

Patterns of Partial Edentulism and its Relation to Khat Chewing in Jazan Population – A Survey Study

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ABSTRACT

Introduction: Partial edentulism is a prime indicator of overall oral health in a given country. Khat chewing habit in the south region of Saudi Arabia is widely practiced by a majority of the population.

Aim: To determine the frequency of Kennedy's classes in each arch among different age groups, gender and to find out the relationship between khat chewing and the pattern of partial edentulism.

Materials and Methods: The data was collected from 780 subjects reporting to the College of Dentistry, Jazan University, who required removable partial dentures. Clinical intra-oral and radiographic examinations were done. The study subjects were divided into five age groups, 20-29, 30-39, 40-49, 50-59 and ≥ 60 years respectively. Khat chewing hours/day and type of Kennedy's classes were recorded. The data were entered into a

Statistical Package for Social Sciences program and analysed accordingly using Fisher-Exact test.

Results: Class III was the highest in all middle age groups followed by Class I. Class III was the highest in males, while in females, Class I was the highest in both arches. Class IV was the lowest in all age groups, both arches, and genders. Among khat chewers Class III was the highest followed by class I in both arches. Class IV was the highest in >12 hours duration in maxilla but in the mandible, Class I and II were the highest in 1-6 hours duration. The obtained p-values were statistically significant ($p < 0.001$) in all tested variables and age groups.

Conclusion: Kennedy's Class III was the highest followed by Class I, while Kennedy's Class IV was the lowest in all age groups and both arches regardless of khat chewing durations. In males Class III, was the highest, while in females Class I was the highest in both arches.

Keywords: Age, *Catha edulis* chewing, Dental arch, Gender, Kennedy classification, Saudi Arabia

INTRODUCTION

Tooth loss not only affects verbal communication but also induces masticatory difficulties and may result in poor aesthetic outcome which in turn has an impact on the quality of life of an individual [1]. Also, it is an indicator of the general oral health of any population. Replacement with a removable prosthesis is usually required to restore these functions [1,2].

There are distinct forms of tooth loss worldwide [3] as is apparent by the observation drawn from the most common patterns of missing teeth, which correlates with the disproportion in the frequencies and types of partial denture designs that are most frequently utilized in daily dental practice in different nations over the world [4].

Khat-chewing habit in the south region of the Kingdom of Saudi Arabia (KSA) is wide spread and practiced by majority of the population [5]. Khat is fresh leaves of the shrub *Catha edulis*, which are chewed like tobacco in the lower buccal pouch unilaterally (right or left) in a bolus form for many hours [6,7]. The staining and attrition of teeth, pain and clicking of the TMJ disorders, increased periodontal problems and attachment loss are all causes of khat chewing [8].

Many methods of partial edentulism classification have been reported in literature. Those classifications had been based on the basis of potential combinations of teeth to ridges [9]. At present, Kennedy's classification is the most widely used and accepted because of its simplicity, ease of application to all partial edentulous situations, immediate visualization of the type of partially edentulous arch being considered and differentiation between tooth-borne and tooth-tissue-borne partial dentures [10]. Kennedy's classification have reduced the tremendous number of existing partial edentulous combinations to four basic simple classes namely Class I, Class II, Class III and Class IV [11].

Several recently conducted studies showed that khat chewing is a cause of gingivitis, and may lead to periodontal tissue attachment loss and periodontal pocket on the chewing side [7,8,12,13,14,15], while, other few studies concluded that khat chewing is a causative reason for teeth mortalities in both males and females [15,16]. Therefore, the aim of this study was to determine the pattern of partial edentulism in both maxillary and mandibular arches, its relation to age and gender among the population of Jazan and also, to investigate if there is an association between khat chewing and pattern of partial edentulism.

This is a part of the published article entitled "Pattern of Partial Edentulism and Its Relation to Age, Gender, Causes of Teeth Loss in Jazan Population" and still some data with other variables will be published in a upcoming article. All the work done by the author was funded as mentioned in the acknowledgment.

MATERIALS AND METHODS

This cross-sectional study was approved by the Research Committee at the Faculty of Dentistry in Jazan University. The study was conducted among patients who reported to the outpatient section of the college and needed to replace their missing teeth. The data collections were carried out during the period of May 2014 to August 2015 for patients who were diagnosed requiring removable partial dentures using purposive sampling.

The sample size consisted of 780 patients (489 male and 291 females). All the patients attending the college examination clinics were surveyed and the cases for this study were selected according to a certain criteria. Patients from both genders, above the age of 20 years and patients having partially edentulous areas in either or both the arches were included in the study. The subjects who chewed khat once or twice per week for five years were considered as khat chewers according to a previous study [16]. Subjects who

were completely edentulous, those with missing third molars in both arches were excluded from the study. The Kennedy's modification areas were not incorporated to circumvent the complexity.

Selected investigators were involved for data collections after short-period of training. The examinations included both radiographic and intraoral clinical examinations by screening the patient in the dental chair using diagnostic kit. The clinical intraoral examinations were done to determine the pattern of partial edentulism in relation to different age groups, area of missing teeth among each dental arch and gender (sex). The panoramic digital radiograph machine used in this study was (Tomography X-ray System Model Pax-Flex 3D). The questions of khat chewing durations were registered as hours/week.

The clinical examination of both dental arches was carried out after the signing of the written consent from each patient. All relevant data of partial edentulism were collected and recorded in a self-designed proforma. According to the age, the selected subjects were divided into five basic groups, 20-29, 30-39, 40-49, 50-59 and ≥ 60 years respectively.

STATISTICAL ANALYSIS

The clinical data were summarized as frequencies and percentages. Association with age, gender, khat chewer and non-khat chewer were tested with Chi-Square (Fisher-exact test). The values of p of < 0.05 were considered as significant. Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) software (version 20.1 SPSS, Chicago, Illinois, USA).

RESULTS

The total number of the subjects were 780; males 489 (62.7%) and females 291 (37.3%). The highest number of subjects was in group (40-49) 27.9%, while the lowest was in group (30-39) 14.2%.

According to [Table/Fig-1,2], it was clear that Kennedy class III was the highest among all age groups and in both maxillary 295 (37.8%) and mandibular arch 284 (36.4%) in all middle age group, followed by class I. While class IV, was the lowest in all age group 78 (10%) in maxilla, 75 (9.6%) in mandible and became the highest in 50-59 and ≥ 60 age group in both arches. The results were statistically significant in all different age groups at p<0.001.

[Table/Fig-3], showed that in males, the highest percentage was in Kennedy class III for both arches (maxillary, 48.5% and mandibular, 44%), while in the females the highest percentage was in Kennedy class I for both arches (maxillary, 40.2% and, mandibular, 40.9%). Class IV was the lowest in both arches (maxillary 10% and mandibular 9.6%) for both genders. The results were statistically significant in different gender at p<0.001.

Khat chewer ratios were 33% and 17% in males and females respectively. From [Table/Fig-4] among khat chewers, Kennedy's class III was the highest (48.9%-45%) followed by class I (20.9% 32.1%) in both maxillary and mandibular arches respectively. For non-khat chewers, almost equal percentages (20%) were found in all Kennedy classes of both arches, except in class I of the mandibular arch which was 9%. When the data was subjected to statistical analysis there was statistically significant difference among khat and non-khat chewers.

Class III was the most frequent in all chewing durations in both arches (37.8% in the maxilla and 36.4% in the mandible) followed by class I (17.8% and 22.6%) in both arches respectively. Class IV was the highest in >12 hours duration in the maxilla. In the mandible, it was obvious that class I and II (49.4% and 32.6%) were the highest in 1-6 hours duration, while class III was 98.6% in >12 hours duration. When the data was subjected to statistical analysis there was statistically significant difference among khat and non-khat chewers durations in all Kennedy classes as shown in [Table/Fig-5].

Arch/ Age Groups	Non edentulous n / %	Class I n / %	Class II n / %	Class III n / %	Class IV n / %	Total n / 100%	p-value
Maxillary/ 20-29	21/ 18.1	26/22.4	24 /20.7	45 /38.8	0 / 0	116	< 0.001*
Maxillary/30-39	1 /0.9	38/34.2	0 /0	72 /64.9	0 /0	111	
Maxillary /40-49	1 / 0.5	30/13.8	80 /36.7	93 /42.7	14 /6.4	218	
Maxillary /50-59	58 /27.5	15 /7.1	5 / 2.4	83 /39.3	50 /23.7	211	
Maxillary / ≥ 60	63 /50.8	30/24.2	15 /12.1	2 /1.6	14 / 11.3	124	
Total n/100%	144/18.5	139/17.8	124/15.9	295/37.8	78 /10	780	

[Table/Fig-1]: Number (n) and percentage (%) distribution of Kennedy's classes of maxillary arch in relation to age groups (Fisher-Exact test).

*Significant value

Arch/ Age Groups	Non edentulous n / %	Class I n / %	Class II n / %	Class III n / %	Class IV N / %	Total n / %	p-value
Mandibular/ 20-29	22/19.0	65/56.0	29/25.0	0/0	0/0	116	< 0.001*
Mandibular/ 30-39	2/1.8	37/33.3	19/17.1	53/47.7	0/0	111	
Mandibular/ 40-49	3/1.4	54/24.8	57/26.1	104/47.7	0/0	218	
Mandibular/ 50-59	10/4.7	0 /0	40/19.0	124/58.8	37/17.5	211	
Mandibular/ ≥ 60	63/50.8	20/16.1	0/0	3/2.4	38/30.6	124	
Total n/100%	100/12.8	176/22.6	145/18.6	284/36.4	75/9.6	780	

[Table/Fig-2]: Number (n) and percentage (%) distribution of Kennedy's classes of mandibular arch in relation to age groups (Fisher-Exact test).

Arches	Gender	Non-edentulous n / %	Class I n / %	Class II n / %	Class III n / %	Class IV n / %	Total n / 100%	p-value
Maxillary	Males	138/29.2	22/4.5	48/9.8	237/48.5	44/9.0	489	< 0.001*
	Females	6/2.1	117/40.2	76/26.1	58/19.9	34/11.7	291	
	Total n/100%	144/18.5	139/17.8	124/15.9	295/37.8	78/10	780	
Mandibular	Males	92/18.8	57/11.7	78/16.0	215/44	47/9.8	489	< 0.001*
	Females	8/2.7	119/40.9	67/23	69/23.7	28/9.6	291	
	Total n/100%	100/12.8	176/22.6	145/18.6	284/36.4	75/9.6	780	

[Table/Fig-3]: Number (n) and percentage (%) distribution of the presence of Kennedy's classes of both arches in relation to gender (Fisher-Exact test).

Khat chewing	Maxillary Arch					Total n/100%	p-value
	Non edentulous n / %	Class I n / %	Class II n / %	Class III n / %	Class IV n / %		
Yes	43/9.4	93/20.9	69/16.1	224/48.9	29/6.3	458	< 0.001*
No	101/31.4	46/14.3	55/17.1	71/22	49/15.2	322	
Total n/100%	144/18.5	139/17.8	124/15.9	295/37.8	78/10	780	
	Mandibular Arch					Total n/100%	p-value
	Non edentulous n / %	Class I n / %	Class II n / %	Class III n / %	Class IV n / %		
Yes	27/5.9	147/32.1	78/17	206/45	0/0	458	< 0.001*
No	73/22.7	29/9	67/20.8	78/24.4	75/23.3	322	
Total n/100%	100/12.8	176/22.6	145/18.6	284/36.4	75/9.6	780/100	

[Table/Fig-4]: Number (n) and percentage (%) distribution of Kennedy's classes of both arches in relation to Khat chewing (Fisher-Exact test).

Time Duration	Maxillary Arch					Total n/100	p-value
	Non edentulous n / %	Class I n / %	Class II n / %	Class III n / %	Class IV n / %		
Non-khat chewers	101/31.4	46/14.3	55/17.1	71/22.2	49/15.2	322	< 0.001*
1-6 hour	22/9.2	82/34.3	49/20.5	86/36	0/0	239	
7-12 hour	1/1.3	9/11.5	20/25.6	48/61.5	0/0	78	
>12 hour	20/14.2	2/1.4	0	90/63.8	29/20.6	141	
Total n/100%	144/18.5	139/17.8	124/15.9	295/37.8	78/10	780	
	Mandibular Arch					Total n/100%	p-value
	Non- khatchewers	Class I n / %	Class II n / %	Class III n / %	Class IV n / %		
Non- khatchewers	73/22.7	29/9	67/20.8	78/24.2	75/23.3	322	< 0.001*
1-6 hour	24/10	118/49.4	78/32.6	19/7.9	0/0	239	
7-12 hour	3/3.8	27/34.6	0/0	48/61.5	0/0	78	
>12 hour	0/0	2/1.4	0/0	139/98.6	0/0	141	
Total n/100%	100/12.8	176/22.6	145/18.5	284/36.4	75/9.6	780	

[Table/Fig-5]: Number (n) and percentage (%) distribution of Kennedy's classes of both arches in relation to Khat chewing duration (Fisher-Exact test).

DISCUSSION

This study was carried out among patients who attended the clinics of the Faculty of Dentistry in Jazan region for prosthetic treatment. Kennedy's classification represents the most accepted classification and allows immediate visualization of the partially edentulous arch. Also, it enables a systemic approach and application of sound principles of denture design. The highest number of subjects were in the middle age group (40-49), this was in agreement with other studies [11,17-23].

From the study findings, it is clear that class III had the highest percentage and frequency in maxillary and mandibular arches in all age groups in comparison to other classes. This is in agreement with other investigations [11,17,20-22,24-26]. While two studies

showed that the maxillary arch had class III only [18,27], some studies also found that the most frequent classes were the class I or class II either in one or both arches [11,18,19,23,26-33] as seen in [Table/Fig-6].

The posterior bounded edentulous areas usually treated with fixed partial denture, while the anterior teeth are the most retained teeth among the general population. The results of the present study found that class IV Kennedy's classification is the least frequent in all age groups, this was in agreement with the findings of other studies [17,19-21,23,24,26-28,30,32] as seen in [Table/Fig-6].

On the comparison between male and females, from [Table/Fig-3], males had greater prevalence of class III Kennedy classification

Researcher Name and year of study	Country	Sample size	Highest % in maxilla arch	Highest % in mandibular arch	Lowest % in both arches
Naveed H et al., [11]	Pakistan	1000	Class I ×	Class I ×	-----
AL-Dwairi ZN [17]	Jordan	200	Class III √	Class III √	Class IV √
Pellizzer EP et al., [18]	Brazil	412	Class III √	Class I ×	-----
Cha P-S et al., [19]	Korea	63	Class I ×	Class I ×	Class IV √
Al Moaleem MM et al., [20]	Jazan, KSA	579	Class III √	Class III √	Class IV √
Abdel-Rahman HK et al., [21]	Iraq	963	Class III √	Class III √	Class IV √
Etman MK & Bikey D [22]	Canada	100	Class III √	Class III √	-----
AL Judy HJ [23]	Iraq	362	Class I ×	Class I ×	Class IV √
Shinawi LA [24]	Jeddah, KSA	293	Class III √	Class III √	Class IV √
Sadig WM & Idowa AT [25]	Riyadh, KSA	740	Class III √	Class III √	-----
Sapkota B et al., [26]	Nepal	194	Class III √	Class III √	Class IV √
Ali SN & Namat ZN [27]	Iraq	129	Class III √	Class I ×	Class IV √
Zaigham AM & Munteer MU [28]	Pakistan	367	Class II ×	-----	Class IV √
Niarchou AP et al., [29]	Greece	553	Class I ×	Class I ×	-----
Eachempati P et al., [30]	India	171	Class I ×	Class I ×	Class IV √
Ueno T et al., [31]	Japan	69	Class I & II ×	Class I & II ×	-----
AL Moaleem MM et al., [32]	Abha, K S A	298	Class I ×	Class II ×	Class IV √
Pournasrollah A et al., [33]	Iran	244	Class I ×	Class I ×	-----

[Table/Fig-6]: Comparing of the results of the present study with other research results.
√: agreed ×: disagree --: no relation

in both arches. Similar results have been reported in Jordan and Iraq [17,21]. While in females, class I Kennedy classification was the highest in both arches, similar results were obtained in Abha, Saudi Arabia [32]. Sapkota B et al., in Nepal showed class III (tooth bounded) was higher among the unemployed female group; this could be explained by the economic status of the patients, who cannot offer for high costing treatments such as fixed partial denture due to low income [26]. Overall results showed significant differences between genders, which was inconsistent with other studies [21,25,28], this could be explained by the fact that females are more concerned about esthetics, are more aware and have a better seeking behaviour than males. Also, they follow the preventive programs sternly as well as they are more conscious about their appearance.

Class IV Kennedy's classification was found to be the least in both genders comparing to other classes in both arches, this could be explained by the fact that, patients generally get anterior teeth replaced immediately due to aesthetic reasons by any type of prosthesis [34].

Khat chewing is a habit among the Jazan population in all age groups with different duration periods. From the present study results, relation was found between duration of khat chewing and pattern of edentulism. No previous studies have investigated the relationship between khat chewing and pattern of partial edentulism. Some studies showed that Khat chewing was a cause of periodontal pocket and attachment loss on the chewing side [7,8,13-15]. While few studies concluded that Khat chewing was a causative reason for teeth mortalities in both males and females [16].

Class III was the most frequent in all chewing durations in both arches followed by class 1 in 1-6 hours chewing duration as shown in [Table/Fig-5]. This result was in concordance to the results of other studies [13-16], which concluded that khat was the cause of tooth attachment loss on the chewing side and khat chewers had significantly higher tooth loss as compared to non-khat chewers.

Anterior teeth loss due to periodontal disease has been reported to be associated with improper oral hygiene measures and presence of diabetes mellitus [35]. Class IV was the highest among khat chewers in >12 hours duration in the maxilla, this could be associated with increased number of diabetes mellitus patients among the Jazan population. Similar assumptions were put forth by Bani IA who concluded increased prevalence of diabetes Mellitus resulted in calls for urgent steps towards prevention and health promotion and, programs designed to reduce its burden [36].

In the mandible, it is obvious class I and II (49.4% and 32.6%) were the most in 1-6 hours duration followed by class III 98.6% in >12 hours duration, this could be due to the site of chewing which was usually the posterior buccal pouch.

One of the limitations of this study was that the number of patients was not large enough and did not represent the whole areas of Jazan, since subjects were selected from patients who visited the dental college clinics. So, we recommended further studies with bigger and more representative sample size, involving all governmental dental centers and private clinics in the province. All the obtained results from the present and futures studies will help in the planning of the need of the population regarding prosthesis to replace their missing teeth.

CONCLUSION

Within the limitations of this cross-sectional study the following conclusions can be drawn; The highest number of subjects were in the group (40-49) while the lowest was in a group (30-39). In all age groups, class III was the highest followed by class I, while class IV was the lowest in both arches and gender. The highest frequent percentage for males were in Kennedy class III for both arches, While in the female, the highest frequent percentage was

in Kennedy class I for both arches. Among khat chewers, Kennedy class III was the highest in both arches followed by class I in the maxillary and mandibular arch. For non-Khat chewers almost equal percentages in all Kennedy classes of both arches, except in class I of the mandibular arch which was lesser.

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