

Epidemiological Study on Prosthodontic Appliance Deliveries within Elderly Cohorts in the Republic of Croatia, 2002–2006

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ABSTRACT

Number of the dentate subjects among the elderly is dramatically increasing, as is the elderly proportion in overall population. Such trends indicate more need for prosthodontic appliances in elderly. The aim of this investigation was to determine the distribution of various prosthodontic appliances in older age cohorts, subventioned by the Croatian Institute for Health Insurance. Data on various prosthodontic appliances subventioned by the CIHI and delivered in all Croatian districts in the period 2002–2006 was obtained and statistically analyzed relative to 4 age cohorts of 50 and more years. The oldest age cohort (80+) showed the least appliance deliveries. The most frequently delivered appliance in all age groups were partial removable dentures (382 456 deliveries). Significantly less deliveries in the oldest age cohort compared to other groups ($p < 0.05$) suggest that the oldest elderly patients tend to maintain prosthodontic appliances for a longer period than functionally acceptable.

Key words : *prosthodontic appliances, elderly, health insurance*

Introduction

Oral health status of older people has been gaining more importance in developing and developed countries in the last decades as the proportion of this group among the population slowly but continuously increases because of the increase in life expectancy¹. In addition, the number of the dentate subjects among the elderly is dramatically increasing².

Before the 1940s it was considered that tooth loss and complete edentulism were inevitable consequences of ageing. The introduction of preventive dentistry in the middle of the 20th century made people aware that they could reach their old age while still having their own teeth³.

Elderly patients have strong will to retain their natural teeth for as long as possible, which increases the need for manufacturing fixed prosthodontic appliances, bridges and crowns, for patients of that age group⁴. The US National epidemiological research results showed a 10% decrease in number of edentulous patients in every decade since the 1950s⁵. In a multinational study conducted between 1990 and 1994, the oral health status

and treatment needs of 19,845 subjects in age groups 55–64, 65–74 and 74+ years from Austria, Byelorussia, Germany, Hungary, Italy, Poland, Slovenia and the Czech Republic were determined. The oral health status of the adult populations of all these countries was characterized by a high rate of tooth loss and edentulism. In Germany, Poland, the Czech Republic and Hungary, edentulism for the 55–64 year olds varied from 17–20%. Ten percents of the subjects were edentulous in Byelorussia and Austria, 6,7% in Slovenia, and 5,8% in Italy. In the age group of 65–74 year-olds, edentulism increased even further; more than 1/3 of all subjects in the Czech Republic, Germany and Poland had no teeth; in the Hungarian sample the proportion exceeded 50%. The lowest edentulism was recorded in the Italian and Austrian samples, with no significant differences between the two countries⁶. Musacchio et al. studied the prevalence of tooth loss among the elderly population of northern Italy. The prevalence of edentulism was about 44.0%. It was more pronounced in females and it was twice as prevalent in the 90+ years age group. Among edentulous subjects,

17.5% wore no dentures⁷. In north-east Germany a study considering dental status in the oldest population was made. The results showed that 16% of the population between 60 and 65 years of age was edentulous, and in the population aged between 75 and 79 results showed 30%⁸. Marcus et al. studied edentulism in New England in the 1990s and found that 36.7% of 1156 examinees were toothless. The highest edentulous percentage was found in the oldest age group, 85+ year-olds, in which 42% of women and 52% of men were completely edentulous⁹. In Denmark, a study of 16,690 subjects of all age groups was undertaken to evaluate the Danish dental health care system's level of achievement for the year 2000. At the age of 65–74 years, 27% were edentulous and 40% had 20 teeth or more; 58% wore removable dentures¹⁰. Špalj et al. determined that caries was the primary reason for extraction of permanent teeth in urban and rural populations of Croatia, with prevalence of over 50%, followed by endodontic and periapical diseases making for 23%¹¹.

The aim of this investigation was to determine the distribution of all prosthodontic appliances / fixed and removable / in older age cohorts, subventioned by the Croatian Institute for Health Insurance in all districts of the Republic of Croatia.

Materials and Methods

Total number of 633 824 of various prosthodontic appliances /fixed (382 456) and removable (251 368)/ subventioned by the Croatian Institute for Health Insurance (CIHI) and delivered in all Croatian districts in the period from 2002 to 2006 was obtained from the CIHI. Distribution of the following prosthodontic appliances was studied: acrylic partial denture up to 10 and more than 10 elements, metal based partial denture, acrylic and metal base complete denture, post and core, acrylic crown, veneered crown, full metal crown, veneered pontic, modified veneered crown, modified full metal crown, denture relining and denture repair (fracture and loss of 1 tooth or fracture and loss of 2 or more teeth). The following parameters were studied: distribution of partial and complete removable dentures according to age, relationship between partial and complete removable denture deliveries in the time period between the years 2002–2006, number of insured patients who received prosthodontic appliances relative to Croatian districts per every year separately, distribution of partial removable dentures (acrylic partial removable denture of up to 10 teeth, acrylic partial removable denture more than 10 teeth and metal based partial dentures), relationship between deliveries of metal based and acrylic partial removable dentures. Regarding fixed prosthodontic appliances the following parameters were studied: distribution of various fixed prosthodontic appliances (post and core, acrylic crown, veneered crown, full metal crown, veneered pontic, modified veneered crown, modified full metal crown) according to age groups through 5 years in the period between 2002–2006 year. Focus of the investigation was on elderly patients segmented into 4 age groups: 51–60

years, 61–70 years, 71–80 years and over 80 years of age. Statistical analysis was performed by SPSS 12 for Windows, SPSS Inc., Chicago, Illinois.

Population size living in the Republic of Croatia was obtained from the National Institute for Statistics.

Total number of insured population through the CIHI at March 31st 2001 was 4,304.588 patients and total number of Croatian population in 2001 was 4,437.460.

Results

In 2002 patients requested 124 227 prosthodontic appliances and in 2006 that number has increased by 35,4% to 168 179. The highest number of prosthodontic appliances through the years has been delivered in the district of Zagreb /the capital/ (24%), than in the district of Splitsko – Dalmatinska (9%) and the smallest number of appliances was delivered in the district of Ličko-Senjska (1%).

The most frequently used removable prosthodontic appliance in the period 2002–2006 were removable partial dentures counting 60% (382 456) relative to 40% (251 368) of removable complete dentures. The highest percentage in the group of removable partial dentures were acrylic removable partial dentures with more than 10 elements (44%), followed by metal based partial dentures (35%), while acrylic removable partial dentures of up to 10 elements took the smallest part of 21%. In complete dentures group acrylic dentures presented 99.80% and metal-based only 0.02% of the overall number.

Removable partial dentures were most often present in the age group between 50–60 years old (26%) and the least in the age group older than 80 years (2.56%). The highest percentage of complete removable denture deliveries was in the age group of 70–80 year olds (30.39%), in the age group of 60–70 year olds (29.61%) the lowest percentage was in the age group of older than 80 years (6.35%).

Index of partial over complete denture deliveries relative to age cohorts is shown in Figure 1.

Most of the fixed prosthodontic appliances were delivered in the age group of 70–80 year olds (30.13%), and the most frequently used appliance was veneered crown,

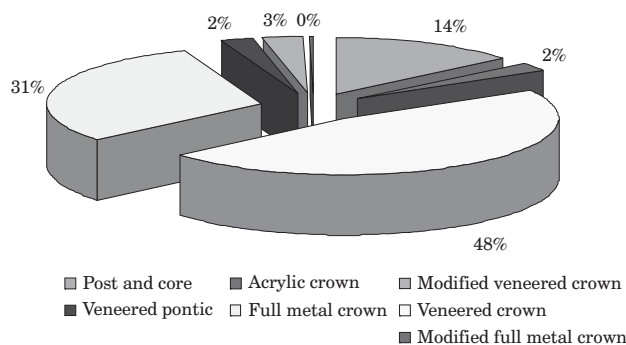


Fig. 1. Distribution of various fixed prosthodontic appliances in overall sample.

which was delivered 77 251 times. The least frequently used fixed prosthodontic appliance was full metal modified crown which was delivered 597 times. Analyzing by age groups, the most frequently used appliance in the age group between 50–60 year olds was modified veneered crown (29.31%), in the age group between 60–70 year olds full metal crown (33.05%), in the age group between 70–80 year olds veneered pontic (55.43%), same as in the oldest age group (8.66%).

There were no statistically significant differences ($p > 0.05$) between the Croatian regions regarding appliance distribution relative to the population size. Regarding appliance distribution relative to age groups, the oldest age group significantly differed from all the other age groups ($p < 0.05$), with the least number of new appliance deliveries.

Pearson's correlation showed significant correlation between age and number of veneered appliance deliveries (Table 1). There was no statistically significant correlation determined between age and any other type of fixed or removable appliance ($p > 0.05$; Table 1).

Most of the repairs were done in the district of Zagreb (21%), in the district of Primorsko-Goranska (9%) and 1% in district of Ličko-Senjska.

Total number of repairs was 179 232, of which 46% were repairs of denture base fracture and up to 1 tooth, 37% repairs of base fracture and 2 or more teeth, and in 17% of denture base relinings.

Discussion

The number of prosthodontic patients in Croatia has been increasing through the years. This trend is tightly related to several important factors, such as improved preventive care allowing people to reach old age with their own teeth, positive socioeconomic and educational status, and perhaps the most importantly, the aging trends. Aging of Croatian population is following the ageing trends of global population, as well as the current demographic development evident in Europe where predictions demonstrate that by the year 2025 every seventh European may be older than 60 years⁶.

The results of the study showed that the distributions of prosthodontic appliances were directly related to the population distribution regarding various Croatian regions. This was most evident regarding the overall prosthodontic appliances distributions in comparison to population distributions: Zagreb region 24% of appliances – 24,5% of population; Splitsko-dalmatinska region

9% of appliances – 10,5% of population; Ličko-senjska region 1% of appliances – 1,2% of population. In a general manner, this finding might imply that all the socioeconomic and educational factors influencing distributions of prosthodontic appliances are the same regardless of the region. However, distributions relative to the type of appliance demonstrated significant differences ($p < 0,05$), where socioeconomically more developed urban regions had less complete removable denture deliveries and more fixed appliance deliveries relative to the less developed regions.

The Croatian Institute for Health Insurance allows removable denture replacement every five years and the cost is fully covered by the insurance. The costs for fixed prosthodontic appliances are subventioned by the insurance only in part, which consists of 2 modified veneered crowns as retentive elements for removable denture and 2 individual post and cores per each jaw¹². The distribution of fixed prosthodontic appliances, with significant percentage of veneered crown and full metal crown deliveries could be related to this model of dental health financing (Figure 1.). The costs for removable prosthodontic appliances are completely covered by the CIHI. This model of dental health financing also explains more removable denture deliveries in relative numbers population wise in economically less developed regions of Croatia. Comparing the denture base material relative to age cohorts, the results of Pearson's correlation shows significant influence of patients' age in acrylic based denture deliveries where older age cohorts demonstrated more acrylic based dentures ($p = 0.44$, Table 2). No significant correlation was determined between age and metal based dentures ($p = 0.79$, Table 2).

Index of partial over complete denture deliveries demonstrated distribution change from partial to complete as

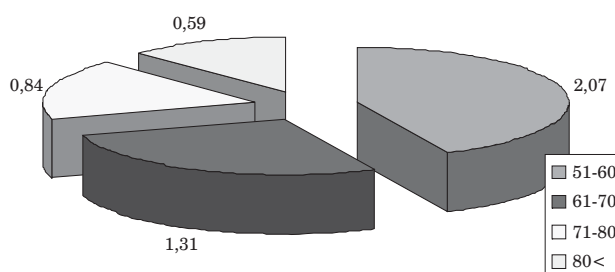


Fig. 2. Distribution index of partial over complete dentures relative to age cohorts.

TABLE 1
PEARSON'S CORRELATION TEST FOR TYPE OF DELIVERED APPLIANCE AND AGE

	Post and core	Veneered crowns	Full metal crowns	Partial dentures	Complete dentures
R	-0.23	-0.57	-0.41	-0.35	-0.52
p	0.67	0.45	0.52	0.62	0.51

TABLE 2
PEARSON'S CORRELATION TEST FOR DENTURE BASE MATERIAL AND AGE

	Acrylic base	Metal base
R	-0.59	-0.18
p	0.44	0.79

the patients were older (Figure 2), which is in agreement with the study of Poljak-Guberina et al.¹³. This result is in agreement with the results of Kraljević Šimunković et al.¹⁴ and Minakuchi et al.¹⁵ who also determined more complete denture wearers in older age cohorts.

The oldest age cohort (80+) showed the least appliance deliveries compared to other age cohorts. Although at first surprising, this result should be expected regarding the fact that the analysis was done on the basis of new appliance deliveries and not on the clinical examinations of present oral health state and function. As shown by Čatović, Jerolimov and Čatić¹⁶, over 35% of elderly had not seen a dentist in a 10-year period. Also, Bergman, Hugoson and Olsson¹⁷ in their longitudinal study demonstrated that 25 years after removable denture deliveries 65% of original dentures were still in function and patients were satisfied with their condition and chewing ability. Their result was in agreement with Frank et al.¹⁸ whose study demonstrated no relationship between clinical acceptance of dentures (43% of dentures) and patients' satisfaction (65% of patients). Watson et al.¹⁹ and Knezović-Zlatarić et al.^{20,21} made a survey whose purpose was to assess the patients' satisfaction with their partial dentures. Čelebić et al.^{22,23,24} also studied patients' satisfaction with complete dentures and made a comparison of satisfaction between complete and partial dentures. A majority of CD and RPD wearers were satisfied with the dentures. CD wearers were more satisfied with speech, chewing and retention of maxillary denture, while RPD wearers were more satisfied with the retention and the comfort of wearing mandibular denture. Screening of fixed prosthodontic appliances after 5 years of use in relation to material and construction showed that 30% of the appliances needed to be replaced²⁵.

Poljak-Guberina et al.²⁶ made a research whose purpose was to evaluate the incidence of denture repairs in four different districts of Croatia through the year 2002 and to analyze the percentage of different repairs in relation to prosthodontic teams. Their conclusion was that denture repairs were negatively correlated with the number of prosthodontic specialist teams in proportion to a number of inhabitants of each region. Therefore, the quality of dentures was significantly higher in regions with more prosthodontic specialists' teams, resulting in less denture repairs. Their finding was in agreement

with the study of Douglass and Watson⁵ who projected the unmet need for fixed and removable partial dentures for the years 2005, 2010 and 2020. Their projected results indicated that total unmet need will increase from 488 million working hours in 2005 to 517 million hours in 2010 and to 560 million hours in 2020. The significance of the results is that unmet prosthodontic need will increase and exceed the supply of services for the foreseeable 20-year future. The results of the present study concur with Douglass and Watson study also demonstrating the increase in prosthodontic appliances provisions, hence determining the increase of need for removable and fixed dentures.

The goal of the investigation made by Čatović et al.¹⁶ was to evaluate the quality of fixed and removable prostheses in a group of elderly home residents in relation to ADL index. It was determined that 87% of the examined patients were in objective need of fixed, removable or combined prosthodontic treatment. The study showed that ADL index scores of functionally dependent elderly patients correlate with poorer condition of fixed and removable prostheses and greater need of fixed, removable or combined prosthodontic treatment. The objectives of a study made in Ankara, Turkey were to determine the oral health status and treatment needs of elderly home residents. The results illustrated poor dental health and showed extremely high demand for the dental health service programs for the elderly living in these institutions. It was determined that more than two thirds of examined teeth needed restorative treatment¹.

Conclusions

The most frequently delivered prosthodontic appliance in all age groups in a period between 2002 and 2006 were partial removable dentures (382 456 deliveries). Significantly less new appliance deliveries in the oldest age cohort compared to other age groups ($p < 0.05$) suggest that the oldest elderly patients tend to maintain prosthodontic appliances for a longer period than functionally acceptable. As result of preventive programs in dentistry, the need for fixed and removable prosthodontic services will increase as the population increases and ages.

REFERENCES

UNLUER, S, GOKALP S, DOGAN BG, Gerodontology, 24 (2007) 22. — PELTOLA, P, VEHKALAHTI MM, SIMOILA R, Gerodontology, 24 (2007) 14. — DOUGLAS, CW, SHIH A, OSTRY L, J Prosthet Dent, 87 (2002) 5. — MORSE, DE, HOLM-PEDERSEN P, HOLM-PEDERSEN J, KATZ RV, VIITANEN M, VON STRAUSS E, WINBLAD B, Gerodontology, 19 (2002) 73. — DOUGLAS, CW, WATSON AJ, J Prosthet Dent, 87 (2002) 9. — HEINRICH-WELTZIEN, R, KUNZEL W, BORUTTA A, LENZ E, FICHER R, SILLA M, VRBIĆ V, Acta Stomatol Croat, 31 (1997) 189. — MUSACCHIO, E, PERISSINOTTO E, BINOTTO P, SARTORI L, SILVANETTO F, ZAMBON S, MANZATO E, CORTI MC, BAGGIO G, CREPALDI G, Acta Odontol Scand, 65 (2007) 78. — MACK, F, MOJON P, BUDTZ-JORGENSEN E, KOCHER T, SPLIETH C, SCHWAHN C, BERNHARDT O, GESCH D, KORDAB B, JOHN U, BIFFAR R, Gerodontology, 21 (2004) 27. — MARCUS, PA, JOSHI A, JONES JA, MORGANO SM, J Prosthet Dent, 76 (1996) 260. — PETERSEN, PE, KJOLLER M, BOGE-CHRISTENSEN L, KRUSTRUP U, J Public Health Dentistry, 64 (2004) 127. — ŠPALJ, S, PLANČAK D, JURIC H, PAVELIĆ B, BOŠNJAK A, Coll Antropol, 28 (2004) 833. — Pravilnik o ortopedskim i drugim pomagalicama. Hrvatski Zavod za zdravstveno osiguranje 15.05.2000. — POLJAK-GUBERINA, R, ČELEBIĆ A, ČATOVIĆ A, ŽIVKOVIĆ O, Coll Antropol, 29 (2005) 127. — KRALJEVIĆ ŠIMUNKOVIĆ, S, VUČIĆEVIĆ BORAS V, PANDURIĆ J, ALAJBEG ŽILIC I, Gerodontology, 22 (2005) 238. — MINAKUCHI, S, TAKAOKA S, ITO J, SHIMOYAMA K, UEMATSU H, Spec Care Dentist, 26 (2006) 101. — ČATOVIĆ, A, BERGMAN V, ČATIĆ A, J Dent, 31 (2003) 3. — BERGMAN, B, HUGOSON A, OLSSON CO, J Oral Rehabil, 22 (1995) 595. — FRANK, RP, BRUDVIK JS, LE-

dontology, 21 (2004) 27. — MARCUS, PA, JOSHI A, JONES JA, MORGANO SM, J Prosthet Dent, 76 (1996) 260. — PETERSEN, PE, KJOLLER M, BOGE-CHRISTENSEN L, KRUSTRUP U, J Public Health Dentistry, 64 (2004) 127. — ŠPALJ, S, PLANČAK D, JURIC H, PAVELIĆ B, BOŠNJAK A, Coll Antropol, 28 (2004) 833. — Pravilnik o ortopedskim i drugim pomagalicama. Hrvatski Zavod za zdravstveno osiguranje 15.05.2000. — POLJAK-GUBERINA, R, ČELEBIĆ A, ČATOVIĆ A, ŽIVKOVIĆ O, Coll Antropol, 29 (2005) 127. — KRALJEVIĆ ŠIMUNKOVIĆ, S, VUČIĆEVIĆ BORAS V, PANDURIĆ J, ALAJBEG ŽILIC I, Gerodontology, 22 (2005) 238. — MINAKUCHI, S, TAKAOKA S, ITO J, SHIMOYAMA K, UEMATSU H, Spec Care Dentist, 26 (2006) 101. — ČATOVIĆ, A, BERGMAN V, ČATIĆ A, J Dent, 31 (2003) 3. — BERGMAN, B, HUGOSON A, OLSSON CO, J Oral Rehabil, 22 (1995) 595. — FRANK, RP, BRUDVIK JS, LE-

- ROUX B, MILGROM P, HAWKINS N, J Prosthet Dent, 83 (2000) 521. — WATSON, CL, REEVE PE, BARNES E, LANE AE, BATES JF, J Oral Rehabil, 13 (1986) 83. — KNEZOVIĆ-ZLATARIĆ, D, ČELEBIĆ A, VALENTIĆ-PERUZOVIĆ M, JEROLIMOV V, PANDURIĆ J, J Oral Rehabil, 30 (2003) 847. — KNEZOVIĆ-ZLATARIĆ, D, ČELEBIĆ A, VALENTIĆ-PERUZOVIĆ M, ČELIĆ R, FILIPOVIĆ-ZORE I, BAUČIĆ M, Coll Antropol, 24 (2000) 485. — ČELEBIĆ, A, KNEZOVIĆ-ZLATARIĆ D, PAPIĆ M, CAREK V, BAUČIĆ I, STIPETIĆ J, J Gerontol A Biol Sci Med Sci 58 (2003) 948. — ČELEBIĆ, A, VALENTIĆ-PERUZOVIĆ M, STIPETIĆ J, DELIĆ Z, STANIČIĆ T, IBRAHIMAGIĆ L, Coll Antropol, 24 (2000) 71. — ČELEBIĆ, A, KNEZOVIĆ-ZLATARIĆ D, J Dent, 31 (2003) 445. — BAUČIĆ, I, BAUČIĆ M, STIPETIĆ J, KOMAR D, MEHULIĆ K, BOŽIĆ D, KLAIĆ B, ČELEBIĆ A, Coll Antropol 26 (2002) 673. — POLJAK-GUBERINA, R, ČELEBIĆ A, ŽIVKOVIĆ O, GUBERINA M, MULJAČIĆ A, Coll Antropol 30 (2006) 3: 569.

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EPIDEMIOLOŠKO ISTRAŽIVANJE DISTRIBUCIJE PROTETSKIH NADOMJESTAKA U OSOBA STARIJE ŽIVOTNE DOBI U REPUBLICI HRVATSKOJ, U PERIODU 2002–2006

S A Ž E T A K

Broj ozubljenih pacijenata starije životne dobi značajno se povećava, jednako kao i zastupljenost starijih osoba u ukupnoj populaciji. Takav trend uvjetuje veću potrebu za protetskim nadomjescima u starijoj populaciji. Svrha istraživanja bila je utvrditi u osoba starije životne dobi distribuciju različitih protetskih nadomjestaka odobrenih i subencioniranih od strane HZZO-a. Podaci o odobrenim protetskim nadomjescima za sve županije u Republici Hrvatskoj u periodu od 2002. do 2006. godine prikupljeni su, podijeljeni u 4 dobne skupine starijih od 50 godina i statistički obrađeni. Najmanje protetskih nadomjestaka izrađeno je u najstarijoj dobnoj skupini (80+). Najčešće izrađivani protetski nadomjestak u svim dobnim skupinama bila je djelomična proteza (382.456 izrađenih). Statistički značajno manje protetskih nadomjestaka izrađeno je i predano skupini najstarijih pacijenata što upućuje na zaključak da pacijenti starije životne dobi koriste svoje protetske nadomjeske preko granice njihove funkcijske trajnosti.