Original Article

The Oral Health Status of Attendees and Residents in United Arab Emirates Care Homes

Banan Almazrooei, Fatemeh Amir Rad, Alexander Milosevic

Department of Prosthodontics, Hamdan Bin Mohammed College of Dental Medicine, Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU), Dubai, UAE

ABSTRACT

Objectives: This cross-sectional study assessed the oral health status of attendees and residents in United Arab Emirates (UAE) care homes. **Materials and Methods:** All care homes identified from the UAE Ministry of Health website were selected and all attendees or residents included. Medical conditions were classified according to World Health Organization (WHO) criteria. Oral and dental status was recorded on the WHO Oral Health Assessment form for adults and demographic details were recorded separately. The three examiners had training and calibration exercises before conducting the dental examinations with an overall mean inter-examiner κ of 0.67. **Results:** A total of 107 patients participated in the study with a mean age of 67.5 years (standard deviation [SD] = 15.65 years). The mean age of men ($n = 57$) (69.2 years, SD = 16.3) was not significantly different to the mean age of women (65.5 years, SD = 14.8, $P > 0.05$). The American Society of Anaesthesiologists (ASA) classification of mild disease was present in 71 participants, whereas 27 were classified with severe systemic disease. Multiple medical problems were common ($n = 28$), followed by endocrine disease ($n = 26$) and mental health problems ($n = 20$). Gingivitis and/or periodontitis were present in 58 (72%) of 81 dentate participants (26 participants were edentate). Overall mean decayed, missing, filled teeth (DMFT) was 23.2 (SD = 9.0) but mean DMFT in men was significantly greater (26.5) than women at 19.8 ($P < 0.001$). Age had a weak positive correlation with DMFT, Spearman's rho = +0.43 ($P < 0.001$). Eighteen participants of 88 (20.5%) complained of pain or soreness at the time of examination. The frequency of tooth brushing/cleaning the mouth was not correlated to participants' mobility (being bed-bound). Age and gender were predictive for DMFT but not education or ASA classification. Gender and ASA classification predicted periodontal status. **Conclusion:** Oral health was generally poor with pain and discomfort present in a high number of care home residents/attendees. Carers require training in oral health as dental care is a priority for this group.

KEYWORDS: *Care homes, oral health*

INTRODUCTION

In 2015, globally there were 901 million people aged 60 years and over, comprising 12% of the global population.[1] The Emirate of Dubai had a total population of 2976,455 in 2017, whereas The United Arab Emirates (UAE) had a population of 9157,000 including expats.[2] The number of people over 60 years of age was 2.3% of its population in 2015. This percentage is anticipated to increase to 23.5% by 2050.[2] During the period from 1990 to 1995, average

Address for correspondence: Prof. Alexander Milosevic,
Hamdan Bin Mohamed College of Dental Medicine,
Mohammed Bin Rashid University of Medicine and Health
Sciences (MBRU), Dubai, UAE.
E-mail: alexander.milosevic@mbru.ac.ae

life expectancy in the UAE was 72.2 years and this is projected to reach 82.7 years by 2050.[1] Anecdotally, the majority of older people in the UAE live with their families, and only a small number live in care homes.

The World Health Organization (WHO) has published the mean decayed, missing, filled teeth (DMFT) of 65-year olds and older for each of its global regions.[3] For the Eastern Mediterranean region which includes the Middle East, it was 25.[3] The Missing component of the dental caries index was noted to be very high in all regions of the world with the finding that oral health care for older people was mainly extractions.[3] The median number of teeth in a US 65+ age group was 21 with 40% of participants having coronal caries and 33% having root caries.[4] Non-institutionalized subjects aged >60 years in two Australian locations were reported to have a mean of 14.7 missing teeth, 8.3 filled, and 0.3 decayed teeth with more missing teeth in older participants.[5] A mean DMFT of 12.4 was reported in over 23,000 subjects aged 65–74 years in the second national oral health survey in China with higher caries in women than men and in 300 subjects aged >60 years in India. The mean DMFT was similar at 13.51. Of which the "missing" component was 10.98 but interestingly none of the subjects had a filling.[6,7] Similar results are seen with periodontal disease insofar older subjects have a higher burden of periodontitis. In the UK Adult Dental Health Survey 2009 (ADHS 2009), 66% of adults aged ≥55 years had loss of attachment (LOA) of 4 mm or more, 21% had above 6 mm, and 4% above 9 mm.[8] For each level of severity of attachment loss, the proportion increased with age; for example, 61% of those aged 55–64 had LOA above 4 mm compared with 76% of adults aged 75–84; 18% of 55–64 year olds had LOA above 6 mm compared with 25% of 75–84 year olds; and 2% aged 55–64 had LOA above 9 mm compared with 5% aged 75–84.[8] Epidemiological studies in different countries show that the percentage of people with a code 4 Community Periodontal Index (deep pockets) ranges from 5% to 70% among older people.[9]

Several studies in the UK have reported an overall poor dental status of care home residents with 72.8% of residents in Wales having caries and only 37% of residents brushing their teeth/denture twice a day.[10] The prevalence of caries in the West Midlands, UK, among dentate residents was 55.8% with 56.4% of the residents being dentate and 43.6% being edentate.[11] The oral health status among 412 nursing home residents in 22 randomly selected nursing homes in Avon, UK, found that over 70% had not seen a dentist for over 5 years and over 22% reported a dental problem. Calculus was present in 82% of subjects and root caries in 63% of subjects.[12]

The mean DMFT was 18.6 ± 12.6 and the mean number of decayed roots was 2.75 ± 3.95 in 129 older care homes residents in Saudi Arabia.[13] In a similar study conducted in Ankara, Turkey, on 193 care home residents, only 7.3% of subjects had a functional dentition with a mean DMFT of 29.3 ± 5.8 and mean root caries of 2.2 ± 3.1. Many were edentulous (67.4%) but a significant number did not have any denture.[14]

It is thus recognized that older subjects and care home residents are often neglected and have significant dental needs. Caries, periodontal status, tooth wear, and, importantly, mucosal status in respect of soft-tissue lesions, especially oral malignancy, should all be recorded prior to entry into residential care. An initial dental examination is thus vital with follow-up checks at least annually, either as domiciliary visits by a dentist or preferably to a fully equipped dental clinic with facilities such as radiography.

To date, no study has been conducted on the dental status of care home residents in the UAE. This cross-sectional study, therefore, aimed to determine the oral health status of care home residents and day-stay attendees at care homes in the UAE using a modified WHO adult oral health survey. The STROBE checklist for observational studies was followed.[15]

MATERIALS AND METHODS

The local HBMCDM Research Ethics Committee approved the study (March 11, 2017). The WHO[16] oral health survey manual is downloadable and was the basis for the oral examination. The WHO[16] oral health assessment form for adults was used for this study with minor modifications. The general information included the date of examination, the Emirate, age and the gender, the medical history and any medication, and the American Society of Anaesthesiologists (ASA) classification. The oral examination included oral mucosal status, periodontal status, tooth wear, DMFT, fluorosis, and presence of dental prosthesis. This WHO form was used for the clinical examination. Cavitation was the criterion for caries lesion determination as per the WHO guideline and early enamel or white spot lesions were not classed as caries. Radiographs were not taken. Existing restorations were recorded within DMFT but the reasons for "M," missing teeth in DMFT, was not known as there was no dental history available. Periodontal disease was assessed on 10 index teeth (FDI notations 17, 16, 11, 26, 27, 37, 36, 31, 46, and 47). Tooth wear was assessed on a 3-point scale code (0) no sign of

wear, code (1) enamel wear, code (2) dentine exposed, and code (3) pulp involvement. Denture wearing was assessed by coding (0) no denture, (1) partial denture, and (2) complete denture. The presence of any implants and fluorosis was recorded. The clinical examination of ambulatory subjects took place in a normal chair but infirm subjects were examined in a wheelchair or bed. The ASA classification was used to code physical status: (1) healthy patient; (2) mild systemic disease; (3) severe systemic disease: and (4) life threatening systemic disease.

Three prosthodontic postgraduate students examined all subjects and were trained and calibrated prior to commencement of the study. Five patients of similar age to the study group were examined twice with 7–10 days between appointments for intra-examiner reliability. Inter-examiner reliability against one author (FAR) as the gold standard was calculated. Both inter- and intra-κ statistics for each examiner were determined, followed by retraining. An overall mean inter-examiner κ of 0.67 was achieved.

Internet searches and contact with the Ministry of Community Development identified four care homes in four of the seven Emirates that constitute the UAE. All residents and day visitors were included and were only excluded if consent was not gained or if the person did not have mental capacity and consent was not given by their guardian. The examination followed the universal standard cross infection control protocol. All instruments were disposable (sterile i-Pak, AD Surgical, Patterson Dental, Saint Paul, MN, USA). The periodontal probe differed from the WHO periodontal probe with 3–6–9 mm markings rather than a black band between 3.5 and 5.5 mm. All care home visits were conducted between April 2017 and July 2018.

STATISTICAL ANALYSIS

Data were analyzed using Statistical Package for the Social Sciences software, version 20.0 (SPSS, Chicago, IL). Chi-squared test was used for categorical variables and for continuous data. Normality was determined by the Kolmogorov–Smirnoff test and subsequently the appropriate nonparametric tests applied. Linear regression modeling to determine interactions was conducted with DMFT as the dependent variable and ASA, age, educational attainment, and periodontal status as predictor variables. The level of statistical significance was set at 5%.

RESULTS

Four care homes were identified: one in each Emirate of Abu Dhabi, Ajman, Dubai, and Sharjah with a total of number of 107 residents and day attendees. The overall mean age for all 107 participants was 67.5 years, with the youngest being 25 years and the eldest 96 years old. The modal value was 82 years ($N = 6$). Nineteen subjects had significant cognitive impairment and could not cooperate and only partial examination was possible. The mean age of men and women is shown in Table 1 with no difference in age by gender. Most of the participants were from Sharjah [Table 2], whereas over

Table 1: Mean age by gender

	N	Mean age in years	St. deviation
Man	57	69.2	16.3
Woman	50	65.5	14.8

Independent samples Mann–Whitney *U* test
P = 0.159 (not statistically significant)

Table 2: Demographic details including ASA classification, medical, and dentate status

Emirate	Number examined	Percent
Abu Dhabi	13	12.1
Dubai	32	29.9
Sharjah	37	34.6
Ajman	25	23.4
Status	Frequency	Percent
Ambulatory	43	40.2
Wheelchair	36	33.6
Bedridden	21	19.6
Declined	7	6.5
ASA classification	Frequency	Percent
Healthy	8	7.5
Mild systemic disease	71	66.3
Severe systemic disease	27	25.2
Severe life-threatening systemic disease	1	1.0
Medical conditions	Frequency	Percent
No medical problem	9	8.4
Multiple conditions	28	26.2
Neoplasms	1	0.9
Endocrine (diabetes)	26	24.3
Mental health problem	20	18.7
Stroke/nervous system	6	5.6
Circulatory system	9	8.4
Respiratory disease	1	0.9
Musculoskeletal	2	1.9
Post RTA paraplegia/brain damage/stroke	2	1.9
Declined	3	2.8
Oral mucosal status	Frequency	Percent
Normal	84	78.6
Abnormal	10	9.3
Declined/uncooperative	13	12.1
Dentate status	Frequency	Percent
Edentulous	26	24
Dentate	69	65
Declined examination	12	11

Table 3: Mean DMFT by gender and overall mean DMFT					
	N	Mean	St. deviation	Minimum	Maximum
DMFT man	49	26.5	7.2	8.00	32.00
DMFT woman	46	19.8	9.5	4.00	32.00
Overall mean DMFT	95	23.24	8.98	4.00	32.00

Independent samples Mann–Whitney *U* test

P < 0.001

half of the participants were either in a wheelchair or confined to a bed [Table 2].

According to the ASA classification, most of the participants had mild systemic disease such as type 2 diabetes or hypertension [Table 2]. "Multiple medical conditions" was most frequent as shown in Table 2 and most of the participants were dentate (*N* = 69, 65%), of whom six participants had an edentulous maxilla and two had an edentulous mandible. Denture granulomata and candida were the most common mucosal abnormalities in 10 subjects but none had suspicious ulceration [Table 2]. Of the 69 dentate subjects, 31 subjects had severe tooth wear as evidenced by dentine or pulp exposure. Only 10% of subjects had speckled enamel or fluorosis.

The overall mean DMFT was 23.24 and the mean DMFT by gender is also shown in Table 3. Men had significantly higher mean DMFT at 26.5 compared to women with 19.8 (*P* < 0.001). Table 4 shows pain or soreness experienced by participants at the time of examination. Nineteen subjects were excluded because difficulty to understand or non-cooperation and therefore 88 subjects were included in the 2 × 2 contingency table. There was no significant difference in the pain experienced between male and female subjects [Table 4]. Eighteen participants (20%) had some pain or soreness at the time of examination.

Gingivitis was present in 50% of dentate subjects and a probing depth >3 mm was present in a further 22%. Thus, a total of 58 participants had poor periodontal status [Table 5]. The oral hygiene habits of the participants are shown in Table 6. Most of the participants stated they brushed their teeth at least once a day (*N* = 87) and used a toothbrush or other method. Other oral hygiene methods included sponge swabs for edentulous patients.

Age had a weak positive correlation with DMFT (Spearman's rho = +0.43, *P* < 0.001). A predictive model using linear regression with DMFT as the dependent variable and age, gender, ASA, and educational attainment as predictor variables was performed [Table 7]. Age and gender were significant predictors of caries experience. The R^2 value shows that 23% of the variance in DMFT is accounted for

Table 4: Presence of pain/soreness by gender			
Gender	No pain	Pain	Total
Man	44 (50%)	8 (9%)	52
Woman	26 (30%)	10 (11%)	36
Total	70	18	88

χ^2 = 2.0081

P = 0.157 (not statistically significant)

Table 5: Periodontal status as determined by highest BPE/ CPITN code in each sextant	
CPITN code	Frequency
No disease	10 (12%)
Gingivitis, calculus, and other retentive factors	40 (50%)
Probing depth >3.0 mm	18 (22%)
Uncooperative/declined	13 (16%)
Total (excluding edentate = 26)	81 (100%)

Table 6: How often do you clean your teeth/denture?		
	Frequency	Percent
Never	5	5
Two to three times a month	3	3
Once a day	29	27
Twice or more a day	65	60
Declined	5	5
Total	107	100

by the model. The nominal regression of periodontal status as the dependent variable with age, gender, ASA classification, and oral hygiene as predictors is shown in Table 8. In this model gender and ASA classification were predictive of periodontal status.

DISCUSSION

This is the first cross-sectional study to assess the dental status of residents and day-stay attendees in UAE care homes. Identifying the number and location of care homes was difficult as there was no registry, either at Emirate or federal level. A study limitation is the relatively small sample size which was a convenience sample but generalizable to the UAE as four of seven Emirates were included. The most common medical problems were diabetes and hypertension which reflects disease patterns in the UAE.[17]

In total, 24% were edentate, which is greater than the 18% of similarly aged 65–74 years old reported in the

Table 7: Linear regression and partial correlations ($R^2 = 0.31$) with DMFT as the dependent variable and gender, age, ASA classification, and educational attainment as predictor variables

Variable	Coefficient	SE	*t* value	*P* value	Partial corr
Gender	−5.538	1.61	−3.44	0.001*	−0.34
Age in years	0.239	0.06	4.18	0.001*	0.40
ASA classification	1.569	1.93	0.815	0.417	0.09
Level of education	−0.574	0.48	−1.19	0.236	−0.13
No. of observations	95 (12 declined)				

*Statistically significant difference.

Table 8: Multi-nominal regression with periodontal status as the dependent variable and gender, age, ASA classification, and oral hygiene as predictor variables

Variable	Coefficient	SE	Wald	*P* value
Gender	−1.25	0.64	3.84	0.05*
Age in years	−0.02	0.02	1.04	0.309
ASA classification	1.29	0.57	5.09	0.02*
Oral hygiene	0.04	0.45	0.72	0.40
No. of observations	67 (40 declined or were edentate)			

*Statistically significant difference.

UK ADHS 2009.[8,18] Of the 69 dentate participants, 8 were edentate in one jaw. These subjects thus wear a complete denture in one jaw and often have associated functional difficulty with eating and speech.[8] The mean DMFT in men was significantly higher than in women probably because men are less motivated than women. Perhaps it would have been better to report on the mean number of remaining natural teeth rather than DMFT as DMFT will inevitably be high in older age groups. The inverse relationship between education and DMFT is to be expected as lower educational attainment and higher caries experience is understandable. Furthermore, in this study, being men was predictive for both caries and periodontal disease, whereas the ASA classification was also predictive for periodontal disease. As morbidity increases, periodontal status worsens.

The UK ADHS (2009) reported that good periodontal health occurred in only 10 per cent of dentate adults aged over 55 years,[8] whereas in 265 Florida nursing home residents, 79.6% had calculus present with the authors concluding that care providers should receive training to improve the standard of oral care given to the elderly.[19] The results regarding periodontal status presented here are contradictory insofar as the majority responded that they brushed at least once a day yet the general periodontal status was sub-optimal. It is likely that ineffective plaque control was practiced or that responses were inaccurate. Nonetheless only 12% had a healthy periodontium, which is similar to 10% in the UK ADHS (2009) albeit participants were not institutionalized.[8] Carers' baseline knowledge about oral health was reportedly poor before a 90-min training program but there was no measurable improvement in oral health a year after the training.[20]

High staff turnover was implied as a reason.[20] Staff training is therefore an iterative process and should be repeated at regular intervals preferably with incentives such as certification.

It is of concern that 18 participants suffered with pain or soreness at the time of examination. None of the care home residents had a dental checkup before being admitted and domiciliary visits by a dentist was not routine. If residents complained of dental problems, the care home sent the residents to the nearest primary dental health centre.

Care home residents are a vulnerable group requiring special care. Lack of oral care can lead to severe problems. For instance, a consequence of dysphagia is aspiration pneumonia of oral bacteria which is often community acquired and has high mortality in the elderly.[21,22] Other conditions have been described from oral microorganisms.[23,24] Carers must be trained in basic oral care and understand the importance of prevention. Care home managers need to implement regular domiciliary visits from dental care professionals.

CONCLUSION

Identifying care homes in the UAE was difficult as there is no local or national registry. Despite the study limitations, the oral health of day-stay attendees and residents in care homes was poor. We recommend that all carers are trained in basic oral care and that they perform oral hygiene for those who are unable to do this effectively for themselves.

AUTHOR CONTRIBUTIONS

BM performed the dental examinations and carried out the literature searches. FAR organised the training, calibration and co-ordinated the care home visits. AM instigated the study, performed data analysis and wrote the manuscript.

ETHICAL POLICY AND INSTITUTIONAL REVIEW BOARD STATEMENT

Ethical approval for this study was obtained from the HBMCDM REC (Protocol no. PRBMA11032017) on March 11, 2017. The study was conducted in accordance with the Declaration of Helsinki ethical principles.

PATIENT DECLARATION OF CONSENT

Informed written consent for participation in this study and publication of the data for research and educational purposes was gained.

DATA AVAILABILITY STATEMENT

The data set is available on request and with the agreement of Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU), Dubai, UAE.

REFERENCES

1. United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Volume I: Comprehensive Tables. UN publication, New York. p.226.
2. Dubai Annual Health Statistical Report; 2017. Available from: https://www.dha.gov.ae.
3. Petersen PE, Kandelman D, Arpin S, Ogawa H. Global oral health of older people—call for public health action. Community Dent Health 2010;27:257-67.
4. Papas A, Joshi A, Giunta J. Prevalence and intraoral distribution of coronal and root caries in middle-aged and older adults. Caries Res 1992;26:459-65.
5. Slade GD, Spencer AJ. Distribution of coronal and root caries experience among persons aged 60+ in south Australia. Aust Dent J 1997;42:178-84.
6. Wang HY, Petersen PE, Bian JY, Zhang BX. The second national survey of oral health status of children and adults in China. Int Dent J 2002;52:283-90.
7. Thomas S, Raja RV, Kutty R, Strayer MS. Pattern of caries experience among an elderly population in south India. Int Dent J 1994;44:617-22.
8. The Health and Social Care Information Centre. 2: Disease and related disorders—a report from the Adult Dental Health Survey 2009. Available from: https://digital.nhs.uk/data-and-information/publications/statistical/adult-dental-health-survey/. [Last accessed on 2019 Jun].
9. Petersen PE, Bourgeois D, Bratthall D, Ogawa H. Oral health information systems—towards measuring progress in oral health promotion and disease prevention. Bull World Health Organ 2005;83:686-93.
10. Karki AJ, Monaghan N, Morgan M. Oral health status of older people living in care homes in Wales. Br Dent J 2015;219:331-4.
11. Tomson M, Watson F, Taylor-Weetman K, Morris AJ, Wilson KI. West midlands care home dental survey 2011: Part 2. Results of clinical survey of care home residents. Br Dent J 2015;219:349-53.
12. Frenkel H, Harvey I, Newcombe RG. Oral health care among nursing home residents in Avon. Gerodontology 2000;17:33-8.
13. Al-Shehri SAM. Oral health status of older people in residential homes in Saudi Arabia. Open J Stomatol 2012;2:307-13.
14. Unlüer S, Gökalp S, Doğan BG. Oral health status of the elderly in a residential home in turkey. Gerodontology 2007;24:22-9.
15. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The strengthening of reporting of observational studies in epidemiology (Strobe) statement: guidelines for reporting observational studies. PLoS Med 2007;4:e296.
16. WHO. Oral Health Surveys Basic Methods; 2013. 5th ed. Available from: https://www.who.int/oral_health/publications/9789241548649/en/.
17. Abdulle A, Alnaeemi A, Aljunaibi A, Al Ali A, Al Saedi K, Al Zaabi E, *et al*. The UAE healthy future study: A pilot for a prospective cohort study of 20,000 United Arab Emirates nationals. BMC Public Health 2018;18:101.
18. White DA, Tsakos G, Pitts NB, Fuller E, Douglas GV, Murray JJ, *et al*. Adult Dental Health Survey 2009: Common oral health conditions and their impact on the population. Br Dent J 2012;213:567-72.
19. Murray PE, Ede-Nichols D, Garcia-Godoy F. Oral health in Florida nursing homes. Int J Dent Hyg 2006;4:198-203.
20. Simons D, Baker P, Jones B, Kidd EA, Beighton D. An evaluation of an oral health training programme for carers of the elderly in residential homes. Br Dent J 2000;188:206-10.
21. Pneumonia in Adults: Diagnosis and Management. Clinical guideline; 2014. Available from: www.nice.org.uk/guidance/cg191. [Last accessed on 2019 May].
22. Langmore SE, Terpenning MS, Schork A, Chen Y, Murray JT, Lopatin D, *et al*. Predictors of aspiration pneumonia: How important is dysphagia? Dysphagia 1998;13:69-81.
23. Patini R, Gallenzi P, Spagnuolo G, Cordaro M, Cantiani M, Amalfitano A, *et al*. Correlation between metabolic syndrome, periodontitis and reactive oxygen species production: A pilot study. Open Dent J 2017;11:621-7.
24. Mohammed H, Varoni EM, Cochis A, Cordaro M, Gallenzi P, Patini R, *et al*. Oral dysbiosis in pancreatic cancer and liver cirrhosis: A review of the literature. Biomedicines 2018;6:E115.