# Partial edentulism: a five year survey on the prevalence and pattern of tooth loss in a sample of patients attending King AbdulAziz University - Faculty of Dentistry.

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Abstract: There is little if any documentation regarding the pattern of tooth loss among the adult population living in Saudi Arabia, especially in the western region. The aim of this study was to investigate patterns of tooth loss in patients treated at King AbdulAziz University – Faculty of Dentistry and to compare it over five years with the documentation of the number and types of removable partial dentures provided as well as patients gender, nationality and mother tongue. Materials and methods: the dental records of patients treated by sixth year students at King AbdulAziz University – Faculty of Dentistry during the academic years 2004 and 2009 were reviewed to record patients' nationality, age, gender, mother tongue and Kennedy classification in both arches. The type and number of removable prosthesis provided were also noted. Results: Descriptive analysis and comparison between the groups was performed using Micro soft excel statistical programme. A total of 293 charts were reviewed and Kennedy Class III was found to be the most common classification in the entire sample. The construction of definitive removable partial dentures was three folds that of transitional removable partial dentures. Conclusion: in a selected sample of patients receiving dental treatment at the faculty of dentistry in Jeddah, Saudi Arabia, the most common pattern of partial edentulism was Kennedy Class III and definitive partial dentures was the first choice for treatment with removable prosthesis.

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#### 1. Introduction

Documenting the prevalence and pattern of partial tooth loss is very important for identifying the prosthetic needs of the studied community as well as aiding the provision of educational and preventive materials suitable for this population in terms of language and composition. Publications on the prevalence of partial edentulism among the Saudi population are scarce, the earliest survey was in 1995 which examined a selected population attending the dental school at King Saud University (KSU) in Rivadh, Saudi Arabia and reported the Mandibular first molar to be the most frequently missing tooth with a tendency for higher tooth loss in females compared to males. Loss of anteriors and premolars in the Maxilla was found to be more frequent than the Mandible in which loss of molars was more prevalent <sup>1</sup>. A later survey of patients receiving removable partial dentures (RPD) at KSU reported that Kennedy Cl III RPD was the most commonly constructed with higher prevalence in Saudi male subjects<sup>2</sup>. The attitude of 238 Saudi male patients attending the dental clinics at KSU towards replacement of missing teeth was studied and concluded that 82% of the studied sample expressed their need to replace missing teeth, the majority stated function as the prime reason for replacement of missing teeth, followed by the negative effect of tooth loss to appearance  $^{3}$ .

An insight into the prosthetic needs of a given population can also be obtained by reports on patients' satisfaction and acceptance of RPD following treatment. In a study of RPD usage in Saudi male patients, a telephone interview was conducted with 52 male patients a year after receiving definitive RPD constructed by undergraduate students at KSU. 64% of the patients stated that they wore their dentures regularly while 21% have stopped completely using them mainly due to pain and discomfort. 27% of the discarded dentures were in the Maxilla compared to 36% in the Mandible. The most commonly provided were Kennedy Cl III in both arches, while Cl IV RPDs were the least common<sup>4</sup>. Denture quality was shown to be related to patients' satisfaction but could not explain the dissatisfaction of all patients or their intolerance to the prosthesis <sup>5</sup>.

Information on the pattern of tooth loss regionally and in the Middle East is also scant. Kennedy Cl III was reported to be the most common (57.14%) in a sample of the Iraqi population. Surprisingly, 63% of the studied sample refused prosthetic replacement of missing teeth<sup>6</sup>. Cl III was also found to be the most common classification in both arches among a sample of Jordanians attending a dental teaching hospital <sup>7</sup>.

Clearly the few local and regional reports on partial edentulism in the Arabian Peninsula agree that Kennedy Class III is the most common while reports on the incidence of RPD in the USA concluded that Kennedy Cl I was the most common at 40%. It is worth noting that the authors recommended conducting periodic reviews on the incidence of various classes of RPD to aid in teaching <sup>8</sup>.

#### Statement of Problem and Aim

Partial edentulism has a significant emotional and psychological impact on ones confidence and might lead to social inhibitions due to the changes in appearance that follow tooth loss 9. However, available literature on the incidence and pattern of tooth loss and partial edentulism mostly quote Caucasian values where Kennedy Class I and II are reported as the most prevalent<sup>10</sup>. There is little if any documentation on the demography and pattern of tooth loss among the adult population living in Saudi Arabia, especially in the western region. The aim of this study was to investigate patterns of tooth loss in patients treated at King AbdulAziz University -Faculty of Dentistry (KAUFD) and to compare it over five years with the documentation of the number and types of RPD provided.

# 2. Material and Methods

This survey was conducted by reviewing the dental charts of patients treated at the KAUFD in the years 2004 and 2009. Only patients treated by Sixth year (senior year) undergraduate dental students' were included. The sample consisted of Saudi and non Saudi nationals. The information gathered charts included patients' demographics (age, gender, nationality and mother tongue) as well as the Kennedy classification in the partially edentulous patients excluding third molars. Descriptive analysis and comparison between the groups was performed using Micro soft excel statistical programme.

# 3. Results

A total of 293 dental charts were included in the current survey, 200 patients treated during the year 2004 vs. 93 in the year 2009. Out of the 200 patients charts reviewed for the year 2004, 106 (53%) were of male patients and 94 (47%) were of female patients while in the year 2009, 33 (35.48%) of the charts were for male patients compared to 60 (64.52%) female patients charts. The mean age of patients in 2004 was 34.48 years compared to 33.94 years in 2009. In 2004 the ratio of Saudi Arabian nationals to others was 55: 145 (27.5% and 72.5% respectively)

this is compared to a ratio of Saudi Arabian nationals to others of 23: 70 (24.73% and 75.27% respectively) in 2009. Table 1 lists the ethnicity of the entire sample according to gender.

The highest number of non Saudi nationals in 2004 and 2009 was from Yemen. The 5 most common non Saudi nationalities in both years are presented in table 2.

The mother tongue of the sample was recorded as either Arabic or other languages and the ratio in the year 2004 was found to be Arabic 142, other languages 54 (71% and 27% respectively) compared to a ratio for Arabic: other languages of 53: 40 (56.99% and 43.01%) in 2009. Table 3 lists the percentage of patients with Arabic as the mother tongue compared to other languages according to gender in the entire sample.

The prosthetic needs and pattern of tooth loss in the sample were also tabulated using the Kennedy classification which describes the location of missing teeth in the arch. Tables 4 - 7 explain the distribution of each Kennedy class in both arches by gender as well as the frequency of each class in the sample. Without a doubt Kennedy class III was found to be the most common in both genders and in both arches while Kennedy class IV was the least common. Higher tooth loss is evident in female subjects except those with Kennedy class IV.

Finally, the charts were used to quantify the number of transitional and definitive RPD provided for the sample in each arch. A higher number of definitive Co-Cr RPD was delivered to patients compared to transitional acrylic RPD. A total of 205 dentures were provided in the year 2004 (158 definitive and 47 transitional) compared to 119 in the year 2009 (85 definitive and 34 transitional). The percentage of patients who received transitional and definitive RPD is tabulated according to the arch treated and by gender (table 8, 9 respectively).

Clearly a higher number of female subjects received transitional RPDs compared to male patients in both 2004 and 2009 but there was no difference in the percentage of arches restored.

The number of female patients receiving definitive RPD was higher compared to their male patients in both examined years and more so in the year 2004.

In terms of additional retentive aids, in 2004 1 male patient received extra coronal attachments and one male patient was treated with copings compared to one female patient whose RPD was fitted with extra coronal attachment. Attachments and coping were not used in 2009.

Year	2004				2009			
Ethnicity	Saudi Arabian		Others		Saudi Arabian		Others	
n	55		145		23		70	
(%)	(27.5)		(72.5)		(24.73)		(75.27)	
Gender	Male	Female	Male	Female	Male	Female	Male	Female
n	33	22	73	72	16	7	17	53
(%)	(31.13)	(23.40)	(68.87)	(76.60)	(48.48)	(11.67)	(52.52)	(88.33)

# Table 1: The distribution of patients' ethnicity according to gender

# Table 2: Percentage of top 5 non Saudi nationalities.

Year	2004	2009
	Yemen	Yemen
	32	21
	(18.93)	(30.43)
	Philistine	Pakistan
	22	10
	(13.02)	(14.49)
Nationality	Afghanistan	Afghanistan
n	17	8
(%)	(10.06)	(11.59)
	Sudan	Eretria
	13	8
	(7.69)	(11.59)
	Eretria	Philistine
	11	5
	(6.51)	(7.25)

Table 3: Distribution of patients language according to gender.

Year	2004	2004				2009			
language	Arabic	Arabic		Other		Arabic		Other	
n	142	142		54		53			
(%)	(71.00)	(71.00)		(27.00)		(56.99)		(43.01)	
Gender	Male	Female	Male	Female	Male	Female	Male	Female	
n	85	61	21	33	8	32	25	28	
(%)	(80.19)	(63.83)	(19.81)	(35.11)	(24.24)	(53.33)	(75.76)	(46.67)	

Table 4: The distribution of Kennedy classification in the Maxilla by gender in the year 2004

	CLI	Cl II	C1 III	Cl IV	Total
Male	12	10	40	7	69
(%)	(11.32)	(9.43)	(37.74)	(6.60)	(65.09)
Female	17	16	38	0	71
(%)	(18.09)	(17.02)	(40.43)	0	(75.53)
Total	29	26	78	7	140
(%)	(14.50)	(13.00)	(39.00)	(3.50)	(70.00)

Table 5: the distribution of Kennedy classification in the Maxilla by gender in the year 2009

	Cl I	Cl II	Cl III	Cl IV	Total
Male	3	4	14	0	21
(%)	(9.09)	(12.12)	(42.42)	(0)	(63.64)
Female	7	11	27	1	46
(%)	(11.67)	(18.33)	(45.00)	(1.67)	(76.67)
Total	10	15	41	1	67
(%)	(10.75)	(16.13)	(44.09)	(1.08)	(72.04)

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	Cl I	Cl II	Cl III	CLIV	Total
Male	10	14	36	2	62
(%)	(9.43)	(13.21)	(33.96)	(1.89)	(58.49)
Female	22	20	32	1	75
(%)	(23.40)	(21.28)	(34.04)	(1.06)	(79.79)
Total	32	34	68	3	137
(%)	(16.00)	(17.00)	(34.00)	(1.50)	(68.50)

Table 7: The distribution of Kennedy classification in the Mandible by gender in the year 2009

	Cl I	Cl II	Cl III	Cl IV	Total
Male	2	6	11	0	19
(%)	(6.06)	(18.18)	(33.33	(0)	(57.58)
Female	12	12	25	0	49
(%)	(20.00)	(20.00)	(41.67)	(0)	(81.67)
Total	14	18	36	0	68
(%)	(15.05)	(19.35)	(38.71)	(0)	(73.12)

Table 8: Percentage of patients provided with transitional RPD in the years 2004 and 2009 according to gender and arch restored.

Year	2004				2009				
Arch	Maxillary	,	Mandibular		Maxillary	Maxillary		Mandibular	
n	23		24		17		17		
(%)	(11.50)	(11.50)		(12.00)		(18.28)		(18.28)	
Condor	Male	Female	Male	Female	Male	Female	Male	Female	
	7	16	8	16	5	12	4	13	
(%)	(6.60)	(17.02)	(7.54)	(17.02)	(15.15)	(20.00)	(12.12)	(21.67)	

Year	2004				2009				
Arch	Maxillary		Mandibular		Maxillary		Mandibular		
n	72		86		39		46		
(%)	(36.00)	(36.00)		(43)		(41.94)		(49.46)	
Candan	Male	Female	Male	Female	Male	Female	Male	Female	
(%)	28	44	34	52	11	28	16	30	
	(26.42) (46.81)		(32.08)	(55.32)	(33.33)	(46.67)	(48.48)	(50.00)	

Table 9: Percentage of patients provided with definitive RPD in the years 2004 and 2009 according to gender.

## 4. Discussion

The dental records of patients treated by sixth year undergraduates were used for this survey as these students are required to provide comprehensive clinical care to their patients. Therefore, students carry out a thorough dental examination on their patients including dental charting, periodontal examination and full mouth radiographs prior to planning and completing the comprehensive dental treatment required by these patients. The dental charting is reviewed and approved by a team of multidisciplinary consultants which insures both the accuracy and consistency of the diagnosis and especially in regards to diagnosis of restorability guided by the preset criteria which takes into account both the restorability if the tooth and the periodontal condition of the patient among other considerations. It is important to point out that both Saudi and non Saudi patients receive free dental treatment at KAUFD including prosthetic RPD and FPD, thus the provision of RPD reported in the present survey is not affected by patients socio economic limitations.

A significantly lower number of patients were treated in 2009 compared to 2004. This can be attributed to two factors, primarily the flooding crisis which devastated Jeddah in 2009 causing the stoppage of schools and university for a few weeks with a decrease of patients' flow in the weeks after. The second factor was the exclusion of any incomplete files from the survey, such as incomplete or unauthorized charting or when treatment was discontinued. Obviously in light of the flooding crisis some patients choose not to continue their treatment which decreased the sample number for the year 2009. The department of medical records at KAUFD reported a decrease in patients flow and attendance of 40% in 2009 compared to previous years as a result of the flooding crisis.

The majority of patients receiving treatment at KAUFD are none Saudi nationals as KAUFD is the sole free dental care provider for foreigners in the city of Jeddah, Saudi Arabia. The current survey illustrates that Arabic is not the mother tongue in a high number of expats patients. While KAUFD provides advocates and translators to aid in filling personal history forms, explaining patients rights, consent and treatment plan, yet most of the take home written instructions are provided in Arabic and English languages. Based on the findings of the current report, a leaflet for partial and complete denture home care instructions utilizing pictures and graphs in addition to text was designed and distributed to patients at the denture delivery appointment, patients feedback on the usefulness of these leaflets has yet to be investigated.

The prosthetic needs of the sample were tabulated using the Kennedy classification which is the most familiar and most widely used classification in literature and in educational curriculums and describes the location of missing teeth in the arch. Kennedy class III was found to be the most common in both genders and in both arches while Kennedy class IV was the least common. These findings are in agreement with other reports on the prevalence of RPD in the kingdom<sup>1,2</sup>, where Kennedy Cl III was found to be the most common at 45% and 37% (Maxilla vs Mandible) while Cl IV was the least common at 8% and 3% respectively<sup>4</sup>.

An inclination towards higher partial edentulism among female subjects was recognised and is consistent with earlier findings reported in patients treated at KSU<sup>1</sup>. Similarly higher levels of tooth mortality in women in some countries have been reported and were attributed to the more frequent dental visits by females for care of inadequate and unaesthetic dentition rather than to a true reflection of higher tooth mortality than the male counterpart<sup>11</sup>. The current study cannot ascertain such claims due to the variance in sample size and diversity of the sample. However, a significantly higher number of female patients received RPD (both transitional and definitive) compared to their male counterpart which is consistent with some studies<sup>12</sup>. This could be a reflection of females' higher concerns over aesthetics and function. A question addressing the purpose for seeking replacement of missing teeth during history recording would be an additional aid in disclosing the public view and perception of partial edentulism in the western region of Saudi Arabia.

It is well establishes that the vast improvement in dental care over the last three decades - especially in developed countries - has lead to the decrease in tooth

loss and subsequently a decrease in complete denture users. This was accompanied with an increase in RPD users<sup>13</sup>. During the late 80's of the last millennium, the pattern of partial edentulism was investigated with Kennedv reports that the most common Classifications are class I in the Mandible and Class III in the Maxilla<sup>14</sup>. Such changes are expected to occur in developed countries where improvement in health care is distinct. On the other hand, the demand for removable prosthesis is increasing in developing countries suffering from the economic depression and lack of or limited access to dental care<sup>15</sup>. Periodic surveys on the pattern of tooth loss are thus vital for measuring dental disease and treatment needs in these countries. The situation of partially and completely edentulous patients in Saudi Arabia cannot be established without the inclusion of patients treated with complete dentures. Future investigation of the prevalence and distribution of complete edentulism by gender would aid in establishing the prosthetic needs in the population as well as provide important resources for educational purposes.

This study illustrates that a significant number of definitive RPD is constructed annually at KAUFD is significantly high. The provision of a considerably higher number of definitive Co-Cr RPD compared to transitional RPD might be a result of the patients treatment need and demands, though, it is more likely to be due to the course requirement, since sixth year undergraduates are required to provide complete and comprehensive dental care to their patients and grades are awarded according to the number of cases the student completes with a minimum of three cases per student. Such comprehensive treatment is free of charge at both of the dental schools in Saudi Arabia (KAUFD and KSU). Sadig et al. reported that out of 650 patients receiving removable partial dentures at KSU in one year, 422 were supplied with definitive  $RPD^2$ . Akeel<sup>4</sup> reported that in a sample of patients receiving prosthetic treatment at KSU, only 12 transitional RPD were constructed in a year compared to 72 definitive Co-Cr RPD. It may be that the availability of free dental treatment at the dental college at KSU and KAUFD results in exaggerated treatment demand especially when taking into consideration that Kennedy Cl IV was the least commonly provided RPD, thus, esthetics and appearance were not among the reasons for replacement. An investigation into the usage of RPD provided to patients at KAUFD is needed to disclose if exaggerated treatment is applied by the students in fulfillment of their requirements and weather such an approach is cost effective. In essence dentures might actually be supplied to patients who do not use them, an issue that has been reported by other investigators <sup>4, 16,-18</sup>. The exaggerated treatment provided in the public sector however is not mirrored in the private sector. A published survey of RPD constructed in private dental practices in Bahrain found that 89% of RPD provided where transitional compared to 11% Co-Cr definitive RPD<sup>19</sup>. Recently KAUFD has adopted a new teaching strategy where requirements were replaced with minimum procedure exposure so that once a given clinical skill is mastered by the student to meet the preset criteria and a clinical competency exam in that skill was successfully completed by the student, that clinical procedure would no longer be a requirement. The impact of this strategy on the number of RPDs provided has not been established to address the question of possible over treatment, additionally and since 2010 KAUFD has introduced a course on dental implants for undergraduates whereby 6<sup>th</sup> year students are trained on the surgical placement and prosthetic restoration of single missing teeth. The impact of this on the number of definitive Cl III RPD provided should be addressed in future surveys. It is interesting to note that in the UK the provision of RPD is indicated by the patients demand and physical function with an annual cost of almost fifty million pounds. Thus a recommendation was proposed to re evaluate the management of partial edentulism to be more cost efficient so that patients with poor oral hygiene would receive transitional acrylic RPD<sup>20</sup>. This was also based on the reports that 30 - 50% Of patients receiving RPD in the UK occasionally or never use them<sup>21,22</sup>

Although prosthetic treatment is provided free of charge at KAUFD, a lower number of male patients received RPD. This is in contrast to an earlier report of higher prevalence of RPD among Saudi males treated at KSU<sup>2</sup>. Social or cultural inhibitions towards use of dentures may be a factor since similar attitude towards tooth loss was reported in other cultures where the replacement of missing teeth is considered socially unacceptable  $^{6, 23}$ . This is in contrast to the European and North American standards of care in communities where esthetics, social, function and cultural factors are the basis for prosthetic replacement<sup>24, 25</sup>. Dental caries and periodontal disease are the leading biological factors associated with tooth loss and are associated with the socioeconomic level of subjects. Sanya et al. reported that in Kenya, molars were the most common teeth lost due to caries<sup>26</sup>, while Mathew stated that periodontal disease was the prime etiologic factor of tooth loss at 61.8% followed by caries at  $24.8\%^{27}$ . These results are a reflection of the socioeconomic level and its relation to oral health where dental caries is the primary etiological factor to tooth loss in developing countries such as Kenya compared to periodontal disease in developed counterparts where

access to restorative dental care is readily available. It has been demonstrated that social class, gender and age are all significant factors for whether or not patients use dental services to obtain dentures<sup>28</sup>.

What follows is a sample of a few of the most recently published reports (2010 - 2011) and is presented for comparison between the prosthetic needs of the sample studied in the current survey and that of other communities. The university hospital of Benin, Nigeria reports that the most common partial edentulism amid 351 subjects (53.6% Male and 46.4% Female) was Kennedy Cl III at 57.3% followed by Cl IV at 26.2%, while the least common were Cl I and Cl II at 2.6% and 2.3% respectively<sup>29</sup>. A study of 193 elderly Taiwanese receiving dental rehabilitation support from the government reported that Kennedy Cl I was the most common at 30.75% while Cl IV was the least common at 3.16%. The highest prevalence of edentulism was among subjects with lower social class, low income level and little or no education. These subjects received treatment only when experiencing tooth ache or discomfort <sup>30</sup>. A survey of 1800 patients receiving dental treatment at the dental college and hospital on Chennai, South India, concluded that Cl I was the most common in the Maxilla at 33.3% while Cl III was the most common classification in the Mandible at 36.3%. As for the type of the RPD provided, 96.9% of the dentures worn by the patients were transitional acrylic RPD compared to 3.1% Co-Cr RPD<sup>31</sup>. A survey of 553 patients receiving treatment at dental school of Athens reported that Kennedy Cl I was the most commonly reported in both arches<sup>32</sup>. Similarly a review of 1502 casts at dental laboratories in eastern Wisconsin reported the Kennedy Cl I was the most common RPD constructed with one in three RPD's made as an acrylic RPD<sup>33</sup>.

# Conclusion

The current survey of a selected sample of patients attending KAUFD highlights numerous challenges to providing optimum dental care generally and removable prosthesis specifically. Most importantly is the diversity of the patients seeking treatment as well as the language barrier and socio economic status of these patients, thus drawing attention to the need for untraditional take home instructions to assure patients compliance. The most common Kennedy classification in the entire sample was Kennedy Class III. Prothetic treatment provided at KAUFD clearly has a tendency to providing definitive RPD with conventional retentive elements. These findings propose the question of whether exaggerated treatment is provided for unsuitable patients, therefore, it is strongly recommended to investigate patients' satisfaction with the provided

RPD at recall appointments few months after treatment.

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