Past and Present Geographic Location as Oral Health Markers Among Older Adults

Rina Adut, DMD, MPH; Jonathan Mann, DMD, MSc; Harold D. Sgan-Cohen, DMD, MPH

Abstract

Objectives: *This study evaluated the association between oral health status of community-dwelling elderly adults visiting day health centers in Israel and geographic living location.* **Methods:** *Oral status was assessed through clinical examination, with additional data obtained using a questionnaire addressing demographic characteristics, dental utilization, and perceived oral health needs.* ***Results:*** *A representative sample of 338 subjects was examined. Fifty-four percent of the sample was edentulous. Higher rates of edentulism were found among subjects living in urban areas compared to subjects living in rural areas (P<.01). More edentate subjects were found among European immigrants than among immigrants from North Africa or subjects born in Israel (P<.01). Among dentate subjects, the mean number of remaining teeth was 10.4. The mean periodontal loss of attachment was 5.8 mm. Less than 10 percent had mean attachment loss <4 mm. Among subjects living in rural areas, mean attachment loss was higher than among those living in urban areas (P=.05). The mean DF score was 1.9. Forty-seven percent had at least one tooth with untreated caries. Subjects living in urban areas tended to utilize dental services more than subjects living in rural areas (P<.01).* ***Conclusion:*** *Results indicate that present (urban or rural) and past (country of origin) geographic location represented a significant oral health risk marker. The implementation of a comprehensive program for this target population was clearly indicated. [J Public Health Dent 2004;64(4):240-43]*

Key Words: caries, epidemiology, aged, edentulism, urban, rural.

As life expectancy increases, the proportion of the population that is elderly also increases (1-5). In Israel, 10 percent of the population are aged 65 years and older, and 22.3 percent of this elderly population are 85 years and older (6). Demographically, only 7 percent were born in Israel, 67 percent are of European-American origin, 14 percent are of Asian (Middle-Eastern) origin, and 12 percent are of North-African origin. Women comprise 57 percent of this population. Ninety-three percent of the elderly live in urban areas (6). Ninety-four percent of the elderly in Israel are Jews, of whom 18 percent immigrated to Israel in the 1990s from the former USSR. This is higher than the proportion of Russian immigrants in the general population in Israel, which is 12 percent. The total number of elderly was 549,300 in 1996, increasing to 603,900 in 2000 (7,8).

The present study focused on the oral status of the elderly population who attended adult day health centers. This group of individuals is a special subset of community-dwelling elderly in Israel. The people who are eligible for these centers are preselected according to low-income national social security status.

Day health centers, as defined by the authorities, were established to "provide physical, cognitive, mental, and social support to disabled/limited elderly who live in the community, to help elders and their families to continue normal life as much as possible" (7). It should be clarified that the elderly visiting these community centers are adequately functionally independent, and thus are not institutionalized. In 1997, there were around 10,000 people who attended day health centers in 137 locations all over Israel (9).

All previous research on geriatric populations in Israel has been conducted among institutionalized people (13,14). The present study is the first investigation of oral health status among elderly in day health centers. This is a unique opportunity to study community-dwelling elderly. These people comprise only 2 percent of the elderly in Israel, but are similarly representative of the noninstitutionalized, lower socioeconomic populations. These data may help define the extent of problems among this population, as well as relevant associated variables.

Methods

This observational study was conducted in 11 adult day health centers in Israel. The selection methodology was two-stage cluster-random sample. In the first (cluster) stage, 12 centers were randomly selected from the list of 124 existing centers. One center refused to participate, and was not replaced. The representative sample included centers in urban (n=8) and rural areas (n=3). This was not absolutely equal to the distribution in the general population, but allowed optimal investigation of the rural group.

In the second stage, a sample of subjects was randomly chosen within each center. In large centers, the examiner visited more than once to achieve the planned sample size and to include individuals in the sample population who only visited on alternating days. A consent form was signed by each participant. The total population size was 10,013, which comprised the subset of older people who visit day health centers around Israel. The total

Send correspondence and reprint request to Dr. Adut, Department of Community Dentistry, School of Dental Medicine, Hebrew University–Hadassah, PO Box 12272, Jerusalem 91120, Israel. E-mail: rinadut@hotmail.com. Drs. Mann and Sgan-Cohen are also with the Department of Community Dentistry, School of Dental Medicine, Hebrew University–Hadassah. This study was presented as a poster at the 2000 IADR meeting in Washington, DC. Manuscript received: 10/13/03; returned to authors for revision: 1/14/04; final version accepted for publication: 3/23/04.

sample size was 355, of whom 112 subjects were males. We excluded 17 subjects (4.8%) who were under the age of 65. Hence, the survey sample was 338, including 110 males (32.5%) and 228 females (67.5%).

Data were collected by questionnaire and examination. The clinical examination was conducted by one examiner using a fiberoptic light mirror, periodontal probe, and an explorer when needed. Data were collected for the remaining teeth, dental status (full/partial dentures, natural dentition, or edentulous) denture evaluation by retention and resistance form (10), DMF index for coronal caries, root caries according to RCI, and Loss of Attachment-PAL index (recession+pocket depth), where 0 value is equal to attachment loss (AL) of 0–3 mm, 1 equals AL of 4–5 mm, 2=6–8 mm, 3=9–11 mm, and 4=12+ mm, all according to the WHO criteria (11,12).

The questionnaire included questions regarding rural or urban location, geographic origin (country of birth), year of immigration, last dental visit, satisfaction with denture, and other universal common independent variables (sex, education, marital status, living alone).

Data were analyzed using SPSS for Windows Version 6.1 and StatXact Version 30. Chi-square tests were used for categorical variables. For two-by-two tables, if any expected value in the table was less than 5, we used the Fisher exact test. ANOVA was used for continuous variables. Associations between categorical and ordinal variables were analyzed by means of Kruskal-Wallis one-way ANOVA, or the Mann-Whitney test. We performed a second examination on 5 percent of patients at least a week later to determine interexaminer reliability.

Results

The compliance rate among respondents in the second stage (random sample in each center) was 73 percent. Intraexaminer reproducibility was assessed for two clinical variables that were considered major and indicative for elderly populations (caries and dentures), and was found to be 92 percent for DFT values, and 94 percent for total denture evaluation score. Of 338 subjects examined, 118 (35%) were 65–74 years of age, 162 (48%) were 75–84 years of age, and 58 (17%) were 85–98 years of age. The mean age was 77.9 years. This age distribution was not absolutely equal to the national data, but was adequately similar. In statistical analyses these three age groups were not found to be significantly related to dental health and care among this population.

Fifty-four percent of the sample was fully edentulous. Among these, 92 percent wore full dentures, 5 percent did not wear any dentures, 2 percent wore only one denture. Among the dentate subjects, 40 percent wore a full denture in one jaw, 22 percent wore partial dentures, and 38 percent had their natural teeth in both jaws and no removable dentures.

The rate of edentulism was significantly higher among females than among males (74% vs 26%; $P<.03$). Among the edentulous, more males than females did not have dentures (10% vs 4.4%; $P<.03$).

Table 1 shows differences among urban and rural living and by country of origin. Fourteen percent lived in rural areas and 86 percent in urban areas, similar to the distribution of the elderly in Israel (3). Six percent were born in Israel, 18 percent were of North-African origin, 29 percent were of Asian (Middle-Eastern) origin, and 48 percent were of European origin. Among urban elderly, the majority (55%) was of European origin, while among those who lived in rural areas North Africans were the most prevalent (48%).

The mean number of remaining teeth was 10.41±0.7 for the dentate population. The mean number of remaining teeth was significantly associated with education and was lower among people with no formal education (9.14±8.07) than among those with high school education (17.00±9.87; $P<.03$). No significant difference was found by country of origin or area of living.

The mean DFT score was 1.93±2.53. Forty-two percent of dentate subjects were caries free, while 36 percent had DFT between 1 to 3 and 22 percent had DFT values of 4 and higher. Scores were higher among those who did not seek dental care than among those who did ($P=.02$). No significant differences in mean DFT were found between urban and rural areas. Fifty-seven percent had untreated caries, which was more prevalent among women than among men ($P<.05$) and was associated with the last visit to a dentist ($P=.02$). Root Caries Index (RCI) (12) was found in 46.6 percent of the subjects and was positively associated with coronal caries ($P=.009$).

Attachment loss was measured by the sum of probing depth and reces-

TABLE 1
Distribution of Dental Status by Demographic Variables

		Country of Origin				Urban Status	
	Total (338)	Euro/NA (163)	Asian (97)	African (59)	Israeli (19)	Urban (290)	Rural (48)
% dentate	45.6	39.3†	28.6†	23.4†	5.7†	44.1*	62.5*
Mean PAL score	1.9	1.9	2.0	2.1	1.3	1.8*	2.5*
% with PAL score of 3+	33.0	66.1	63.3	60.5	22.2	58.8†	70.9†
% edentulous	54.4	62.0*	48.5*	37.3*	52.6*	55.9*	37.5*
% rated poor upper denture	16.0	6.9	4.5	10.0	11.1	29.1†	55.6†
% who never visited dentist	30.0	33.3	33.4	33.3	22.2	1.4	10.9*

*Significant difference within category, $P<.05$.
†Significant difference within category, $P<.01$.

sion (11). Mean loss of attachment according to PAL was 1.96±1.14, indicating almost 6 mm of attachment loss. Fewer than 10 percent of subjects had no sign of periodontal disease (less than 4 mm mean loss of attachment, PAL=0). Mean periodontal attachment loss index was higher among subjects living in rural areas (2.45±1.27) than among those living in urban areas (1.82±1.89; P=.02) (Table 1). Among subjects who immigrated from the former USSR in the 1990s, 85.7 percent had loss of attachment of ≥9 mm (PAL=3, 4), compared to 31.6 percent with PAL scores of 3 and 4 among those who immigrated until the 1960s, and 33.3 percent among those who immigrated between 1961 and 1989. Among those who were of Israeli origin, 11.1 percent had loss of attachment of ≥9 mm and 77.8 percent of the Israeli origin had loss of attachment ≤5 mm (PAL=1; P=.012). Influence of length of time in Israel was not found for any other variables aside from PAL. There were no statistical differences in periodontal attachment loss and age, sex, level of education, origin, systemic disease, or number of remaining teeth.

As for dental services utilization, the results demonstrate that almost 11 percent of older adults living in rural areas had never visited a dentist, compared to 1.4 percent of those living in urban areas (P=.002). Only 2.2 percent of those living in rural areas are currently visiting a dentist compared to 4.6 percent among urban area inhabitants (P=.002). Almost 40 percent of the study population had not visited a dentist for more than five years.

Discussion

The representative sample of this cross-sectional study provides oral health data on elderly people who visit day health centers in Israel. When looking at this population, we have to take into consideration the wide variance within the group. Most of them were not born in Israel, but came from different places around the globe, bearing different cultural traditions and different attitudes toward health in general and dentistry in particular. Almost half came from Europe, where the majority was affected by the Holocaust. Those influences had affected their oral status: many of them lost their teeth during this period or shortly after. In the present, part of this population resides in urban and part in rural areas.

Fifty-four percent of the sample was fully edentulous, a lower rate than the rates reported in previous studies on Israeli elderly populations (13,14). The prevalence of edentulousness in Israel is still higher than in most industrialized countries (15-23). This indicates that elderly in Israel had previously not benefited from oral health promotion efforts, and emphasizes the need for public health action.

Stratification of the population by rural and urban areas in previous studies in other countries has shown a higher prevalence of edentulousness among those who live in rural areas (24-26). In Israel, there are more edentate persons among urban-living elderly (55.9%) than among those who live in rural areas (37.5%) (Table 1). The explanation may lie in the utilization of dental services by these two different populations. Subjects living in rural areas tend to visit their dentist less frequently than subjects living in urban areas (P=.002). One of the main reasons may be the lack of dental services access in rural areas compared to urban areas; 11 percent of rural area inhabitants had never visited a dentist compared to 1.4 percent of urban area inhabitants. Only 2 percent of rural area inhabitants are undergoing current treatment compared to almost 5 percent of those who live in urban areas (27). It should be noted that Israel is a small country, and the distances are not so large; nevertheless, accessibility may be an issue for the elderly.

In rural areas, most of the older adults are immigrants from North Africa or Asia compared to urban areas, where the majority is from Europe. This fact may lead to differences in treatment-seeking behavior. Europeans tend to seek treatment more than the other groups because of cultural and socioeconomic differences, as mentioned in a US report (28). Furthermore, the cohort of subjects in the study population received treatment during the 1950s and 1960s, a period when dentistry focused on extractions, rather than trying to "save" teeth. Often people who sought treatment at that time ended up losing their teeth more than those who had not sought care (29).

In our study we used loss of attachment as an index to measure periodontal diseases. More than 60 percent had attachment loss of more than 6 mm. An association was found between loss of attachment and living in rural or urban area, where those who live in rural area tend to have higher scores. Similar results were reported in the United States, where there was more periodontal disease among rural elderly (30).

The majority of subjects who immigrated from the former USSR during the 1990s had loss of attachment of 9 mm or more, compared to those born in Israel, who in most cases had a loss of attachment ≤5 mm (P=.012). The elderly immigrants from the former USSR are usually recent immigrants with a low income that does not facilitate seeking dental treatment in Israel, which is mostly private and expensive.

This study is the beginning of the data accumulation process urgently needed and required (31). Further data collection among community-dwelling elderly is still indicated. A community-based geriatric dentistry program should be implemented as part of all National Health Insurance Services. Such a plan should be built upon baseline oral examinations stressing early detection of pathology, denture quality, need for denture adjustment, caries treatment, extractions, and scaling.

In the present study, the only significant associations that were detected with dental status, aside from sex, were past and present geographic location.

Needs among elderly who live in rural areas are evidently greater, and dental services availability are lower than in urban areas. This plan should therefore give priority to services in rural areas with emphasis on elderly people originating from Asia and North Africa. A carefully implemented treatment plan of promotion, prevention, and early care should be fostered for improvement of the oral health and quality of life among the elderly population.

Acknowledgments

The study was supported by the Hadassah-Hebrew University Grant #034-5055 and by the Carpas grant #90-013-3041.

References

1. Denton FT, Spencer BG. Demographic change and the cost of publicly funded health care. Can J Aging 1995;14:174-92.
2. Ettinger RL. Demography and dental

needs, an international perspective. Gerodontology 1993;124:234-41.
3. Rowe JW, Kahn RL. Successful aging. New York: Random House, 1998.
4. Bureau of the Census (US). Statistical abstracts of the United States 1996. 116th ed. Washington, DC: Census Bureau, 1996.
5. Niessen LC, Gibson G. Aging and oral health for the 21st century. Gen Dent 2000;48:544-9.
6. Brodezky G, Snir J, Beer H. Elderly in Israel. Annual statistic report 1998. Israel: ESHEL, JOINT, 1998 (Hebrew).
7. Brodezky G, Sobol A, Neon D, King J, Lifshitz H. Characteristics and needs of elderly in the community. Israel: JOINT, 1991 (Hebrew).
8. Clarfield AM, Paltiel A, Gindin Y, Morginstin B, Dwolatzky T. Country profile: Israel. J Am Geriatr Soc 2000;48:980-4.
9. Manual of Institutions for the elderly. Israel: Ministry of Health and Welfare, ESHEL, 1998 (Hebrew).
10. Boucher CO, Hickey JC, Zarb GA. Prosthodontic treatment for edentulous patients. 7th ed. St. Louis: Mosby, 1975.
11. World Health Organization. Oral Health Surveys basic methods. 4th ed. Geneva: WHO, 1997.
12. Katz RV. Assessing root caries in populations: the evolution of the Root Caries Index. J Public Health Dent 1980;40:7-16.
13. Mann J, Mersel A, Gabai E. Dental status and dental needs of an elderly population in Israel. Community Dent Oral Epidemiol 1985;13:156-8.
14. Adut M. Dental needs of the old-old institutionalized elderly in Israel [thesis]. Jerusalem Hebrew University, 1988 (Hebrew).
15. Miyazaki H, Ohtani I, Abe N, Ansai T, Katoh Y, Sakao S, et al. Periodontal conditions in older age cohorts aged 65 years and older in Japan, measured by CPITN and loss of attachment. Community Dent Health 1995;12:216-20.
16. Slade GD, Spencer AJ, Gorkic E, Andrews G. Oral health status and treatment needs of noninstitutionalized persons aged 60+ in Adelaide, South Australia. Aust Dent J 1993;38:373-80.
17. Bergman JD, Wright FA, Hammond RH. The oral health of the elderly in Melbourne. Aust Dent J 1991;36:280-5.
18. Tzakis MG, Osterberg T, Carlsson GE. A study of some masticatory functions in 90-year-old subjects. Gerodontology 1994;11:25-9.
19. Barenthin I. Dental health status and dental satisfaction. Int J Epidemiol 1977; 6:73-9.
20. Douglas CW, Jette AM, Fox CH, Tennstedt SL, Joshi A, Feldman HA, et al. Oral health status of the elderly in New England. Gerodontol 1993;48:39-46.
21. Kiyak HA, Grayston MN, Crinean CL. Oral health problems and needs of nursing home residents. Community Dent Oral Epidemiol 1993;21:49-52.
22. Burt BA. Epidemiology of dental diseases in elderly. Clin Geriatr Med 1992;8: 447-59.
23. Drake CW, Beck JD, Graves RC. Dental treatment needs in an elderly population. J Public Health Dent 1991;51:205-11.
24. Osterberg T, Carlsson GE, Sundh W, Fyhrlund A. Prognosis of and factors associated with dental status in adult Swedish population, 1975-1989. Community Dent Oral Epidemiol 1995;23: 232-6.
25. Tobias B, Smith DM. Dental screening of long-stay geriatric patients in West Essex and recommendations for their care. Community Dent Oral Epidemiol 1995; 17:175-81.
26. Norderyd O, Hugoson A. Tooth loss and periodontal bone level in individuals of Jonkoping County, a comparison between two adult populations living in the city and in the surrounding area. Swed Dent J 1998;22:165-74.
27. Shishno F. New strategy for better geriatric oral health in Japan: 80/20 movement and Healthy Japan 21. Int Dent J 2001;51(Suppl 3):200-6.
28. Kramarow E, Lentzner H, Rooks R, Weeks J, Saydah S. Health and aging chartbook. Health United States, 1999. Hyatttsville, MD: National Center for Health Statistics, 1999; DHHS pub no (PHS) 99-1232.
29. Lundgren M, Osterberg T, Emilson G, Steen B. Oral complaints and utilization of dental services in relation to general health factors in a 88-year-old Swedish population. Gerodontol 1995;12:81-8.
30. Kiyak HA, Grayston MN, Crinean CL. Oral health problems and needs of nursing home residents. Community Dent Oral Epidemiol 1993;21:49-52.
31. O'Hicky S, Kelman AM, Zusman SP, Mersel A. Planning oral health care for the elderly in Israel for the years 2000 and 2025. Gerodontol 1994;11:115-50.