Oral health in frail elderly

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Chapter 3

General health, frailty and physical function in care dependant home dwelling elderly with and without teeth

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Abstract

Objective: To assess the oral health and oral status of care-dependent home dwelling elderly who recently (<6 months) received formal home care as well as to assess the impact of oral status on frailty, general health and quality of life (QoL).

Subjects and methods: Dutch home-dwelling elderly persons (≥65 years) who recently received formal home care and who were physically and/or cognitively able to be interviewed were eligible for this cross-sectional observational study. Oral (health) status, frailty (Groningen Frailty Indicator), cognition (Minimal Mental State Examination), and (oral health related) QoL (RAND 36, Oral Health Impact Profile-14) were assessed.

Results: 103 out of 275 consecutive eligible elderly persons (median age 79, IQR 72-85 years) participated in the study. Thirty-nine patients had remaining teeth and 64 were edentulous. Compared with edentulous elderly persons, elderly with remaining teeth scored significantly better on frailty, QoL, physical function and general health. No significant differences were seen in cognition. Overall oral health was poor. Sixty-nine percent of the participants no longer visited a dentist for yearly check-ups.

Conclusion: Despite their often poor oral health, care-dependent home-dwelling elderly with remaining teeth seemed to generally function better than edentulous elderly persons.

Introduction

Worldwide life expectancy is increasing and birth rates are decreasing, resulting in a higher proportion of elderly in society.[1] For example, in 2020, around 30% of the people who live in the northern region of the Netherlands will be 65 years of age or older (CBS 2011).[2] The number of elderly who are older than 80 years will also increase rapidly (prognosis 2020 >14%).[3]

A growing number of elderly still have their own teeth.[4,5] When elderly with remaining teeth become frail, care-dependent and home-bound, the quality of self-care often declines, particularly oral care.[6,7] As a result oral health usually deteriorates, which has been presumed to negatively impact general health.[8] The lack of attention for oral health is therefore considered to be a hidden health hazard with an increasing, not yet fully understood, impact on general health. For example, dental and periodontal diseases have been associated with diabetes[9], cardiovascular disease[10], atherosclerosis[11], rheumatoid arthritis[12], decreased kidney function[13], pneumonia[14], and multiple sclerosis and other systemic immune problems[8]. Moreover, poorer oral health has been linked to greater cognitive dysfunction patients with Alzheimer's disease.[15,16]

Identification of elderly persons at risk for adverse health outcomes based solely on chronic illnesses or age is not advisable because it disregards the considerable inter-individual variation during ageing.[17] Therefore, the concept of frailty has been introduced in geriatric care. Frailty indicates a state of vulnerability regarding the future occurrence of poor health outcomes, such as mortality, hospitalization, institutionalization, chronic conditions and loss of function in one or more domains (i.e., physical, psychological, cognitive, social).[17-21] Previous studies have shown that certain individual characteristics, such as socio-economic class, morbidity (physical and psychological), obesity, and formal home care utilization, are associated with higher levels of frailty.[18,21] These studies, including studies on formal home care utilization, did not include oral status (having own teeth or being edentulous) or oral health status (i.e., presence of periodontal diseases, caries and broken teeth) of community living elderly persons. Consequently, the impact of oral status and oral health on general health, frailty, quality of life (QoL) and/or cognitive dysfunction in this group remains unclear. The few studies yet published on oral health of community-living elderly suggest that many elderly face oral health problems[33]. However, these studies did not report specifically on the oral status (own teeth, implant supported overdentures or edentulous) of these community-dwelling elderly and neither did these studies oral status and/or oral health with frailty, activity of daily living (ADL), QoL and/or general health. Recently, Tôrres[34] systematically reviewed the relationship between components of frailty and poor oral health. They concluded that none of the eligible studies showed whether

or not poor oral health increases the likelihood of developing signs of frailty, although the reviewed studies did suggest an association between frailty and oral health. Thus, there is a need for well-designed studies that give better insight in the oral status and oral health of community living elderly focus on the possible associations between frailty, ADL, QoL, general health and oral status.

The aim of the current study was to assess oral health and oral status of care dependent elderly patients who live at their own home (community living elderly) and recently (<6 months) received formal home care as well as to assess the impact of oral status on frailty, general health and QoL. It was presumed that frailty, general health and quality of life may differ between elderly with or without remaining teeth.

Methods

Participants
Between January 2015 and January 2016, a cross sectional study was conducted among community living elderly persons (≥65 years) residing in the northern region of the Netherlands who live at their own home and recently (<6 months) received formal home care provided by large home care organizations operating in this region. The patients were eligible to participate if they were physically and/or cognitively able to be interviewed. The 3 participating home care organizations (located in the towns of Groningen, Haren, Hoogezand and Winschoten) informed all their new clients (clients ≥65 years who subscribed for care within the last 6 months) about the study and asked whether the researchers could contact them for further inquiry and participation. Participation meant that participants should allow for an extensive structured interview and oral examination (see below). For all elderly persons who received the letter, data on age, gender and intensity/type of formal home care were available and used for analysis.

If potential participants were willing to take part in the study, their contact information was provided to the researchers of the University Medical Center Groningen. Next, the researchers contacted the elderly by phone. Elderly who participated gave written informed consent. They were then invited to visit a dental care unit of the department of oral and maxillofacial surgery of the University Medical Center Groningen or, if preferred, they were visited at home. An extensive structured interview (see below), followed by an oral examination, was performed by either ARH or AV, both geriatric dentists. These dentists had worked together for over 15 years, were calibrated and were very experienced in performing oral examinations in geriatric patients.[22]

The institutional review board of our institution provided a waiver (file number M13.145588), as this observational study was not an experimental study with test subjects as defined in the Medical Research Involving Human Subjects Act. Informed consent was obtained from all participants and the study was performed in accordance with the Declaration of Helsinki.

Structured interview and questionnaires
The extensive questionnaire took around 45 minutes to complete. All data was collected by a personal interview of the participant. The following data were obtained during the interview:

- Demographics (age, gender, marital status, living situation, education level);
- General health (physical and psychological morbidity, polypharmacy);
- Lifestyle (smoking and alcohol intake);
- Formal care (domestic care, personal care, nursing care);
- Informal care (frequency of care given by friends and relatives).

The following four validated questionnaires were used to measure Frailty, Cognition, General health an Oral health related QoL:

1) Frailty was assessed with the Groningen Frailty Indicator (GFI). This instrument comprises 15 items and measures losses of functions and resources in four domains: physical, cognitive, social, and psychological. Scores range from 0 to 15; a score of 4 and higher indicates moderate to severe frailty.[18,23]

2) Cognitive function was assessed with the Minimal Mental State Examination.[24] Scores range from 0 to 30. A score of 25 or lower indicates moderate to severe cognitive impairment.[24]

3) Generic health-related quality of life was assessed with the RAND 36-Item Health Survey (RAND-36). This measure includes the following subscales: physical functioning, social functioning, role limitations due to physical health problems, role limitations due to emotional problems, general mental health, vitality, bodily pain and general health perception.[25] The total score range of all scales is 0 to 100, with higher scores indicating better health.

4) Oral-health-related quality of life was assessed with the Oral Health Impact Profile (OHIP-14). This instrument consists 14 items, range 0-56. A higher score indicates lower oral health-related quality of life.[26]

Oral health examination

First oral status was determined. Elderly persons with remaining teeth were examined for the number of teeth present and the presence of dental plaque, broken teeth, caries, periodontal disease (1 or more pockets of ≥5 mm). For presence of plaque, the index according to Mombelli et al.[35] was used (score 0: no detection of plaque, score 1: plaque can be detected by running a probe across the smooth marginal surface of the implant, score 2: plaque can be seen by the naked eye, score 3: abundance amount of plaque). The presence of calculus (score 1) or the absence of calculus (score 0) was scored. Probing depth was measured at 4 sites of each tooth (mesially, labially, distally, lingually) by using a periodontal probe (Merit B, Hu Friedy, Chicago, USA); the distance between the marginal border of the mucosa and the tip of the periodontal probe was scored as the probing depth. Elderly persons having no teeth, either with or without full dental prostheses or dental implants, were examined for the fit and appearance (fractured parts, wear etc.) of the prosthesis. Additional assessments included oral self-care, oral hygiene and whether the participants still visited the dentist regularly (yearly dental check-ups).

Oral hygiene was rated as good in the absence of visual plaque (score 0), poor when thin layers of plaque were seen on all surfaces (score 2) and very poor when layers of plaque were present in or on the teeth or prostheses (score 3).

Statistical analyses

Baseline characteristics were reported with descriptive statistics. Differences between participating and non-participating elderly on age, gender and intensity of formal home care were evaluated with Pearson Chi-Square tests and Mann-Whitney test. Median scores, including interquartile ranges (IQR) were calculated for all measurement scores, since the data were not normally distributed. Statistical differences between elderly subgroups on oral status that differed on measurement scores were examined with Mann-Whitney tests. A p-value of ≤0.05 was considered statistically significant. Statistical analyses were performed with SPSS Statistics 22.0 (SPSS inc. Chicago, Illinois).

Results

Between January 2015 and January 2016, a total of 275 consecutive elderly persons was admitted for formal home care (**Fig. 1**). Of this group, 33 were excluded due to severe or terminal illness (n=16) or severe dementia (n=3). Of the remaining 242 elderly persons, 139 declined to participate for various reasons; the majority of them indicated that they had no interest in the study

(n=59) or were ill (n=17) (**Fig. 1**). Compared with the demographics of non-participating elderly persons, the 103 elderly included in the study did not differ on age (p=0.61) and gender (p=0.39). However, non-participating elderly received significantly more formal personal care (p≤0.001), however. No information on health problems was available for non-participants.

The 103 consecutive included elderly had a median age of 79 (IQR 72-85) years; and 51% (n=52) of the participants were female (**Table 1**). Three-fourths of the participants reported three or more physical morbidities and one-fifth (n=23) at least one psychological morbidity. The median number of medications was 7 (IQR 4-11). The three most-used medications were anticoagulants (51%), anti-hypertensive's (44%), and beta blockers (39%). The majority of the elderly participants received formal home care assistance with their personal care. Moreover, 78% (n=80) also indicated that they received informal care with assistance on domestic matters (65%), administrative management (financial and postal paperwork (43%), emotional support and supervision (n=23), personal care (16%) and/or nursing care (13%). Sixty out of the 103 elderly persons that were studied revealed that they could not visit the clinic. This was mainly due to mobility problems. Therefore, these elderly persons were interviewed and examined at their own home

Oral health examination and self-care
More than half of the participants (63%, n=65) were interviewed and examined at their homes since they experienced difficulties in visiting the dental clinic due to mobility problems. This result is probably related to the observation that 69% of the participants no longer visited their dentist regularly (**Table 1**). The oral examination showed that 39 elderly participants had remaining teeth and 64 participants were edentulous and had dental prosthesis. Of the latter 64 participants, 9 participants wore an implant-supported mandibular overdenture. The scores on the various variable assessed did not differ between edentulous participants with an implant-supported or conventional denture. The oral health status of both subgroups was poor since caries, broken teeth or periodontal disease were common in 77% (n=30) of participants with remaining teeth. In addition, 75% (n=48) of the edentulous participants had poorly fitting prostheses or no prostheses at all (**Table 2**). Elderly with implant-supported mandibular overdentures had no signs of peri-implant bone loss.

Oral care/self-care
Elderly with remaining teeth visited their dentists on regular basis more often than edentulous elderly persons (69% versus 9%, respectively; **Table 1**). Reasons for avoiding dental care mentioned were mobility problems (not able to

Table 1 Baseline characteristics of the included care dependent home-dwelling elderly persons.

| | Oral status | | | |
DEMOGRAPHICS	Total population n=103	Remaining teeth n=39	Edentulous Prostheses/ implants n=64	p-value
Age (median, IQR; years)	79 (72-85)	79 (70-86)	78 (74-84)	0.53
Female (n,%)	52 (51)	19 (49)	33 (52)	0.78
Partner/spouse (n,%)	39 (38)	16 (41)	23 (36)	0.61
Living situation (n,%)				0.23
Community living elderly	92 (89)	33 (85)	59 (92)	
Living in assisted living residences	11 (11)	6 (15)	5 (8)	
Education level (n,%)				0.09
Primary school or lower	39 (38)	11 (28)	28 (44)	
Secondary school	53 (52)	21 (54)	32 (50)	
Higher education	11 (11)	7 (18)	4 (6)	
				0.02
Physical morbidity[1]				
0-1 disease/disorder	17 (17)	11 (28)	6 (9)	
2 diseases/disorders	10 (10)	5 (13)	5 (8)	
≥ 3 diseases/disorders	76 (74)	23 (59)	53 (83)	
Psychological morbidity[2]				
≥1 disease		9 (23)	14 (22)	
Polypharmacy (median, IQR)	7 (4-13)	6 (3-9)	8 (4-13)	0.02
				0.07
Domestic care	20 (19)	4 (10)	16 (25)	
Personal care	52 (51)	21 (54)	31 (48)	
Nursing care	19 (18)	11 (28)	8 (13)	
Domestic, personal or/and nursing care	12 (12)	3 (8)	9 (14)	
Present smoking	21 (20)	4 (10)	17 (27)	0.05
Alcohol intake				
No alcohol consumption	67 (65)	22 (57)	45 (70)	NA
< 1 day a week	13 (13)	7 (18)	6 (9)	
2-5 days a week	9 (9)	4 (10)	5 (8)	
6-7 days a week	14 (14)	6 (15)	8 (13)	
				0.32
Daily informal care by relative/friend	35 (34)	11 (28)	24 (38)	
Good cooperation dental examination	94 (91)	35 (89)	59 (92)	0.67
Poor oral hygiene (plaque score 2 and 3)	55 (53)	23 (61)	32 (50)	0.38
Regular dental visit	32 (31)	26 (67)	6 (9)	≤ 0.001

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│   Total elderly participants who were recently     │
│   (<6 months) admitted for formal home care        │
│                   n=275                            │
└──────────────────────────────────────────────────┘

                        Excluded n=33
                        Died before first study visit n=4
                        Terminally ill n=16
                        Severe dementia n=3
                        Nursing home admission n=6
                        Out of formal home care n=4
                        Temporary formal home care n=4

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│   Eligible participants who received formal home care │
│                                                    │
│                   n=242                            │
└──────────────────────────────────────────────────┘

                        Elderly persons were not willing to participate n=139
                        Due to severe health problems n=17
                        Informal care giver cancelled study visit n=4
                        No interest in the study n=59
                        Did not respond to study request n=21
                        Reason unknown n=38

┌──────────────────────────────────────────────────┐
│        Participants included in the study          │
│                   n=103                            │
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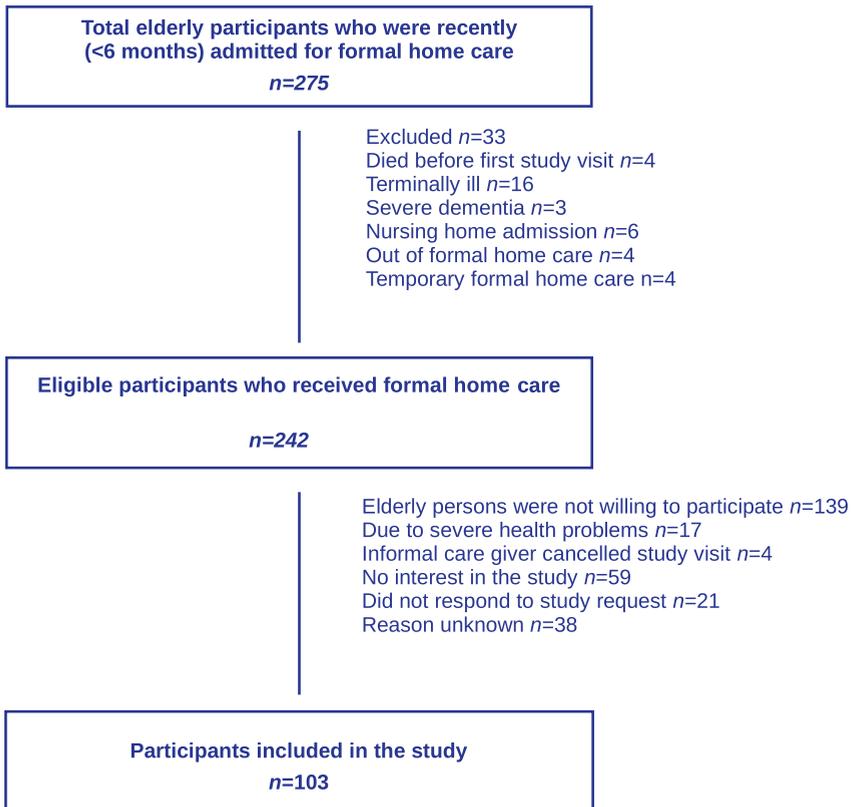
Fig. 1 flow chart of included elderly.

Table 2 Oral examination outcomes of elderly persons with remaining teeth (n=39) or with dental prosthesis/implants (n=64).

ELDERY WITH REMAINING TEETH (n=39)	
Number of natural teeth (median, IQR)	18 (11- 22)
Caries (N,%)	
No caries	18 (46)
1-2 caries	8 (21)
≥3 caries	13 (33)
Broken elements (N,%)	
No broken elements	22 (56)
1-2 broken element	12 (31)
≥3 broken elements	5 (13)
Pockets ≥5 mm (N,%)	
No pockets	14 (36)
1-2 pockets	3 (8)
≥3 pockets	22 (56)
ELDERLY WITH PROSTHESIS/IMPLANTS (n=64)	
Upper jaw prosthesis/dental implant fitting (n, %)	
No prosthesis/dental implant	2 (3)
Good	8 (13)
Moderate	22 (34)
Poor	32 (50)
Lower jaw prosthesis/dental implants fitting (n, %)	
No prosthesis	5 (8)
Good	10 (16)
Moderate	30 (47)
Poor	19 (30)

go to the dental office), financial aspects (fear for high costs), disturbed relation with the dental office after change of dental team, cognitive problems (forgot to go, or forgot appointments) and dental fear. A large majority of the elderly (94%) revealed that they cleaned their teeth by themselves and 89% did not experience any difficulties with this task, notwithstanding the poor oral hygiene (plaque scores 2 and 3) that was observed in >50% of all participants (**Table 1**).

Measurement scores

Two-thirds of the participating elderly (n=68) were identified as frail (GFI score 34) and nearly half of them had a mild cognitive impairment (MMSE score between 21-26). Elderly persons that differed on oral status scored similarly on cognitive dysfunction (MMSE and GFI cognitive domain, **Table 3**). However, participants with remaining teeth scored significantly better on frailty (GFI) and QoL (oral health, physical function, general health) than edentulous participants (including those with implant-supported mandibular overdentures, **Table 3**).

Discussion

We conducted this cross-sectional study of care dependent elderly persons who continued to live at their own homes and recently (≤ 6 months) received formal home care to gain insight into the oral status and oral health and to determine the impact of these aspects on frailty, cognitive function, physical function, psychosocial function and QoL. Overall oral health of the population assessed was commonly poor, especially in elderly persons with remaining teeth. Furthermore, oral status had a significant impact on frailty, quality of life and general health. Notwithstanding the poorer oral health in persons with remaining teeth, participants with remaining teeth generally scored better on GFI, Rand-36 and OHIP14 than their edentulous counterparts. This is surprising, as poor oral health is assumed to be a health risk.[8-14]

The reasons for this apparently paradoxical finding are unclear. A possibility is that oral health of elderly with remaining teeth might have been reasonable until they became care dependant in the last few months before the screening. When elderly become frail and their general health declines, oral clearance is often rapidly reduces, leading to increased risk of oral infections and dental caries.[5,27] Furthermore, manual skills and cognitive function often deteriorate; as result, elderly become unable to brush their teeth properly and to visit their dentist regularly[7], or they may simply forget to do so. Another possible explanation is based on previous findings that elderly with remaining teeth have a higher socio-economic status and better general health[28,29] which is also the case in this study (**Table 1**). People with a higher education and higher socio-economic status are usually more interested in their own general health and oral health, which may also result in fewer diseases/disorders in later life. This presumption was recently confirmed by Vettore[30] who showed that adults with a higher socio-economic status generally have better oral health.

For this study we selected elderly persons who were recently referred for formal homecare for the first time. We included only this group and not all elderly

Table 3 Median scores (IQR) of cognitive dysfunction, frailty, and (oral health related) quality of life of the total population and elderly subgroups who differed on oral status.

Measures	Oral status			
	Total population N=103	Remaining teeth N=39	Prosthesis/ implants N=64	p-value
Cognitive dysfunction (MMSE) [1]	26 (23-27)	26 (23-27)	26 (23-27)	0.89
Frailty (GFI) [2]	5 (3-7)	3 (2-6)	5 (4-7)	0.01
GFI physical domain	3 (2-5)	2 (1-3)	3 (2-5)	0.02
GFI cognitive domain	0 (0-0)	0 (0-0)	0 (0-0)	0.51
GFI psychosocial domain	1 (0-2)	1 (0-2)	1 (1-3)	0.03
Quality of life oral health (OHIP-14)[3]	3 (1-6)	1 (0-4)	4 (2-8)	≤ 0.001
Quality of life (RAND-36)[4]				
Physical functioning	55 (15-80)	61 (20-95)	40 (15-70)	0.05
Social function	63 (50-88)	75 (50-100)	63 (50-88)	0.22
Role limitations physical	50 (0-100)	50 (0-100)	100 (0-100)	0.64
Role limitations emotional	100 (33-100)	100 (33-100)	100 (33-100)	0.63
Mental health	76 (60-84)	76 (64-88)	68 (60-84)	0.19
Vitality	60 (40-75)	65 (45-80)	55 (40-74)	0.09
Bodily pain	68 (33-100)	80 (45-100)	61 (33-100)	0.19
General health	55 (35-70)	65 (50-75)	50 (30-70)	0.01

[1] Minimal Mental State Examination
[2] Groningen Frailty Indicator
[3] Oral health impact profile 14
[4] The RAND-36-item Health Survey

persons who received formal home care because the focus of the current study was on the oral health status of elderly had who were newly admitted to formal home care, thus before health might have declined further. In another study from our group performed in a nursing home[22] we found that even 70% of the elderly who are newly admitted to a nursing home had poor oral health. In this study we found poor oral health in approximately 50% of the cases (Table 2) We presume that oral health had declined in the period of sickness before elderly were admitted to a nursing home.

A possible limitation of our study is the rather low response rate (approximately 40%), however such a response rate is in line with other studies performed

in elderly living at their own homes.[31,32] The problems we encountered in our study were similar to those reported in the other studies. E.g., when we telephoned the elderly initially to inform them about the study and to ask them whether they were willing to participate in the study, many elderly recalled that they had no interest in participation in research at all and that oral care was not on their personal priority list. They did not want to visit a dental office or being visited at home by a dentist. Many of them recalled that their energy level was too low to join any study. As the non-participants needed substantially more formal personal care than the participants, is it likely that their oral health might have been even worse than the oral health of the participating subjects. Another reason for not participating might be that some of them were aware of their possibly poor oral health and declined to participate because they were ashamed of this. On the other hand, other elderly were keen on participating as they knew that they were in need of dental care but did not know how to get this care or how to pay for it; by participating in the study they received free dental consultation.

Conclusion

Notwithstanding their often poor oral health, care dependent community living elderly who have their own teeth generally score better in terms of physical function, frailty and general health than edentulous elderly persons. Most elderly do not visit their dentist regularly or at all. We advise dentists to continue tracking their elderly clients, and we advise general practitioners to encourage their patients to get dental care in order to maintain oral health and a functional dentition. Further research in this area is needed.

Acknowledgements

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