

The prevalence and experience of oral diseases in Adelaide nursing home residents

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Abstract

Background: The twenty-first century will see the evolution of a population of dentate older Australians with dental needs very different from those of older adults in past years. This study provided comprehensive information concerning oral disease prevalence in older South Australian nursing home residents.

Methods: This paper presents cross-sectional baseline results.

Results: Most of the 224 residents, from seven randomly selected nursing homes, were functionally dependent, medically compromised, cognitively impaired and behaviourally difficult older adults who presented many complex challenges to carers and to dental professionals. Two-thirds (66 per cent) were edentulous with many dental problems and treatment needs. Dentate residents had a mean of 11.9 teeth present, higher than previously reported. The prevalence and experience of coronal and root caries and plaque accumulation was very high in dentate residents; especially males, those admitted more than three years previously, those who ate fewer food types and those who were severely cognitively impaired. These residents had more retained roots, decayed teeth and missing teeth, and fewer filled teeth when compared with data for community-dwelling older adults.

Conclusions: This study highlighted the poor oral health status of these nursing home residents and the great impact of dementia on their high levels of oral diseases.

Key words: Nursing homes, oral health, oral hygiene care, dementia, caries.

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INTRODUCTION

Along with the increase in size and change in composition of older adult populations in industrialized countries, there has recently been a growth in the amount of research focusing on the oral health of these populations.¹⁻³ This growth in research has also occurred in Australia, where the decreasing prevalence of edentulism and the increasing numbers of

functionally dependent and disabled older adults are producing a population of dentate older Australians with dental needs that are very different from those of older adults in past years.^{4,5} However, the magnitude of oral health problems in older Australians is yet to be fully researched and quantified.^{6,7}

The bulk of Australian geriatric dental research has generally been cross-sectional and conducted with two sub-groups of older adults, chosen on the basis of their residential location: the community-dwelling older adults, and institutionalized older adults residing in nursing homes, hospitals and hostels (Table 1).⁸⁻²³ It has focused on the assessment of oral health status using dental indicators of oral diseases and conditions, and general demographic characteristics. To target dental services and programmes appropriately and effectively, comprehensive longitudinal data are needed concerning the onset and progression of oral diseases in all sub-groups of older adults, so that those at highest risk can be identified.^{7,10} There has been limited assessment in these Australian investigations of older adults' functional status, medical conditions, medication use, cognitive status, nutritional status, social support and financial status (Table 1). It is essential that more comprehensive assessments of these characteristics are included in geriatric dental research investigations to accurately describe and quantify the oral health status and needs of older Australians.

There are nearly 7000 nursing home residents in South Australia (SA), with approximately 5000 of these residing in Adelaide.²⁴ With substantial changes occurring in the Australian aged care system in recent years, there was a need to update and expand upon the information obtained in two previous cross-sectional investigations of South Australian nursing home residents.^{8,11} The Adelaide Dental Study of Nursing Homes was instigated by the South Australian Branch (SA Branch) of the Australian Dental Association (ADA) and the Australian Institute of Health and Welfare (AIHW) Dental Statistics and Research Unit in 1997, to provide comprehensive information concerning the prevalence and incidence of oral diseases in those older South Australians who reside in nursing homes. To improve the comprehensiveness and

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Table 1. Australian geriatric dental research investigations

Author and year	Information collected		Functional status assessment					Participant sub-groups of older adults				
	State	Interview	Dental inspection	IADL/ADL scales used	No. of questions asked	Community-dwelling	Homebound	Hospital	Hostel	Nursing home	Handicapped	Cognitive/mental/neurological disorders
Vowles 1979 ⁸	SA	Yes	No	No	2		•			•		
Crack 1980 ⁹	Vic	Yes	Yes	No	3		•	•	•	•	•	•
Gibson 1984 ¹⁰	NSW	Yes	No	Yes (IADL)	7	•						
Walker 1984 ¹¹	SA	Yes	Yes#	No	0			•	•	•		
Homan 1986 ¹²	Qld	Yes	Yes	No	1			•	•	•		
Stockwell 1987 ¹³	WA	Yes	Yes	No	1			•	•	•		
Bergman 1991 ¹⁴	Vic	Yes	Yes (dentate)	No	0	•		•				
Chapman 1991 ¹⁵	Qld	Yes (carers)	No	No	0							•
King 1992 ¹⁶	NSW	Yes (carers)	No	No	0					•		
Slade 1993-97 ^{17,21}	SA	Yes	Yes**	No	2	•						
Lau 1994 ²²	NSW	Yes	No	No	0	•						
Chalmers 1998 ²³	NSW	Yes	Yes**	No	1							•
King, personal communication, 1998	NSW	Yes	No	No	1	•			•			
Chalmers, personal communication, 1999*	SA	Yes	Yes**	Yes (ADL/IADL)	12	•						•

*Longitudinal studies.

**Surface level epidemiological data collected.

#Dental inspection conducted by nursing sister for edentulous participants.

usefulness of the study results, the Adelaide Dental Study of Nursing Homes collected data concerning residents' medical, functional, cognitive, social and financial status as well as their general demographic and oral health.

This paper presents results from the baseline data collection for the study. The aims of the baseline data collection were to:

- determine the dentate status of Adelaide nursing home residents and to identify characteristics associated with dentate status;
- identify residents' dental history and oral hygiene care characteristics associated with more severe cognitive impairment and higher functional dependency;
- determine the prevalence and experience of oral diseases and conditions, e.g., coronal caries, root caries, periodontal diseases, attrition, oral mucosal lesions, and denture problems in residents;
- identify residents' characteristics of medical status, functional status, cognitive status, weight change, and eating ability that are associated with oral diseases and conditions; and
- compare normative and perceived needs for dental treatment among residents.

MATERIALS AND METHODS

The Adelaide Dental Study of Nursing Homes was a longitudinal study with the baseline data collected

during 1998 and one-year follow-up data collected during 1999. The study used a random sample from the list of Adelaide nursing homes provided by the Aged Care Division of the Commonwealth Department of Health and Family Services. The 114 Adelaide nursing homes listed with the Commonwealth were grouped by number of beds (small-medium and large), and seven nursing facilities (five small-medium and two large) were randomly selected for participation. The first seven nursing homes approached all agreed to participate. Time and funding constraints, combined with the labour intensive approach needed for the study, limited the number of nursing homes selected. All residents of the seven nursing facilities were invited to participate.

Approval for the study was obtained from The University of Adelaide Human Research Ethics Committee. To ensure confidentiality for all residents, approval was sought from each nursing home before contact with residents or their guardians was initiated. All initial contacts with guardians were co-ordinated with the assistance of each nursing home, using a primary approach letter. An information summary of the study was given to all residents and their guardians, and a consent form was completed for each participant before data collection.

A questionnaire was completed for each participant prior to the dental inspection, using information obtained from an audit of nursing home records and from interviews held with the nursing home staff, family

members and residents. The questionnaire used close-ended questions to collect information concerning the resident's oral hygiene practices and assistance required with oral hygiene, problems encountered providing oral care for the resident, time since, reason for, and treatment provided at last dental visit, location of last dental visit, smoking and alcohol consumption, medical history, current prescription and over-the-counter medications, eating abilities, and socio-economic status. An assessment of functional status was conducted using the Katz²⁵ Index of Activities of Daily Living (ADL) and the Lawton and Brody²⁶ Instrumental Activities of Daily Living (IADL) scales.

The National Institute of Dental Research (NIDR)²⁷ protocol was used for the dental inspections. The calibrated dentists examined subjects under standardized lighting conditions and used visual and tactile criteria to assess tooth status, coronal and root caries experience, tooth attrition, accumulation of debris/plaque, presence of gingivitis, loss of periodontal attachment (recession and probing depths), oral mucosal lesions and dental treatment needs. Tooth status was categorized as one of the following: present, sound, missing-replaced with fixed/removable appliance, missing-no space, missing-not replaced, crown, retained root-sound, or retained root-decayed. A retained root had only one-quarter or less of the crown remaining. Coronal caries data were recorded for five surfaces for molars and premolars and four surfaces for canines and incisors. Four root surfaces were coded for each tooth. Surfaces of tooth crowns and roots were categorized as: sound, decayed, recurrent decay, filled, or filled unsatisfactory. For root surfaces, an additional category of 'not exposed' was available for surfaces with no gingival recession apical to the cemento-enamel junction (CEJ). When a crown or root surface could not be physically or visually accessed, an 'excluded' category was scored. When a crown or root surface could not be accessed because of abundant deposits of debris, calculus and/or plaque, a 'plaque' category was scored. The normatively assessed tooth treatment needed was scored: number of surfaces requiring restoration, need for preventive treatment, or extraction due to caries, periodontal disease, or prosthetic reasons.

The World Health Organization (WHO)²⁸ Oral Health Surveys; Basic Methods' was used to assess oral mucosal lesions. Presence, condition and need for replacement of prosthetic appliances were assessed using the criteria developed by Rise.²⁹ Presence or absence of plaque was scored using Silness and Loe's Plaque Index (PI)³⁰ criteria, giving a score of 0-3 for plaque accumulation on the buccal surfaces of six key teeth. Periodontal disease was assessed at three sites per tooth: mesiobuccal, buccal and distolingual. At each site, recession, probing depth, presence of calculus, and presence of bleeding after probing were scored.

The dental inspections were conducted by one of two calibrated dentists and duplicate dental inspections

were conducted on 10 per cent of the participants during the study to check for reliability. The dental inspections were conducted over several weeks at each nursing home, using an additional communication protocol for participants with dementia and behavioural difficulties.³¹

Following completion of the dental inspection, a Mini Mental State Exam (MMSE)³² was conducted. The MMSE scores were categorized using the system developed by Mungas.³³ Those participants scoring 26 or greater (out of 30) were categorized as within normal cognitive range, those scoring from 21 to 25 had mild dementia, those scoring from 11 to 20 had moderate dementia and those scoring 10 or less had severe dementia.

Maintenance of the participant database, epidemiological data management, and statistical analyses were conducted using SPSS for Windows (Versions 6.1 and 8.0). Univariate statistics were computed to describe:

- residents' participation and response rates;
- participants' dentate status, cognitive status (MMSE score), and functional status (IADL and ADL score);
- participants' normative and perceived dental needs; and
- prevalence and experience of oral diseases and conditions (denture status, oral mucosal lesions, and attrition).

Where appropriate, tests of significance (Pearson's chi-square statistic) were used to investigate differences between the dentate, cognitive and functional status variables with demographic, medical, weight change, eating ability, dental history, and oral hygiene care characteristics. In order to provide population estimates for the prevalence and experience of oral diseases and conditions the data were weighted by size of nursing home. Tests of significance were used to investigate differences in experience of these weighted oral diseases and conditions for sub-groups, using residents' medical status, cognitive status (MMSE score), functional status (ADL score), weight change, and eating ability. Analyses used weighted least squares regression, with a Tukey HSD post hoc test. Inter-examiner reliability was analysed using intra-class correlation and coefficients were 0.76 for decayed coronal surfaces, 0.97 for decayed root surfaces and 0.97 for total filled surfaces.

RESULTS

The first seven nursing homes randomly selected participated in the dental inspections. Participation rates varied among nursing homes, and ranged from 49 per cent to 86 per cent. Participants' characteristics (age, sex, government card status, time since admitted, and dependency levels) were representative of Adelaide nursing home residents.²⁴ No significant differences were found between the distribution of sex and consent type (self versus guardian) characteristics of participants and non-participants.

Table 2. Resident characteristics by dentate status (n=224)

	Dentate status	
	Dentate (n=76)	Edentulous (n=148)
Sex**		
Male	43.4	28.4
Female	56.6	71.6
Age group		
<64 years	9.2	3.4
65-84 years	46.1	44.0
85-95+ years	44.8	52.7
Number of chronic medical conditions		
1-2	9.2	8.8
3-4	43.4	31.8
5+	47.3	59.4
Total number of medications		
1-2	2.6	4.7
3-6	43.4	33.8
7+	53.9	61.5
MMSE score		
≤10 (severe)	55.1	60.6
11-20	21.7	22.7
21-25	8.7	9.8
26-30 (normal)	14.5	6.8
ADL score (number of dependent activities)		
0-2	5.3	4.1
3-4	18.4	14.9
5-6	76.3	81.1
IADL score (number of independent activities)		
0-2	94.8	97.9
3-4	5.3	2.1
5-6	0	0
Time since admitted		
<1 year	28.9	26.4
1-4 years	43.4	45.9
5+ years	27.7	27.8
Pensioner concession card	73.7	77.7
Veterans' affairs card	13.2	12.8
Private health insurance*	40.8	16.9
Weight change (%change per month)#	n=72	n=135
<0%	48.6	54.1
≥0	51.4	45.9
Number of food types eaten*		
0-1	17.1	20.3
2-3	57.9	70.9
4-5	25.0	8.8
Attend dentist		
For check-ups	22.4	11.5
For a dental problem	75.0	83.1
Don't know	2.6	5.4

*Chi-square test sig. p<0.01.

**Chi-square test sig. p<0.05.

#Subjects who could not be weighed or who were new admissions and only had one weight recorded are not included in this table.

Residents' demographic, medical and dental characteristics are presented in Table 2. The majority of residents were female, aged 75+ years, had multiple chronic medical conditions and were taking five or more medications. The mean age of participating residents was 83.2 years. More than three-quarters of the residents had cognitive testing (MMSE) scores indicative of dementia, 55 per cent of severe dementia. The majority of residents were dependent for nearly all ADLs and few could independently perform any IADLs. Approximately one-quarter had resided in the nursing home for less than one year, 45 per cent for one to four years, and 28 per cent for five or more years.

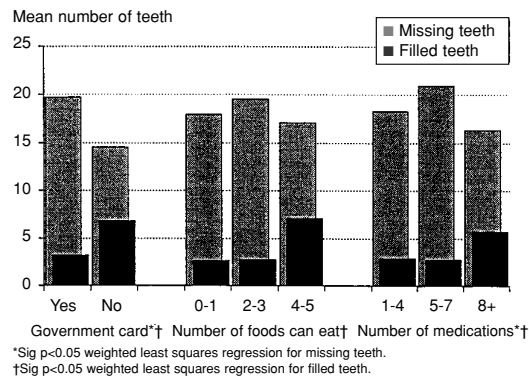


Fig 1. Tooth status by government card status, food types eaten, and medications (n=76).

Over 75 per cent were holders of pension cards and an additional 13 per cent were Veterans' Affairs card-holders. Forty per cent of dentate residents had private health insurance. There were no significant differences among residents' characteristics and dentate status, with the exception of more edentulous females, more dentate with private health insurance, and fewer food types eaten by edentulous.

Dental inspections were completed for 224 of the 227 residents for whom consent was obtained. Three residents with dementia refused to participate, although guardian consent had been given. Two-thirds (66 per cent) of residents were edentulous and had significant dental problems and treatment needs. Edentulous residents lost a greater percentage of body weight, could eat fewer food types, were more likely to have last visited the dentist for a problem, and were less likely to think they needed dental treatment. Up to 20 per cent of residents owned dentures that were not worn. Denture-related oral mucosal conditions were prevalent, such as denture stomatitis (16.8 per cent) and angular cheilitis (18.5 per cent).

Dentate residents had a mean of 11.9 teeth remaining, 18.9 missing teeth, and 1.1 retained roots (0.8 decayed and 0.3 sound retained roots). They had a mean of 1.1 decayed teeth, and 3.8 filled teeth (DMFT=23.7). A mean of 0.3 teeth per resident could not be assessed because of excessive plaque/debris accumulation. Residents with a government card, and those taking fewer medications had significantly more missing teeth (Fig 1). Residents without a government card, those taking eight or more medications and those who could eat more food types had significantly more filled teeth (Fig 1). Males had significantly more decayed crowns (Fig 2). Males and residents who had been living at the nursing home for more than three years had significantly more retained roots (Fig 2). There was a trend, although not statistically significant, for residents with severe cognitive impairment to have more decayed teeth, more missing teeth, fewer filled teeth and many more plaque/debris covered teeth.

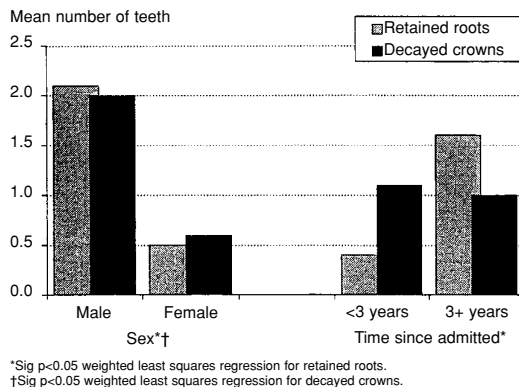


Fig 2. Tooth status by sex and time since admitted (n=76).

Coronal and root surface caries experience was high. The mean number of decayed coronal surfaces (1.7) was greater than the number of decayed teeth (1.1) for residents, indicating that multiple surfaces were affected on some teeth. The mean number of filled coronal surfaces was 8.7, decayed root surfaces was 1.5, and filled root surfaces was 1.1. Males had significantly more decayed coronal surfaces; they also had more filled coronal surfaces and a significantly higher coronal caries attack rate (Fig 3). Males had significantly more decayed root surfaces, filled root surfaces and a higher root caries attack rate (=Root Caries Index (RCI)) (Fig 3). There was a trend, although not statistically significant, for residents who ate fewer food types to have more decayed coronal surfaces. Residents who ate fewer food types did have significantly fewer filled coronal and root surfaces, and a higher RCI. There was also a trend, although not statistically significant, for cognitively impaired residents to have more decayed coronal surfaces, and fewer filled coronal and root surfaces. A mean of 1.3 coronal and 8.6 root surfaces per resident were covered in plaque/debris and so could not be scored. There were significantly more plaque covered surfaces in severely cognitively impaired residents (MMSE<10) and in those who ate fewer food types (Fig 4).

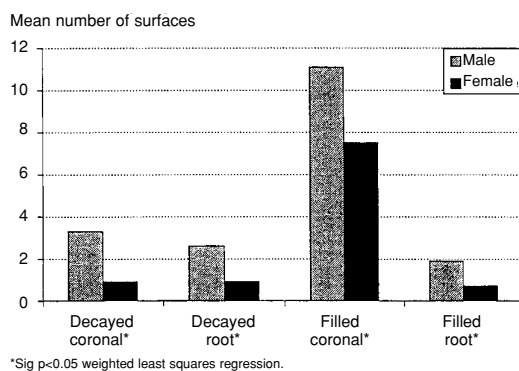


Fig 3. Coronal and root surface caries by sex (n=76).

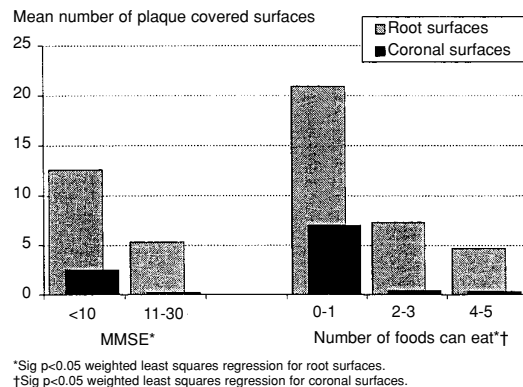


Fig 4. Plaque covered coronal and root surfaces by MMSE score and number of food types eaten (n=76).

Plaque and calculus accumulation was high on residents' teeth and dentures. Over 25 per cent of dentate and edentulous residents who wore dentures had staining/debris accumulation on more than one-third of the denture surface. Mean Plaque Index (PI) scores for dentate residents was moderately high – 1.75 out of three (Table 3). Residents with significantly higher PI scores were those who could not eat many food types and those who had been admitted to the nursing home more than 12 months previously. There was a trend, although not statistically significant, for higher PI scores in residents with a diagnosed dementia and/or severe cognitive impairment, government card holders, males, younger residents, and the more functionally dependent. Calculus accumulation was high – 63 per cent of sites assessed for loss of periodontal attachment had calculus present on probing. A limited number (18) of periodontal inspections were able to be completed because the high prevalence of residents' medical conditions precluding subgingival periodontal probing, and the gross accumulations of plaque and debris on residents' teeth. Thus, no analyses of the periodontal data are presented.

With increasing severity of cognitive impairment, residents required significantly more assistance with oral hygiene care and gave carers more difficulties with the provision of this care (Table 4). All severely cognitively impaired residents required assistance with

Table 3. Mean Plaque Index (PI) scores – dentate residents (n=76)

		Mean PI Score
Time since admitted	<12 months	1.24
	1-3 years	1.96
	3+ years	2.00
Number of food types eaten*	0-1	2.29
	2-3	1.67
	4-5	1.58
	All residents	1.75

*Sig. p<0.01 weighted least squares regression (first category different – Tukey HSD test).

Table 4. Difficulties staff encountered with oral hygiene care by MMSE score (n=201) (%)

	MMSE score			
	≤10 (severe)	11-20	21-25	26-30 (normal)
Total number of difficulties*				
0	44.9	80.0	94.7	94.7
1-4	31.4	13.3	5.3	5.3
5+	23.7	6.7	0	0
Assistance required with cleaning of dentures*	100.0	97.3	88.3	73.4
Assistance required with cleaning of teeth*	100.0	57.2	66.7	11.1

*Chi-square test sig. $p < 0.01$.

the cleaning of their teeth and dentures. The majority of carers encountered difficulties with oral hygiene care provision for residents with cognitive impairment. The most frequently reported difficulties that carers encountered with residents' oral care were residents:

- not opening their mouth;
- not understanding directions about oral care;
- refusing oral care;
- kicking/hitting out during oral care;
- not being able to rinse/spit; and
- heads facing downward so carers could not access the mouth.

Dentate residents had high normative treatment needs. They had a mean of 2.9 surfaces requiring restoration. When categorized by restoration type, residents required the restoration of 1-surface for a mean of 1.0 teeth, the restoration of 2-surfaces for 0.4 teeth, and the restoration of 3-surfaces for 0.3 teeth. Normative need for extractions was high – 0.9 teeth per dentate resident.

Residents' normatively assessed denture treatment needs were high – over 30 per cent of dentate residents had unstable and/or unretentive upper dentures and 40 per cent of edentulous residents had unstable and/or unretentive lower dentures. Over 20 per cent of dentate residents had defects with their upper partial dentures. However, residents' perceived need for denture treatment was much lower than the assessed normative need. For example, 68 per cent of residents who required a new full denture did not want it and 50 per cent of residents who required a denture relined did not want it. This low perceived need was reflected in residents' interview responses – less than 25 per cent of residents perceived a need for dental treatment.

DISCUSSION

Most nursing home residents in this study were very functionally dependent, medically compromised, cognitively impaired, and behaviourally difficult older adults who presented many complex challenges for their carers and dental professionals. Residents' characteristics in this Adelaide sample were comparable to those reported by the AIHW²⁴ for all South Australian nursing home residents. Although response rates varied among the nursing homes participating in this study, they were generally higher than in similar

overseas studies. With the sampling, methodological and ethical constraints operating in this study, non-participants' sex and consent status only could be obtained. Given that participants' and non-participants' sex and consent status were similar, possible differences between the participants and non-participants are likely to be their dentate status and the severity of their cognitive impairment. Guardians may have been less likely to agree to the participation of edentulous and more severely cognitively impaired residents; thus the percentages of edentulous and severely cognitively impaired residents may have been under-estimated in this study.

The unit chosen for sampling in this study was the nursing home: sampling at the resident level was not possible as the information required, such as residents' dentate status, was not available. With the good participation rate of more than 50 per cent, and the almost universal completion of the dental inspections, the data obtained in this study were comprehensive and were as representative as possible.

The percentage of edentulous residents (66 per cent) was slightly higher than national estimates for similarly aged older Australians (57 per cent).⁵ This percentage was lower than the 80-90 per cent of residents reported to be edentulous in previous South Australian nursing home studies,^{8,11} and parallels the current and projected edentulism estimates from national data.⁵ The consequences of these declining edentulism rates were evident in the results of this study. The experience of oral diseases among dentate residents was higher in this study than in previous studies:

- the mean number of teeth had increased from 8.0 in 1984¹¹ to 11.9; and
- current nursing home residents required twice the number of coronal and root restorations than previously reported in the 1980s.^{11,13}

This high experience of oral diseases was highlighted when results were compared with data from The South Australian Dental Longitudinal Study (SADLS) of community-dwelling older adults.²¹ Both studies used randomly selected subjects, the same study protocols, and data were weighted to provide population estimates. While the DMFT scores were similar in both studies (23.2 for SADLS participants and 23.7 for nursing home residents), the components of the DMFT index varied greatly. Nursing home residents had:

- 3.5 times more decayed teeth;
- one-third more missing teeth;
- less than half as many filled teeth;
- 5.5 times more retained roots; and
- a higher RCI.

The most interesting study finding was the high experience of oral diseases and difficulties encountered by carers with the many residents with dementia, especially those with severe dementia. Severely cognitively impaired residents required the most assistance with oral care and gave carers more difficulties with oral hygiene care. Oral hygiene care provision for these residents was a very challenging and difficult task for carers.

Discussions with carers highlighted an important complicating issue with oral hygiene care provision for cognitively impaired residents – the issue of restraint. What should carers do when a resident verbally and/or physically refuses oral hygiene care? When a cognitively impaired resident is excessively resistive, aggressive, abusive or threatening to carers, oral hygiene care cannot be adequately provided on a regular daily basis. It may only be possible to provide oral care infrequently and in an unpredictable manner. Even if carers have the knowledge and skills, there are some residents for whom a form of physical or sedative restraint would be required to provide oral hygiene care. Dental professionals, nursing home administrators and government officials must become more aware and understanding of these immense behavioural challenges that carers encounter. Improved preventive dental therapeutic products and hands-on educational strategies need to be developed to assist carers with reducing plaque accumulation and oral diseases. It is with severely cognitively impaired residents that carers require continual advice and support from dentists and dental hygienists.

CONCLUSION

Most Adelaide nursing home residents participating in this study were very functionally dependent, medically compromised, cognitively impaired and behaviourally difficult older adults who presented many complex challenges to carers and to dental professionals.

Two-thirds (66 per cent) of residents in this study were edentulous. Edentulous residents had many dental problems and treatment needs. Many residents owned dentures that were not worn, and denture-related oral mucosal conditions, such as denture stomatitis and angular cheilitis were prevalent. Dentate residents had a mean number of 11.9 teeth present, higher than found in previous studies.

Severely cognitively impaired residents who were dependent for nearly all Activities of Daily Living:

- had less information available concerning their dental history, current dental problems, and need for dental treatment;

- required the most assistance with oral hygiene care;
- gave carers more difficulties with oral hygiene care;
- had a higher experience of coronal and root caries; and
- had greater accumulation of plaque on natural teeth and dentures.

The experience of coronal and root caries and plaque accumulation was high in dentate residents, especially males, those who had been admitted more than three years previously, those who ate fewer food types and those who were severely cognitively impaired. Root caries attack rates (root caries index) were high. When compared with community-dwelling older adults residing in Adelaide, these Adelaide nursing home residents had many more retained roots, decayed teeth and missing teeth, and fewer filled teeth. The accumulation of plaque on dentate residents' teeth was high. Residents had high levels of normatively assessed prosthodontic, preventive, extraction and restorative treatment needs. However, residents' perceived dental needs were low, especially for edentulous residents.

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