class I	0	3 (3.65%)	6 (4.16%)	14 (6.73%)	35 (14.70%)	46 (22.54%)	6 (11.32%)
Class II	0	5 (6.09%)	32 (22.22%)	45 (21.63%)	48 (21.05%)	48 (23.52%)	22 (41.50%)
Class III	5 (50%)	57 (69.51%)	93 (64.58%)	121 (58.17%)	125 (54.82%)	92 (45.09%)	22 (41.50%)
Class IV	5 (50%)	17 (20.73%)	13 (9.02%)	28 (13.46%)	20 (8.77%)	18 (8.82%)	3 (5.66%)
Total: 929	10 (1.07%)	82 (8.82%)	144 (15.50%)	208 (22.38%)	228 (24.54%)	204 (21.95%)	53 (5.70%)

Interpretation of Chi square test: Calculated value: 97.78089111, Tabulated value/Critical value: 34.805, Degree of freedom: 18. As the calculated value is greater than tabulated value the correlation is SIGNIFICANT at 0.01 level.

Table 3(b) To assess the correlation of the pattern of partial edentulous arches with age-mandibular arch

Kennedy's classification	Below 20 years	20 years-29 years	30 years-39 years	40 years-49 years	50 years-59 years	60 years-69 years	70 years and Above
Class I	0	4 (5.47%)	4 (2.5%)	31 (12.65%)	31 12.15(%)	42 (18.18%)	13 (21.66%)
Class II	3 (25%)	15 (20.54%)	37 (23.12%)	62 (25.30%)	67 (26.27%)	71 (30.73%)	16 (26.66%)
Class III	8 (66.66%)	44 (60.27%)	105 (65.62%)	136 (55.51%)	123 (48.23%)	96 (41.55%)	28 (46.66%)
Class IV	1 (8.33%)	10 (13.69%)	14 (8.75%)	16 (6.53%)	34 (13.33%)	22(9.52%)	3 (5%)
Total: 1036	12 (1.15%)	73 (7.04%)	160 (15.44%)	245 (23.64%)	255 (24.61%)	231 (22.29%)	60 (5.79%)

Interpretation of Chi square test: Calculated value: 53.77525349, Tabulated value /Critical value: 34.805, Degree of freedom: 18. As the calculated value is greater than tabulated value the correlation is SIGNIFICANT at 0.01 levels.

To Assess the Correlation of Pattern of Partial Edentulism with Gender

Out of 1965 partially edentulous arches; 1120 (57%) was of male patients and 845 (43%) of female patients. The frequency of Kennedy's classification of I, II, and IV was found more in male patients which was about 140 (12.5%), 272 (24.28%), and 129 (11.51%) respectively while Class III is more frequent in female patients 476 (56.33%).

Statistically; the correlation of pattern of partial edentulism with gender was found to be non-significant at 0.05 levels as shown in detail in table 4.

Table 4 To assess the correlation of the pattern of partial edentulous arches with gender

Kennedy's classification	Male	Female	Total
Class I	140 (12.5%)	95 (11.24%)	235 (12%)
Class II	272 (24.28%)	199 (23.55%)	471 (24%)
Class III	579 (51.69%)	476 (56.33%)	1055 (54%)
Class IV	129 (11.51%)	75 (8.87%)	204 (10%)
Total	1120 (57%)	845 (43%)	1965 (100%)

Interpretation of Chi square test: Calculated value: 5.91105551, Tabulated value/Critical value: 7.81, Degree of freedom: 03. As the calculated value is smaller than tabulated value the correlation is non-significant at 0.05 levels.

To Assess the Correlation of Pattern of Partial Edentulism with Socioeconomic Status of Patients

The frequency of Kennedy's classification of I, and II was found more in SES V which is about; 6 (20%) and 11 (36.66%) while frequency of Class III is found more in SES III 362 (56.73%) and class IV frequency is again seen more in SES V which is about 4 (13.33%).

Statistically; the correlation of pattern of partial edentulism with SES was found to be significant at 0.05 levels as shown in detail in table 5.

Table 5 To assess the correlation of the pattern of partial edentulous arches with socioeconomic status of patients

Kennedy's classification	SES I	SES II	SES III	SES IV	SES V	Total
Class I	11 (11.11%)	58 (9.09%)	88 (11.59%)	72 (16.40%)	6 (20%)	235 (12%)
Class II	24 (24.24%)	156 (24.24%)	170 (22.39%)	110 (25.05%)	11 (2.33%)	471 (24%)

Class III	52 (52.52%)	362 (56.73%)	419 (55.20%)	213 (48.51%)	9 (30%)	1055 (54%)
Class IV	12 (12.12%)	62 (9.71%)	82 (10.80%)	44 (10.02%)	4 (13.33%)	204 (10%)
Total	99 (5.03%)	638 (32.46%)	759 (38.62%)	439 (22.34%)	30 (1.52%)	1965 (100%)

Interpretation of Chi square test: Calculated value: 24.2505035, Tabulated value/Critical value: 21.03, Degree of freedom: 12. As the calculated value is greater than tabulated value the correlation is significant at 0.05 levels.

To Assess the Causes of Tooth/Teeth Loss
Out of 1461 patients; maximum 794 (54.35%) of them gave dental caries was main cause of tooth/teeth loss followed by periodontal 335 (22.93%) and other reasons as given in detail in table 6.

Table 6 To assess the causes of tooth loss

Causes	Numbers	%
Caries	794	54.35
Periodontal	335	22.93
Trauma	125	8.56
Caries/ Periodontal	151	10.34
Caries/Trauma	23	1.57
Periodontal/Trauma	6	0.41
Neoplasm	3	0.21
Insignificant	24	1.64
Total	1461	100%

To Assess the Presence of Prosthesis and Need of Prosthesis
Out of 1461 patients; only 210 (14.37%) were with prosthesis while 1251 (85.62%) were without prosthesis. Out of without prosthesis patients; 956 (76.41%) need prosthesis as given in detail in table 7.

Table 7 To assess the presence of prosthesis and need of prosthesis

Observations	Yes	No	Total patients
Prosthesis present	210 (14.37%)	1251 (85.62%)	1461
If no, wants prosthesis	956 (76.41%)	295 (23.58%)	-

DISCUSSION

The pattern of tooth loss has been evaluated in many selected populations in different countries [2,6,10-13]. Edentulism is the important problem throughout the world population. As irreversible condition, it can lead to functional impairment, physical, psychological and social disability. Dental caries and periodontal diseases are the main causative agent found for the tooth loss in adult population throughout the world due to their high prevalence [14].

According to literature review partial edentulism is more common in maxilla than in the mandible, and anterior tooth loss following posterior tooth loss [15]. In the present study, the occurrence of partial edentulism is more common in mandible which is similar to other study results while opposite to other study where maxillary occurrence was more common [6,8,16,17].

In the literature, it is found that, Kennedy's class III was the dominant pattern in both dental arches, while disagree with the present study result showed Kennedy's class III as the dominant pattern in both dental arches [8,10,12,13,15,17,18-23].

Like the other study result present study results agreed that the Class I, Class II is more prevalent with older age group in both dental arches; also the present study result were statistically significant in both arches at 0.01 level [8,15,18,24].

Out of 1461 partially edentulous patients, 818 (55.98%) were male participants as compare to 643 (44.01%) female participants which is opposite to earlier studies where the male participants were more as compare to female participants [25-27].

According Kuppuswamy's socioeconomic scale, in the present study population; out of 1965 partially edentulous arches, 759 (38.62%) arches were of SES III (lower middle) and 362 (56.73%) were of SES II (upper middle) which is in accordance with study result where 158 (51.7%) and 126 (41.2%) of the study subjects were from SES II and SES III respectively [25].

In the present study the main reason for tooth loss was dental caries which is opposite to previous studies where periodontal disease was the main cause for tooth loss [25,28,29].

The limitations of the present study is; the study was conducted among the patients visiting to one institution only so the study will have to be extended to explore the partial edentulism among the public of our city to get a more precise results. Also the present study did not compare the correlation geographically.

CONCLUSION

The study result can be concluded that; although the number of dental clinics and dental institutes are increased all over but still the general public needs continuous awareness regarding the importance of saving of the tooth, its replacement if the tooth get lost to avoid the various ill effects due to missing teeth. Various street plays (nukkad-natak), skits on road site in local languages will have to be conducted to spread the awareness and for prevention of complications of missing teeth.

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DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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