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Kennedy Classification and Treatment Options: A Study of Partially Edentulous Patients Being Treated in a Specialized Prosthetic Clinic

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Abstract

Purpose: This study was done under the auspices of the Swedish International Development Cooperation Agency, whose aim is to improve living conditions in developing countries, including dental aid. Each year the number of medical staff from the European Union willing to help in developing countries increases, and it is thus important to highlight issues of development. From the Middle Asian region, the Republic of Kazakhstan was chosen. At present, few studies have evaluated the prevalence of various types of partial edentulism in this region, and no research has investigated the prosthetic treatment choice in the various types of partial edentulism. The purpose of this study was to determine (i) the prevalence of various types of partial edentulism in patients seeking dental care and (ii) the type of prosthetic restoration most commonly chosen to treat these patients.

Materials and Methods: One hundred twelve patient records, together with panoramic radiographs, were studied. Various types of partial edentulism were grouped into four Kennedy classes. Patient records were used to examine which treatment option was chosen for each patient.

Results: The most prevalent type of partial edentulism in this patient sample was Kennedy type III, in both the maxilla (50.0%) and the mandible (41.1%). Partial edentulism was most frequently managed by fixed partial dentures (FPDs) in both jaws. Kennedy IV was the least prevalent (7.1% in the maxilla, 5.6% in the mandible) and in most cases treated with removable partial dentures (RPDs) in both jaws.

Conclusion: Our results are consistent with previous research on the prevalence of Kennedy classes in Kazakhstan. RPDs were the most common type of prosthetic management for partial edentulism.

Despite constant improvement in service provided by prosthetic dentists, few works present objective data on the prevalence of various types of partial edentulism. Consequently, no data on frequency of prosthetic treatment type chosen in various dental arch defects are available.[1] It is, however, essential for prosthetic dentists to be acquainted with the most common patterns of partial edentulism to provide the best treatment option for each patient. The prevalence of diverse patterns of partial edentulism may vary from region to region and may reflect the views of the local population on dental health prioritizations.[2]

Various classification systems exist for grouping diverse patterns of partial edentulism.[3,4] However, the Kennedy classification system is the most widely used.[5] For this reason, Kennedy classification for partially edentulous ridges will be used in this study.

Partial edentulism can be treated by a variety of methods to improve function, esthetics, and phonetics and, thus, patient satisfaction and quality of life. Among the prosthetic options used to treat partial edentulism are fixed partial dentures (FPDs), removable partial dentures (RPDs), and dental implant-supported prosthetic constructions. Studies conducted in Kazakhstan, such as a work by Nysanova,[1] have evaluated the prevalence of various types of partial edentulism and the quality of prosthetic restorations; however, no data on use-frequencies of the various treatment options are available.

In Nysanova's study, 250 partially edentulous patients ages 18 to 69 were examined clinically. Of these patients, 40% were previously treated with RPDs in a different dental clinic. Only 51% of the RPDs were satisfactory. The author concluded that the most common mistakes were rests that were not deep enough (55%) and incorrectly chosen clasp designs (40%). Kennedy III was the most common type of partial edentulism in the maxilla and the mandible, whereas Kennedy IV was the least prevalent in both jaws.[1]

Table 1 Prevalence of Kennedy classes in the current patient sample

	Maxilla		Mandible	
Kennedy class	Number of patients	Percentage (%)	Number of patients	Percentage (%)
I	28	25.0	31	30.0
II	20	17.9	26	24.3
III	56	50.0	44	41.1
IV	8	7.1	6	5.6
Total	112	100	107	100

The aim of this study was to determine (i) the prevalence of various types of partial edentulism as classified by Kennedy and (ii) the type of prosthetic restorations most commonly used to treat these patients.

Materials and methods

One hundred twelve patient records and panoramic radiographs were studied. All patients were partially edentulous and had applied for prosthetic treatment to the School of Dentistry, Kazakh National Medical University (KazNMU) in Almaty. The human subject research study was approved by the ethical panel of KazNMU. The panoramic radiographs included in the analysis had been taken between 2008 and 2010 for use in treatment planning. Treatment planning was done by staff dentists specializing in prosthodontics. The Kennedy classification was used.

Inclusion criteria were patients with acquired partial edentulism (i) who had contacted the Faculty of Odontology for prosthetic treatment between 2008 and 2010, (ii) who had panoramic radiographs, and (iii) whose treatment had begun or had been finished. Upper and lower jaws were counted separately.

The second part of the study was to determine the prevalence of various types of prosthetic restorations for each of the four Kennedy groups. Patient records were analyzed to determine what treatment had been begun or done. Patients' gender and age were recorded, as was occupation to determine social status. Treatment options were grouped into four categories: (i) FPDs on tooth abutments, (ii) RPDs on tooth abutments, (iii) implant–implant-supported FPDs, and (iv) implant–tooth-supported FPDs. RPDs were not combined with implants. All patients received treatment for their partial edentulism.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS, v18, SPSS Inc, Chicago, IL). The significance level was set at 5%. Correlation between different variables was calculated.

Results

Part I

Patients

The patients' age ranged between 28 and 81 years. There were slightly more women (53.6%) than men (46.4%). Percentage of patients with jobs not requiring higher education was 17.9%.

Table 2 Comparison of the results obtained for the maxilla in this study with the results from a previous study with a larger sample size

Kennedy class	Number of patients (%; this study)	Number of patients (%; Nysanova[1])
I	25.0	29.8
II	17.9	23.9
III	50.0	34.5
IV	7.1	7.5

There was no correlation between educational level and type of partial edentulism ($p = 0.01$).

Types and prevalence of partial edentulism

The most prevalent type of edentulism in the maxilla (50.0%) was Kennedy type III, whereas Kennedy type IV was encountered least often (7.1%). In the mandible, type III was again most prevalent (41.1%) and type IV least prevalent (5.6%). Of 112 patients, 107 were partially edentulous in both the maxilla and the mandible. Five patients were partially edentulous in the maxilla only. Table 1 summarizes all results. Tables 2 and 3 compare the results with the Nysanova Kazakh study on 250 patients.[1]

Part II

The second part of the study was to determine the prevalence of various types of prosthetic restorations for each of the four groups (Tables 4 and 5). FPDs were significantly ($p = 0.02$) more prevalent in young patients (28- to 39-year age group). It can be assumed that the older patients in the 40+ age groups were treated with RPDs because they had more missing teeth than younger patients did. Implant-supported prosthetic constructions were found in patients over age 39 years. No patient was prescribed a combination of prosthetic treatments.

Discussion

The prevalence of various patterns of partial edentulism differs from country to country. Such patterns can be explained by differences in socioeconomic status, education, attitudes toward dental health, and the importance of dental health compared with other concerns. In this study, the number of persons wanting to restore their dental arches increased with age. Most

Table 3 Comparison of the results obtained for the mandible in the present study with the results from a previous study with a larger sample size

Kennedy class	Number of patients (%; this study)	Number of patients (%; Nysanova[1])
I	30.0	26.3
II	24.3	22.7
III	41.1	32.1
IV	5.6	6.4

Table 4 Prevalence of types of prosthetic restorations in the maxilla

	FPDs		RPDs		Tooth-implant-supported FPDs		Implant-implant-supported FPDs	
Kennedy class	Patient number	Percentage (%)	Patient number	Percentage (%)	Patient number	Percentage (%)	Patient number	Percentage (%)
I	0	0	24	85.7	3	10.7	1	3.6
II	6	30.0	9	45.0	2	10.0	3	15.0
III	49	87.5	3	5.4	3	5.4	1	1.8
IV	0	0	6	75.0	0	0	2	25

patients were in the 58- to 63-year age group; in older age groups, the number of patients decreased with age. Retirement pensions that do not allow expensive prosthetic treatment and lack of need because treatment has already been done probably explain this decrease. It appears from the literature that the prevalence of various types of partial edentulism is not stable over the years, but can fluctuate even in the same region.

One American study reviewing the scientific literature of the past 30 years found that the prevalence of patients needing Kennedy class II RPDs had increased, whereas prevalence of patients needing RPDs with designs in the other Kennedy classes did not change significantly.[2] Our study did not aim to compare variations in the prevalence of the Kennedy classes in Kazakhstan between 2008 and 2010, but only reports the current situation in a group of patients at Almaty.

The recent studies from other developing countries indicate that Kennedy class III is the most prevalent type of partial edentulism in many countries (i.e., Jordan, Nigeria, and Saudi Arabia).[6-8] This was also true in our investigation. Moreover, our results are very close to those obtained in earlier Kazakh studies with a larger sample size of patients, consisting of 250 individuals.[1] This, however, is in contrast to the other studies from Japan and Turkey in which Kennedy class I and II were the most frequent.[9,10] In one American study[2] Kennedy classes I and II were also the most prevalent, 40% and 33%, respectively. Kennedy class IV was the least prevalent in our patient sample. This finding is in line with the Turkish and Saudi Arabian studies.[8,10]

According to Zitzmann et al,[11] the frequency of RPDs in Europe varies between 10% and 16%. Nysanova mentions in her dissertation work[1] that in the annual Kazakh reports, RPDs comprise 54.6% of all prosthetic constructions made. This is much higher than in Europe. Many patients in this study had several teeth missing in a jaw, imposing a difficulty in restoring the edentulous spaces with FPDs, which may explain the choice of RPDs (107) as opposed to FPDs (89).

According to Zitzmann et al,[11] the frequency of removable restorations is higher in (i) older age groups, (ii) rural areas, (iii) patients with a lower socioeconomic status, (iv) patients with less education, and (v) patients with lower incomes. In our study, no relationship was found between educational level and type of partial edentulism. Statistically, 12.6% of the Kazakh population have higher education.[12] In this study, 82.1% of patients had university education. Perhaps people with higher education are more concerned with oral health status and esthetics and thus seek professional dental help more readily than people with basic general or secondary education.

Treatment choice was affected by which jaw had to be managed. In the mandible, all Kennedy class IV cases were treated with RPDs; in the maxilla, Kennedy class IV cases were treated with both RPDs (75.0%) and dental implants (25.0%).

Dental implants are the least common treatment option for partial edentulism due to the high cost, even in developed countries.[11] This study shows that RPDs are the most common treatment in the studied patient sample. Many things can explain the popularity of this prosthetic option: lower cost compared with implant-supported constructions, preferences of the patient's dentist, and patients' knowledge of various treatment options.

The limitation of this study is that the patient group size for some treatment options, especially implant-supported prosthetics, were too small for drawing firm conclusions, and

Table 5 Prevalence of different types of prosthetic restorations in the mandible

	FPDs		RPDs		Tooth-implant-supported FPDs		Implant-implant-supported FPDs	
Kennedy class	Patient number	Percentage (%)	Patient number	Percentage (%)	Patient number	Percentage (%)	Patient number	Percentage (%)
I	0	0	29	93.5	1	3.2	1	3.2
II	0	0	24	92.3	2	7.7	0	0
III	34	77.3	6	13.6	2	4.6	2	4.6
IV	0	0	6	100	0	0	0	0

randomized clinical trials with equally large patient groups would better help our understanding of the prevalence of various prosthetic options in Kazakhstan and the reasons for choosing them.

Conclusion

The most frequent type of partial edentulism in the studied patient sample was Kennedy class III both in the maxilla and in the mandible, whereas Kennedy class IV was the least prevalent for both jaws. Implant treatment was the most rare prosthetic treatment option, whereas RPD treatment was the most common in this study.

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