

Tooth retention and tooth loss in the Bulgarian population aged over 60

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Summary

Objective. Many studies have been carried out on natural tooth retention in elderly people. However, data on tooth retention in the elderly population in Bulgaria are very scarce. The aim of this study was to establish tooth loss in the Bulgarian population aged over 60.

Methods. The study was carried out in 1999 and included 653 subjects aged over 60 (263 males and 390 females). Participants were sampled based on age and area of residence. Dentists with abundant practical experience and specially trained and calibrated by us performed the clinical inspection in dental surgery.

The following statistical methods were applied: Fisher's exact (two-tail) test; χ^2 criterion (chi-square; uncertainty coefficient); χ^2 criterion (Mantel-Haenszel chi-square test); ANOVA test.

Results. The results showed that just under one-fourth (23.89%) of the subjects were toothless. Among the dentate subjects, the average number of the remaining teeth was 15.58. Molars were the most frequently removed teeth on both jaws.

Conclusions. No significant difference in tooth loss existed between males and females. A statistically significant linear progression of the percentage of totally toothless subjects was observed with aging.

Key words: tooth retention, tooth loss, edentulism, elderly people, Bulgaria.

Introduction

Many factors have influenced the increased interest in the health of elderly people. Two factors are of particular interest: the changing age distribution of the population and the changing model for dental health and treatment needs.

Demographic data show that the proportion of elderly people has grown steeply all over the world. During the next 30 years the proportion of the population aged over 80 is expected to reach 22 to 30% of the total number of people aged over 60 in Europe [1].

Overall, the population aged over 60 throughout the world is increasing by about one million each month, which means that in 2025 those aged over sixty years will increase by one in every four persons [2]. The WHO report on health care conditions in 1998 showed that the number of people aged over 65 will reach 800

millions in 2025 [3]. According to Merdjanov, the population of Bulgaria is also rapidly growing old, the relative proportion of people beyond working age being 13.0% in 1956, 21.3% in 1986, and 22.7% in 1990 [4].

The official population projection in Bulgaria shows that in 2010 the retired population will reach 28.3%, and in 2020 - 30.5%. [5]

One of the most significant indices of dental health among elderly people - the natural teeth retention and teeth loss - has been the subject of numerous studies [2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17]. The studies' results indicated a different percentage of edentulous subjects but in most cases this percentage was high [8, 18, 19, 20, 21 and 22].

The data on tooth loss of both sexes are controversial, although in most studies a significant difference between tooth loss in males and females has not been reported [7, 14, 18 and 21]. Numerous studies point out an increase in the

percentage of edentulous individuals by age and a decline of this percentage in the "new elderly people" [18, 24, 25, 26 and 27].

Material and methods

The aim of the present study was to evaluate natural tooth retention and tooth loss in the population aged over 60 in Bulgaria. 653 subjects aged over 60 (263 males and 390 females) were included in a full clinical examination.

The age and sex distribution of the observed sample is shown in *Table 1*.

Participants were selected by age, gender and residence through occasional selection in 24 areas (4 areas in Sofia, 10 areas in other cities and 10 areas in villages). The sample corresponded to the actual age and gender structure of Bulgarian population over 60. Differences between the structure of population and the structure of the observed sample according to age are ($P\chi^2 = 0.264$) and according to sex (Fisher's exact (two-tail) test - $P = 0.179$), i.e. the sample was representative for the country.

The study was carried out in 1999. Objective clinical status (loss teeth) was registered by clinical examination. Dentists of great clinical experience held it; they were trained and calibrated under our supervision. The 3rd molars were not included. The clinical examination of

the subjects was held in dental surgeries. The data of examination were registered according to WHO criteria, in an individual dental record for every subject.

The SPSS software package (SPSS for Windows, SPSS Inc. Release 5.02, 1993) was used for the statistical processing and analysis. The following statistical methods were applied:

- Look for any statistical relationship between quality variables (Fisher's exact (two-tail) test; χ^2 criterion (chi-square; uncertainly coefficient));
- Look for any linear trend (linear-by-linear association test) by means of χ^2 criterion (Mantel-Haenszel chi-square test);
- Compare the mean values by means of one-way ANOVA test.

Results

More than 98% out of the observed 653 subjects had at least one tooth missing (*Table 2*).

Only 12 subjects (1.8%) retained all 28 natural teeth. There were no subjects without any extracted tooth beyond the age of 79. Four of the 12 subjects with remaining 28 teeth were males (1.5% of males) and 8 were females (2.1% of females).

The percentage of subjects with extracted teeth increased with aging, starting from a high

Table 1. Age and sex distribution of observed subjects

Age groups	Males	Females	Total
60-64	67	72	139
65-69	72	89	161
70-74	61	96	157
75-79	31	76	107
80+	32	57	89
Total	263	390	653

Table 2. Subjects with missing teeth

Age	Subjects with one or more teeth missing					
	Males		Females		Total	
	Number	%	Number	%	Number	%
60-64	65	97.0	70	97.2	135	97.1
65-69	72	100.0	85	95.5	157	97.5
70-74	59	97.0	95	99.0	154	98.1
75-79	31	100.0	75	98.7	106	99.1
80+	32	100.0	57	100.0	89	100.0
Total	259	98.5	382	98.0	641	98.2

Differences: according to sex (F; $P = 0.77$) and according to age (UC; $P = 0.293$)

level (97.1%) in the 60-64-year-old batch and reaching 100% in the 80-year-old or older people. This percentage was 98% in females and 98.5% in males.

The average number of missing teeth per person was 16.14 among the total number of observed people aged over 60 (Table 3).

The average number of missing teeth per person increased with age: from 11.6 in the group of the 60-64-year-old batch to 17.3 in the group of the 70-74-year-old batch reaching 22.8 among the subjects over 80. The increase in the average number of extracted teeth with aging was observed on both upper and lower jaws. Average number of missing teeth in the upper arch for the observed subjects was 8.1 and in the lower arch - 8.

The average number of remaining natural teeth among the dentate subjects was 15.6 (Table 4).

Males had more remaining natural teeth (16.1) than females (15.2). The number of the remaining natural teeth decreased with aging from 17.80 among the 60-64-year-old batch to 12.9 among the 80-year-old batch and the older people. The average number of retained teeth on the upper arch was 7.7 and 7.9 on the lower arch.

Of all teeth, molars were extracted most often - both on the upper jaw and on the lower one (Figure 1).

In the molar group, the highest percentage of extraction (79.2%) was observed for the first left lower molar (No. 36), while the lowest percentage (71.7%) was observed for the second right lower molar (No. 47). The teeth of the premolar group came next in prevalence of extraction: from 51.2% for No. 44 to 69.4% for No. 25. The premolars of the upper jaw were extracted more often. The percentage of extracted second premolars on both jaws was higher than the percentage of extracted first premolars. The frontal teeth ranked third in the prevalence of extraction: from 36.9% for No. 43 to 49.3% for No. 41.

The canines on the lower jaw were extracted most rarely in this group (No. 43 in 36.9%; No. 33 in 37.4%). The cases of extraction of these teeth on the upper jaw were more frequent: No. 13 in 42.3% and No. 23 in 44.7%.

The distribution of subjects by number of missing teeth was: 23.9% were with 28 missing teeth; 15.1% were with 21-27 missing teeth; 11.5% - with 16.2 missing teeth; 14.1% - with 11-15 lost teeth; 15.5% - with 7-10 removed teeth; 10.7% - with 4-6 missing teeth; 5% - with 2-3

Table 3. Average number of missing teeth per subject out of the total number of subjects observed

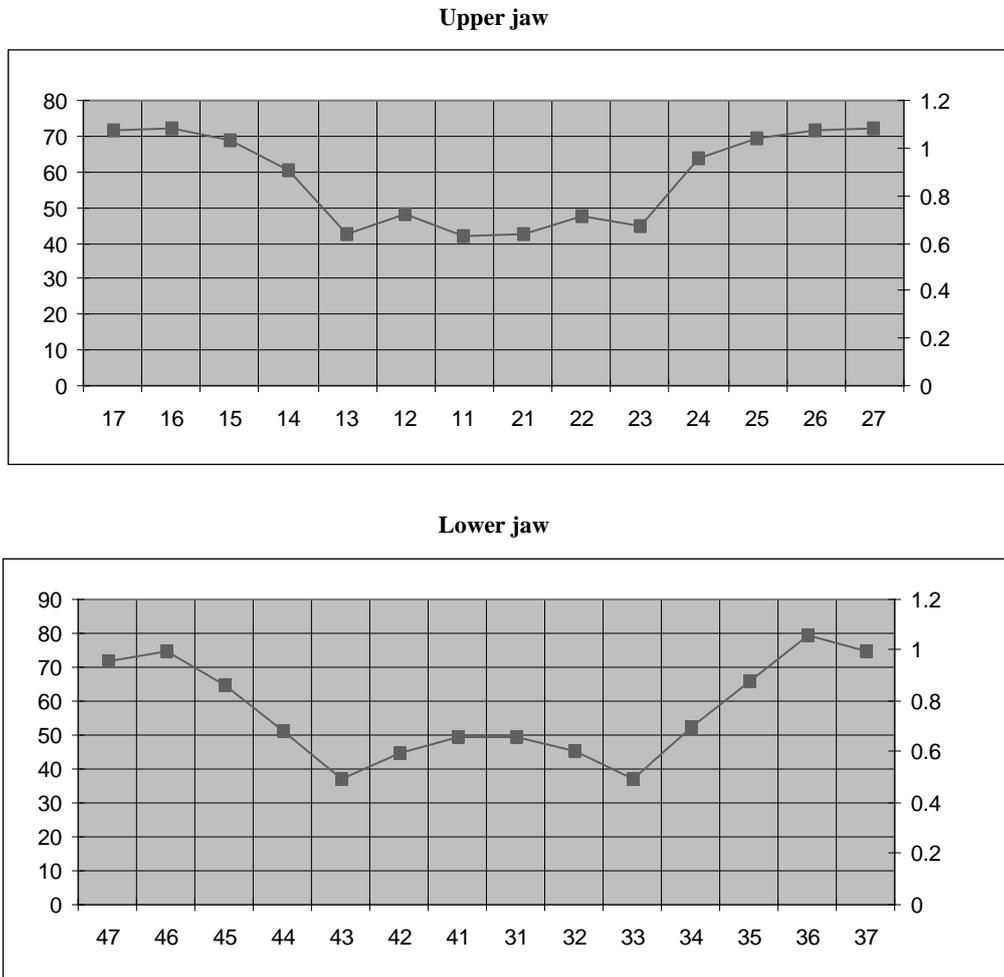
Age	Males			Females			Total		
	Upper jaw	Lower jaw	Total	Upper jaw	Lower jaw	Total	Upper jaw	Lower jaw	Total
60-64	6.6	5.3	11.9	5.9	5.4	11.3	6.2	5.4	11.6
65-69	6.9	6.5	13.4	6.9	6.8	13.7	6.9	6.7	13.6
70-74	7.9	7.9	15.9	8.9	9.3	18.1	8.5	8.7	17.3
75-79	9.6	10.1	19.7	9.3	9.1	18.3	9.4	9.4	18.7
80+	11.3	10.6	21.9	11.5	11.8	23.3	11.5	11.4	22.8
Total	7.9	7.5	15.4	8.4	8.3	16.7	8.2	8.0	16.1

Table 4. Average number of remaining natural teeth per subject among the dentate subjects

Age	Males			Females			Total		
	Upper jaw	Lower jaw	Total	Upper jaw	Lower jaw	Total	Upper jaw	Lower jaw	Total
60-64	8.2	9.5	17.7	8.7	9.2	17.9	8.4	9.4	17.8
65-69	8.2	8.6	16.7	7.9	8.0	15.9	8.0	8.3	16.2
70-74	7.7	7.7	15.4	7.2	6.7	13.9	7.4	7.1	14.5
75-79	7.5	6.8	14.3	6.4	6.7	13.1	6.7	6.7	13.4
80+	5.4	6.8	12.3	7.0	6.4	13.4	6.3	6.6	12.9
Total	7.8	8.4	16.1	7.6	7.6	15.2	7.7	7.9	15.6

Differences: according to sex: ANOVA (P = 0.169)
 according to age: 60-69 and over 70: ANOVA (P < 0.001)

Figure 1. Frequency of missing teeth on the upper and lower jaw



missing teeth; 2.3% - with only 1 missing tooth.

The distribution of subjects with retained teeth, according to the number of retained teeth pointed out that only 2.3% had 27 retained teeth (Table 5).

3.0% of males and 1.8% of females were glad to have such a status. 5.1% (6.5% males and 4.1% females) had 25-26 own teeth retained. The percentage of subjects with 22-24 retained teeth was considerable (10.7%). 15.5% (18-21 teeth) of subjects were on the border of acceptable number of retained teeth in people over 60. The percentage of men with such a status was 12.6% and in women - 17.4%. The rest of 64.6% of subjects had less than 17 teeth retained and were distributed as follows: 13-17 - 14.1%; 8-12

- 11.5%; 1-7 - 15.2% and 23.9% were edentulous.

The percentage of edentulous individuals increased by age from 7.9% in 60-64-years-old to 11.2% in 65-69-years-old, to 26.1% in 70-74-years-old and reached 30.8% in 75-79-years-old (Table 6).

The percentage of individuals that were partially edentulous (upper or lower arch) was almost equal - 7.3 and 7.2 respectively.

There were some differences in the percentage of edentulous subjects with different level of education in the present study:

- Individuals without education - 38.9%;
- Individuals with high school - 24.6%;
- Individuals with university degree - 19.9%

Table 5. Distribution of subjects by number of remaining and missing teeth

Males										
Remaining teeth	28	27	25-26	22-24	18-21	13-17	8-12	1-7	0	Total number of subjects
Missing teeth	0	1	2-3	4-6	7-10	11-15	16-20	21-27	28	
Age	%	%	%	%	%	%	%	%	%	
60-64	3.0	1.5	14.9	16.4	14.9	16.4	9.0	14.9	9.0	67
65-69		5.6	6.9	22.2	11.1	15.3	11.1	15.3	12.5	72
70-74	3.3	3.3	3.3	4.9	21.3	14.8	11.5	16.4	21.3	61
75-79				12.9		22.6	12.9	9.7	41.9	31
≥ 80		3.1		3.1	6.3		25.0	12.5	50.0	32
Total	1.5	3.0	6.5	13.3	12.6	14.5	12.6	14.5	21.7	263

Females										
Remaining teeth	28	27	25-26	22-24	18-21	13-17	8-12	1-7	0	Total number of subjects
Missing teeth	0	1	2-3	4-6	7-10	11-15	16-20	21-27	28	
Age	%	%	%	%	%	%	%	%	%	
60-64	3.3	6.9	5.6	13.9	31.9	13.9	4.2	13.9	6.9	72
65-69	4.5	2.3	6.7	13.5	18.0	16.9	6.7	21.4	10.1	89
70-74	1.0		3.1	7.3	13.5	17.7	13.5	14.6	29.2	96
75-79	1.3		4.0	4.0	14.5	14.5	18.4	17.1	26.3	76
≥ 80				5.3	8.8	1.8	10.5	8.8	64.9	57
Total	2.1	1.8	4.1	9.0	17.4	13.9	10.8	15.6	25.4	390

Total										
Remaining teeth	28	27	25-26	22-24	18-21	13-17	8-12	1-7	0	Total number of subjects
Missing teeth	0	1	2-3	4-6	7-10	11-15	16-20	21-27	28	
Age	%	%	%	%	%	%	%	%	%	
60-64	2.9	4.3	10.1	15.1	23.7	15.1	6.5	14.4	7.9	139
65-69	2.5	3.7	6.8	17.4	14.9	16.2	8.7	18.6	11.2	161
70-74	1.9	1.3	3.2	6.4	16.6	16.6	12.7	15.3	26.1	157
75-79	0.9		2.8	6.5	10.3	16.8	16.8	15.0	30.8	107
≥ 80		1.1		4.5	7.9	1.1	15.7	10.1	59.6	89
Total	1.8	2.3	5.1	10.7	15.5	14.1	11.5	15.2	23.9	653

Table 6. Edentulism in subjects over 60 years of age

Total				
Age	Number of observed subjects	Percentage of edentulous subjects		
		Only on upper arch	Only on lower arch	Both arches
		%	%	%
60-64	139	10.8	2.2	7.9
65-69	161	9.3	8.1	11.2
70-74	157	5.1	8.9	26.1
75-79	107	8.4	11.2	30.8
≥ 80	89	1.1	5.6	59.6
Total	653	7.4	7.2	23.9

Differences by gender ($P = 0.159$) and by age ($P = 0.001$). Trend for linear increase of edentulism by age: $P < 0.0001$

Our research on 942 dental removals in people over 65 years of age pointed out that the major reason for removals (59-65%) was still dental caries. Removals due to advanced periodontitis reached 16-17% of the total number of lost teeth.

A considerable percentage of teeth (18-19%) were removed either in connection with forthcoming prosthetic treatment or in some cases on demands of the patient.

Discussion

Our study results indicated that in population over 60 years of age 24% were edentulous and 76% were dentate. Only 1.8% of subjects were glad to be completely dentate. The percentage of edentulous subjects was lower than percentage pointed out in some studies [2, 6, 8, 18, 19 and 28], higher than the results in other one [7, 11 and 12] and near to the results in the third source [27, 28 and 29].

The percentage of edentulous subjects increased by age from 7.9 in 60-64-year-old to 30.8 in 75-79-years-old group. Nearly 60% of subjects over 80 years of age were edentulous. This trend coincided with the results given in studies of other authors [18, 27, 28, 29 and 30].

The increase in percentage of edentulous subjects by age pointed out a linear increase ($P < 0.0001$) trend of statistical importance.

Differences in edentulism among men and women had no statistical importance. The results were similar of other studies [24, 25, 29 and 31].

The variations in edentulism among subjects with different educational level could not be deeply analyzed in the present study. However, they indicate that there is a need for further longitudinal studies in this direction.

The differences in percentage of subjects with at least 1 missing tooth in different age groups over 60 years lot were of no statistical importance ($P = 0.293$).

The differences in percentage in men and women with at least one missing tooth were also of no statistical importance ($P = 0.77$).

The average number of retained teeth in dentate men and women, respectively 16.1 and 15.1 did not show statistically important differences ($P = 0.169$). These results coincided with other studies' results [24, 25 and 29]. There was

difference of statistical value regarding the number of retained teeth in the age group up to 69 years old and in the group over 70-years old ($P < 0.001$). There was not a considerable difference in the average number of retained teeth on the upper and lower arches.

Molars were most likely to be missing in the lower and upper arch from all the teeth. Bicuspids were secondly more likely to be missing and front teeth were the least missing teeth. Differences in absence of different teeth groups were of statistical importance ($P < 0.0001$). Cuspids were the teeth most likely to be retained in all quadrants. Lower cuspids were the most rarely removed teeth. A similar case was described by other authors [29].

The distribution of subjects by number of missing teeth indicated considerable percentage of subjects with over 16 removed teeth - 26.6%. One third of the subjects (33.5%) had less than 11 missing teeth or respectively over 18 present teeth. That situation almost reached the commonly accepted goal for this age group (to have at least 20 natural teeth).

The major reason for teeth removal in subjects over 60 years of age remained dental caries (59-65%).

An almost equal percentage of teeth were removed because of advanced periodontal diseases and non-medical reasons - respectively 16-17% and 18-19% in studied age groups over 60 years old.

Conclusion

Approximately one fourth (23.9%) of the population aged over 60 did not have any remaining natural teeth. The number of remaining teeth (15.6) was less than the number of lacking teeth (16.1) in the other three-fourths of the population. The percentage of edentulous individuals increased by age. No significant differences in tooth loss in males and females were observed.

Differences existed in the lack of different groups of teeth. The teeth of the molar group were lacking most often, followed by the premolars, whereas the frontal teeth were lacking most rarely. The most often remaining teeth were the lower canines.

Total tooth loss showed a statistically significant linear progression with aging.

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