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Reasons for Extraction of Permanent Teeth in Urban and Rural Populations of Croatia

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ABSTRACT

The survey aimed to determine the reasons for extraction of permanent teeth by general dental practitioners in urban and rural population of the Senj region, Adriatic coast, Croatia. During a two-year period (1998–9), a total of 2006 teeth were extracted in both regions, in patients aged 15+. The causes were defined as follows: (1) decay or root without a crown (radix relicta), (2) periodontal disease, (3) endodontic or periapical diseases and (4) other reasons – orthodontics/prosthodontics and dental trauma. The statistical Chi-square-test was used to determine the significant difference between the populations and the sexes. Dental caries was the most frequent cause for extraction (over 50%), followed by endodontic and periapical diseases (23%) as the result of untreated caries and at the end periodontal disease (21%). Urban population more often lose teeth due to periodontal disease (22.75%) than rural (18.93%, $p < 0.05$). Similarly, this is more frequent in the urban male population (25.61%) than the female urban population (20%, $p < 0.05$). In rural areas, people more often lost teeth as a result of endodontic and periapical disease (25.85%) than in the urban locations (19.07%, $p < 0.01$) and this is more frequent in women from rural areas (28.37%) than the rural men (22.44%, $p < 0.05$). Periodontal disease was not the main cause of tooth loss in either the rural or the urban population. Dental caries and its sequel remain the most important challenge for the dental service. It also reveals the inadequacy of dental services. Education of both the population and the general dental practitioners must be conducted in order to improve oral hygiene and to insist on conservative rather than extraction therapy.

Key words: tooth loss, decay, periodontal disease, periapical disease

Introduction

A prevailing opinion that periodontal disease was the major cause of tooth loss in adults existed for a long time. Contradictory to old understanding, periodontitis was not the main cause for tooth extraction in adults. It is more often due to caries, socio-cultural and economic reasons such as the expense of fixed prosthetic products. Takala et al. state that the reasons for extraction in Finnish rural areas was caries or left behind root without a crown in 70%, periodontal disease in 20%, while in 10% it was due to prosthetic reasons, without caries or periodontal disease¹. They point out that the older, less well-educated, poorer, rural and male population, lost teeth more frequently. In Finland (5 million residents), 2500 people in one year lose all their teeth¹. Edentulousness reduces the quality of life, self-image and daily functioning. Although a result of caries and periodontitis, it reflects the views of patients and dentists, accessibility, availability and the standard of dental care²⁻⁷. According to Murray, orthodontic indication was the most frequent cause of tooth loss at childhood age, caries continuing to be an important cause at all ages, while periodontal disease (35.9%) was more frequent than caries (28.9%) in those over 40 years of age⁸. A study in Australia revealed that over 50% of teeth were lost due to periodontal disease between 40 and 70 years of age⁹. Contrary to these findings, a study in primary dental care in Hungary showed that 64% of teeth are extracted due to caries, on which (up to 60.73%) no treatment was even considered before extraction¹⁰. The studies in France and Hong Kong state that caries is still the main reason for tooth loss, even in patients older than 50 to 60 years^{11,12}. Niessen's study corroborates these findings, showing that in patients older than 35 years caries and root without a crown cause tooth loss in over 70% of cases¹³. In the western

countries, the incidence of caries has reduced dramatically during the last few decades, following an increase in the number of teeth remaining in the older population, which leads to a higher incidence of advanced periodontitis. In regard to that, some authors state their concerns due to possible increase in the number of extractions caused by periodontal disease^{14,15}.

The purpose of this study was to report on the reasons for tooth extraction in an urban and a rural population in Croatia. Furthermore, the differences between those settings were compared and an attempt was made identify the causes of possible differences.

Materials and Methods

Data was gathered through examination of daily reports of two (out of a total of four, randomly selected) dental practices in the town of Senj, along with two dental offices in the villages of Sv. Juraj and Krasno, close to Senj. Senj (population around 5500) is located on Croatia's Adriatic coast and according to the census from 2001, it has a population of 8132, together with its outlying areas and villages (0.2% of the total population of Croatia). Sveti Juraj is 10 km and Krasno is 35 km away from the town centre. Both villages have around 700 residents. One dentist who is also the only operating doctor in the practice owns each practice.

The study lasted for two years (1998–1999) and comprised a total of 2006 extracted teeth. The reasons for extraction (as stated in patients' chart) were classified into four groups: a) caries or a root without a crown (*radix relicta*), b) advanced periodontal disease with a marked horizontal and/or vertical mobility, c) endodontic or periapical disease (pulpitis, necrosis pulpaе, otitis apicalis acuta et chronica, abscessus periapicalis cum et

sine fistulation, cysta radicularis, granuloma, sy. pulpo-parodontale), as well as d) other reasons (orthodontic anomaly, fractura dentis, prosthetic reasons, abrasio/atritio dentis). For diagnostics, clinical examinations, probing and radiographic imaging were used. All data were collected by one experienced clinical investigator (SŠ), so there was no need for calibration. The statistical analysis was performed by SPSS 10.0 program (SPSS Inc., Chicago, USA), the significance level being set at 0.05.

Results

Urban population lost teeth more often due to periodontal disease (22.75%) than rural (18.93%, $p < 0.05$) and this was more prevalent in urban males (25.61%) than the males from rural areas (20.04%, $p < 0.05$). There were no significant differences between the village men and women in regards to tooth loss caused by periodontal disease, as well as between urban and rural women (Table 1). Differ-

ences between tooth loss due to caries or root without a crown, between the sexes and the surroundings, were not statistically significant.

In general, rural population more often lost teeth due to endodontic and periapical disease (25.85%), than the urban population (19.07%, $p < 0.01$), female subjects having more extractions than males (28.37% vs. 22.44%, $p < 0.05$) in the rural population. For the same reason, rural women lost more teeth (28.37%) than did the urban women (20.64%, $p < 0.05$), while no statistically significant difference was found between males in urban and rural regions, as well as between the urban men and women (Table 2 and Table 3).

Among other reasons – orthodontics, trauma and prosthetics, more extractions were performed in urban (1.3%) than in rural areas (0.37%, $p < 0.05$). Sex and sex-residential differences were not statistically significant for this extraction reason. Cumulative χ -square test showed significant differences in the distribution

TABLE 1
TOOTH EXTRACTION REASONS IN URBAN AND RURAL POPULATION

Population	Gender	Decay+Rad	PD	Endo+Peri	Other	TOTAL
Urban	M	252 (55.63%)	116 (25.61%)	79 (17.44%)	6 (1.32%)	453
	F	273 (58.09%)	94 (20%)	97 (20.64%)	6 (1.28%)	470
	Total	525 (56.88%)	210 (22.75%)	176 (19.07%)	12 (1.30%)	923
Rural	M	262 (57.08%)	92 (20.04%)	103 (22.44%)	2 (0.44%)	459
	F	332 (53.21%)	113 (18.11%)	177 (28.37%)	2 (0.32%)	624
	Total	594 (54.85%)	205 (18.93%)	280 (25.85%)	4 (0.37%)	1083

Decay+Rad – tooth decay / *radix relicta*

PD – periodontal disease

Endo+Peri – endodontic / periapical disease

Other – orthodontic / prosthodontic reasons, dental trauma, abrasion

TABLE 2
TOOTH EXTRACTION REASONS IN URBAN POPULATION BY AGE AND GENDER

Age	Gender	Decay+Rad	PD	End+Per	Other	Total
15–19	M	36	0	10	1	47
	F	32	0	21	1	54
	Total	68	0	31	2	101
20–29	M	28	1	10	0	39
	F	27	1	8	0	36
	Total	55	2	18	0	75
30–34	M	13	0	3	0	16
	F	18	0	3	0	21
	Total	31	0	6	0	37
35–44	M	66	7	20	0	93
	F	98	17	33	1	149
	Total	164	24	53	1	242
45–54	M	19	37	8	1	65
	F	27	28	12	2	69
	Total	46	65	20	3	134
55–64	M	22	25	9	2	58
	F	33	28	10	0	71
	Total	55	53	19	2	129
>65	M	68	46	19	2	135
	F	38	20	10	2	70
	Total	106	66	29	4	205
Total	M	252	116	79	6	453
	F	273	94	97	6	470
Overall total		525	210	176	12	923

Decay+Rad – tooth decay / *radix relicta*

PD – periodontal disease

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other – orthodontic / prosthodontic reasons, dental trauma, abrasion

of reasons for tooth loss in the male population in the urban and rural regions ($p < 0.05$), between urban and rural women ($p < 0.05$), as well as between the rural and urban populations altogether ($p < 0.05$).

Concerning the distribution of lost teeth according to age, the age group with most extracted teeth is 35–44 years of age group, in both populations (18% in the urban and 16% in the rural). It is important to emphasize that these details relate to teeth that were extracted as the result of

caries or were diagnosed as *radix relicta*. In this age group, for example, only around 2% of teeth were extracted as a result of periodontal disease in examined populations.

Discussion

Takala et al. published similar results in the rural population of Finland, periodontal disease being the reason for 20% of extractions (22.75% in Croatia), caries for 70% (75.95% for caries, endodontic and

TABLE 3
TOOTH EXTRACTION REASONS IN RURAL POPULATION BY AGE AND GENDER

Age	Gender	Car+Rad	PD	End+Per	Other	Σ
15–19	M	43	0	22	0	65
	F	44	0	44	0	88
	Total	87	0	66	0	153
20–29	M	31	1	17	1	50
	F	41	3	27	0	71
	Total	72	4	44	1	121
30–34	M	17	v1	9	0	27
	F	27	4	15	1	47
	Total	44	5	24	1	74
35–44	M	70	5	27	0	102
	F	106	19	41	0	166
	Total	176	24	68	0	268
45–54	M	16	32	15	1	64
	F	40	30	26	0	96
	Total	56	62	41	1	160
55–64	M	25	19	7	0	51
	F	41	33	16	1	91
	Total	66	52	23	1	142
>65	M	60	34	6	0	100
	F	33	24	8	0	65
	Total	93	58	14	0	165
Total	M	262	92	103	2	459
	F	332	113	177	2	624
Overall total		594	205	280	4	1083

Decay+Rad – tooth decay / *radix relicta*

PD – periodontal disease

Endo+Peri – endodontic / periapical disease

Other – orthodontic / prosthodontic reasons, dental trauma, abrasion

periapical disease in Croatia), as and prosthetic reasons for 10% of extractions (1.3% in Croatia). They found more roots for extraction in males than in females¹. Chesnutt et al. observed similar reasons for tooth loss in Scotland¹⁶. In as many as 51% of cases, the reason for extraction was caries, in 21% it was periodontal disease, in 11% orthodontic reasons, in 4% unsuccessful endodontics, in 5.5% trauma, *pericoronitis* and other reasons. In 7.5% of cases, it was the patient that demanded the extraction.

Periodontal disease is the reason for tooth loss in mature population in 13% (Tanzania), 18.7% (USA), 19% (Norway)¹⁷, 19.6% (Malaysia)¹⁸, 20% (Finland), 21% (Scotland), 24% (Norway)¹⁹, 25.1% (Hungary)²⁰, 25.6% (Australia)²¹, 27.3% (Germany)²², 28% (Hong Kong)²³ 29% (USA)²⁴, 29.9% (Caribbean), 32.4% (France)²⁵, 33.1% (Italy)²⁶, 33.4% (Jordan)²⁷, 35.9% (Canada), 38% (Japan)²⁸, 55.8% (Singapore)²⁹. The findings of the present study range between those of Norway and Germany.

In the studied population, periodontal disease was not the major cause of tooth loss in the younger population, since at that age, it is less often manifested. With an increase in age, the incidence of periodontitis also increases, while the prevalence of caries reduces due to stabilisation of oral hygiene and nutrition habits. Adults eat sticky carbohydrates less often than children. It needs to be kept in mind that up to the age when periodontitis is on an increase, a large number of teeth have been extracted due to caries and its consequences. A large proportion of teeth have been treated with fillings by then. Apprehension, as a factor for not going to the dentist is on a decrease in older population, which also changed the reasons for extractions. In the population study, even in older age groups, caries and its consequences were a more frequent cause of tooth loss from periodontal disease. A noticeably low frequency of extraction due to orthodontic reasons, which reduces the incidence of compression, is indicated in a large number of extracted first molars in the younger population. The distance to an orthodontic practice (nearest is 70 km away) is a negative motivating factor and a reason for the lack of orthodontic treatment. Poor preventive protection and oral hygiene education may be attributed as the main reason for these findings. Still, the general practitioners carry their part of the blame. They do not inform the patients about the possibilities of conservative or endodontic therapy. It should be

explained to the patients that toothache is not a reason for extraction. Dentistry is a distinctly expensive medical branch, in particular endodontics, periodontology and prosthetics. The impoverished population of the emerging countries is not at liberty to afford expensive fixed constructions. In too many situations it is cheaper to extract a tooth than to treat it. Molars have more complex endodontic morphology, they are difficult to access and thus their therapy is more complicated. That is probably also the reason for a lack of motivation to treat them conservatively. A patient that is not motivated cannot motivate the dentist to insist on treating such teeth, and a magic circle is created. Still, all that is mentioned above is even more accentuated in the rural areas.

Conclusion

Periodontal disease is not the major reason for extractions in either the rural or the urban population. The largest percentage among the reasons has caries (more than 50%), as well as endodontic and periapical disease (up to 27%), these two being results of untreated caries. The reasons are lack of motivation in both patients and dentists for conservative treatment. Beside the preventive measures, education of the population together with dental practitioners needs to be implemented, in the purpose of improving oral hygiene and insisting on conservative therapy rather than extraction.

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UZROCI VAĐENJA STALNIH ZUBA U URBANOJ I RURALNOJ POPULACIJI U HRVATSKOJ

SAŽETAK

Svrha ovog rada bila je utvrditi indikacije za ekstrakciju trajnih zubi u općim primarnim stomatološkim ambulancama u urbanoj i ruralnoj populaciji na području grada Senja, Hrvatsko primorje, Hrvatska. Za statističku obradu rabljen je Chi-kvadrat-test koji je mjerio razliku između ispitnih populacija i spolova. Tijekom dvije godine (1998–1999) u oba ispitna područja je ekstrahirano 2006 zubi kod pacijenata u dobi 15+. Indikacije za ekstrakciju bile su podijeljene u skupine: (1) karijes ili perzistentni korijen (*radix relicta*), (2) parodontna bolest, (3) pulpna ili periapikalna bolest i (4) ostali razlozi – ortodontski, protetski, trauma zuba. Karijes zuba još je uvijek najčešći razlog za ekstrakciju zuba (50%), zatim su tu pulpne i periapikalne patoze s 23% kao posljedice neliječenog karijesa i na kraju bolesti parodonta s 21%. Gradska populacija češće gubi zube zbog parodontne bolesti (22,75%) nego seoska (18,93%, $p < 0,05$). Isto tako muška gradska populacija češće (25,61%) nego ženska gradska populacija (20%, $p < 0,05$). Na selu ljudi češće gube zube zbog bolesti pulpe i periapeksa (25,85%), nego u gradu (19,07%, $p < 0,01$) i to češće seoske žene (28,37%) nego seoski muškarci (22,44%, $p < 0,05$). Što se tiče dobi, najveći gubitak zubi kod svih ispitanika, i to kao posljedica karijesa, je od 35–44 godina u obje populacije (18% u gradskoj i 16% u seoskoj populaciji). Iz ovih podataka može se zaključiti da zubni karijes i njegove posljedice i nadalje ostaju najveći izazov stomatološke prakse. Edukacija populacije i stomatologa u primarnoj stomatološkoj zaštiti morala bi unaprijediti oralnu higijenu i promovirati konzervativnu terapiju a ne ekstrakcije zuba.