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Abstract

Background: The sustained growth of older people and the epidemiological shift from communicable to chronic health problems have attracted increased attention to geriatric wellbeing, including oral health.

Aims: To evaluate the oral health of urban community-dwelling older people and identify their priority oral health needs.

Methods: We recruited 352 adults aged ≥ 65 years in 2015 from social organizations and primary healthcare centres in Beirut and its suburbs. Older people underwent dental examination including the decayed, missing and filled teeth (DMFT) score, gingival health [plaque index (PI) and Periodontal Screening and Recording (PSR)], and dental functional units (FUs). Sociodemographic data were gathered through a structured questionnaire in a face-to-face interview. The participants were stratified into 3 age groups, and according to restoration with partial, complete and no dentures. Statistical analyses included the Mann–Whitney, Kruskal–Wallis and $\chi 2$ tests to explore the oral health status by sociodemographics.

Results: Missing teeth contributed most to high DMFT score . Mean PI and root caries indices were high. Mean FU scores were low, but higher in women and in complete denture wearers.

Lower numbers of remaining mandibular anterior and maxillary posterior teeth, higher DMFT scores, but better periodontal status (lower PSR scores) were found in the older age groups. The more educated participants exhibited the healthier scores.

Conclusion: We observed poor oral health, particularly missing teeth and low FUs, in older people, warranting interventions to integrate oral health within the scope of geriatric general health.

Keywords: oral health, geriatrics, Lebanon, Lebanese elderly, community-dwelling, urban elderly.

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Introduction

The number and percentage of people aged ≥ 65 years are increasing fast worldwide (1); a demographic change that is paralleled by an epidemiological transition or a shift from communicable to noncommunicable diseases, including oral health problems (2). These demographic and epidemiological developments have raised interest in the oral health status of geriatric populations given the comorbidities associated with edentulism and denture-related conditions (3). The ensuing compromised mastication performance has been associated with potential effects on gastrointestinal health (4). Oral health affects geriatric quality of life because of compromised diet (e.g. inadequate mastication), limited social interactions (e.g. affected smile and speech) and ill health when oral problems increase the risk of frailty and disease (e.g. cancer) (3).

The main reported sociodemographic factors affecting geriatric oral health include age and gender, because oral health deteriorates with age, especially with increased tooth loss (5) and periodontal problems (6). Although women report more barriers to seeking oral care, their compliance with and the success of oral treatment are significantly higher than in men (7).

The global trends are observed in Lebanon, where the older population is expected to reach 10.2% by 2025 and 23% by 2050, which are the highest percentages in the Eastern Mediterranean and Arab Regions (8). Similar to other developing countries, attention to geriatric oral health has been minimal in Lebanon (9–11). Available studies have mainly focused on institutionalized (12) or care-seeking (13–16) older adults, with only 2 research groups targeting community-dwelling older people in Lebanon. One focused on the rural community (17,18) and the other targeted a non-treatment-seeking, community-dwelling urban Lebanese geriatric population (19). The limited studies on Lebanese older people have underlined the high burden of oral problems among them, mainly related to missing teeth and unrestored edentulism (16,18,19), dissatisfaction with oral health status (12,15), and poor oral-health-related quality of life (14,16).

The aim of this study was to assess the oral health of community-dwelling Lebanese older people using a comprehensive range of indicators, and to identify priority oral health needs of this population.

Methods

This cross-sectional study included 352 people aged ≥ 65 years, recruited over 5 months in 2015 from 19 social organizations in Greater Beirut. These organizations provide a social setting for activities and games (e.g. playing cards and backgammon tournaments) as well as free food and clothes to people from low to moderate socioeconomic backgrounds. Some of the centres also deliver free healthcare services on specific days, which did not coincide with our visiting days.

The Ministry of Public Health manual on existing social and medical organizations serving older people was carefully reviewed. Of 28 eligible centres/organizations that were identified, 19 (68%) that did not provide in-house dental services agreed to participate. The administrators of the cooperating centres were visited prior to data collection and the procedures were explained in detail before the centres agreed to participate.

An a priori calculation was performed to estimate the adequate sample size, although sample

size calculation is typically not conducted with nonprobability convenient sampling. The calculation determined that 350 participants were needed, with a confidence interval of 95%, power of 80%, marginal error of 5%, and prevalence of plaque index (> 2) of 35%.

A decision-making competency, assessed through a postconsent quiz, was first performed by the examiner to confirm that all recruited participants had intact cognitive faculties, comprehended the nature of the investigation, and could consciously consent to join the study (20). Subsequently, a face-to-face interview was conducted by an examiner using a structured questionnaire to collect sociodemographic data (e.g. age, gender and educational level). The questionnaire was developed by the research team in Arabic, and took about 10 minutes to complete. A dental examination was performed by the same evaluator who was calibrated on the assessment of oral health indicators by a professional dentist before data collection. The examiner used noninvasive sterile and disposable dental instruments to determine the following characteristics and indicators. 1) A survey of the participant's oral health status: on a schematic view of the mouth, every tooth was marked if decayed, filled, missing or crowned. When the participant wore a denture, the teeth replaced in the denture, and the type of denture (complete vs partial) were recorded. 2) DMFT Index (21): an accurate count of the total number of decayed, missing, and filled teeth. 3) Root Caries Index (RCI) (22): the number of radicular caries calculated by dividing the number of filled or decayed root surfaces by all visible root surfaces. 4) Plaque Index (PI) (23): evaluating the oral hygiene by recording both soft and mineralized deposits on the 4 surfaces (mesial, distal, buccal and lingual) of 6 teeth with a score ranging from 0 (no plaque) to 3 (abundance of soft matter on the tooth and gingival margin). 5) Periodontal Screening and Recording (PSR) (24): assessing the periodontal health, taking into account pocket depth, furcation involvement, tooth mobility, mucogingival problems and recession. The score ranges from 0 (healthy periodontium) to 4 (severe periodontal problem). 6) Functional Unit (FU) (25,26): number of mandibular teeth involved in mastication counted using articulating paper to mark the contacting mandibular and maxillary teeth. Every anterior tooth was considered 1 FU while premolars and molars were counted as 2 FUs each. All natural and restored teeth, including teeth in removable dentures, were counted.

A descriptive data analysis was performed for all the variables; frequency distributions were generated for categorical outcomes and the median/mean/standard deviation for continuous ones. Age was categorized according to World Health Organization (WHO) practices in 3 age groups: 65–74, 75–84 and ≥ 85 years (27). All oral health indicators were compared according to gender, age and education. Nonparametric tests were used considering that the assumption of normality for the measures was not met. The bivariate associations between continuous measures of oral health outcome with gender were performed with the Mann–Whitney nonparametric test. The associations between the oral measures and variables of age, education and denture groups (no, complete and partial dentures), were gauged with the Kruskal–Wallis test. For categorical indicators, the $\chi 2$ test was used to evaluate the associations with age and gender. The calibration reliability between examiners was evaluated with the kappa coefficient; the inter-rater agreement was very high (0.88

Ethical approval was granted by the Institutional Review Board (IRB) at the American University of Beirut (FHS.LG.17). Every consenting participant was given appropriate instructions specific to their dental status (in terms of oral care and treatment need) and was provided with a list of centres delivering affordable oral treatments. Participants in need of treatment were referred to the centre closest to their homes. An IRB-approved flyer detailing how to keep healthy teeth and dentures, and care for the oral cavity was distributed to all participants.

Results

The average age of the participants was 73 (standard deviation 7.03) years; almost 40% of them between 71 and 80 years, around a third between 65 and 70 years, and a quarter > 80 years. The majority (~70%) were women (Table 1).

On average, the missing teeth count was 19.6, and the FU count was nearly a third lower (7.5; range 0–22) than the functional norm of 20 FUs (Table 1). The periodontal status was reflected by a mean PSR score per sextant of 1.01 and a PI of 1.96. Three-quarters of the sites had a PI of ≤ 2. The average RCI was 0.3; however, the median RCI was null. Most of the remaining teeth were mandibular, with more in the anterior (incisors and canines) than posterior (premolars and molars) regions. The remaining maxillary teeth were equally anterior or posterior. More than half of participants wore dentures (54.83%), predominantly complete (39.77%) and partial (15.06%). Most participants (80.68%) were edentulous (

Age was significantly related to DMFT score, which increased with age (mainly the missing component), and to the number of remaining mandibular anterior and maxillary posterior teeth, which decreased with age (Table 2). PSR differed significantly between the 2 younger age groups; PI did not, although it showed a pattern of reduction with age. Comparisons among denture groups revealed significant differences between no denture and complete denture wearers for all variables; between complete and partial denture wearers for all variables except FU; and between no denture and partial denture groups only for the D component of the DMFT (Table 3).

Many variables (RCI, FU, DMFT, upper anterior and posterior teeth, lower posterior teeth) were significantly related to educational status (Table 4). RCI was lowest among people with college education, followed by those with secondary education. The highest numbers of FUs were found in college-educated older people. The numbers of remaining teeth and DMFT scores were the lowest among participants who were illiterate. The higher the education achieved, the more likely were people to retain their natural teeth versus wearing a denture.

Discussion

The poor oral health status disclosed in our population of community-dwelling older people was underlined through indices that revealed compromised functionality of the masticatory system. The increased number of missing teeth, mostly posterior, and the low FU count, reflect nonfunctional natural occlusion. However, most of these people wore replacement prostheses, with complete dentures outnumbering partial dentures, indicating that, even if prevention of dental/oral disease was lacking in younger study participants, an acceptable (although not necessarily optimal) remedy precluded the neglect of functionality compatible with basic tenets of quality of life. This premise would require dedicated research on oral health-related quality of life, in which the quality and functionality of the prostheses would also be assessed. Nevertheless, 33.45% of the edentulous older people (

The observed major burden of missing teeth is in line with the national and global literature (28). The edentulism rate in our study (54%) was between the lower rate (41.2%) reported by Farhat-Mechayleh et al. (19) and higher prevalence observed by El Helou et al. (69.6%) in a hospital-based study (16). The current findings were compared with similar assessments from other countries, particularly the surrounding Middle East and North Africa (MENA) Region, using American data as a benchmark because of the availability of basic dental coverage for older people (Figure 1). Only DMFT scores were available for a number of countries (Figure 1A). Dental plaque, FU and RCI were not commonly evaluated in the MENA Region; therefore, comparisons were made with western countries (
Figure 1B–D
).

The number of older people retaining at least 20 teeth in this study (21.59%) was markedly lower than the millennium goals set by the World Dental Federation to have in 2000 ≥ 50% of older adults aged 65 years retain no fewer than 20 teeth (29). The 25% rate of unrestored edentulism among those with

The average number of decayed and filled teeth (3.75) is midway between international and regional numbers, which range from 2.5 to 5.7 (31, 32). The data differ within subcategories when compared with other reports on Lebanese older people: 1.51 decayed and 18.6 missing teeth compared with corresponding numbers reported by El Osta et al. (3.32 and 17.8, respectively) (15). The lower number of decayed teeth in our study may be associated with the higher number of missing teeth, on the assumption that severely decayed teeth were lost or extracted.

The PSR score and low PI indicate acceptable periodontal and oral hygiene status, but the high number of missing teeth may have resulted from poor prior periodontal health that led to the observed edentulism. More mandibular anterior teeth remained, compared with all other teeth, possibly because of their protected position in the mouth.

The lack of gender differences, except for the higher FUs in women, is not in line with the published literature (18, 29, 32). This difference may be ascribed to the fact that men and women in our study received the same level of care and follow-up. Also, it is plausible that the high number of missing teeth camouflaged data that are otherwise better depicted by oral health indices.

The increase in tooth loss and periodontal diseases with age agrees with previous studies (28, 29). In contrast, our findings on root caries were not in line with the reported increase with age (33). The reduction in the periodontal indices (PI and PSR) was not significantly different between the older age groups. This finding may be associated with the increased number of missing teeth with age, which resulted in the lower number of remaining teeth being assessed for periodontal status. The association between oral health and education reflecting better oral condition in the more-educated older people corresponds to already established links (3).

The target of geriatric healthcare is to provide functionality and optimal quality of life to people becoming more vulnerable with age. Accordingly, the primary focus is on the necessary FUs that support painless masticatory function (and appropriate speech) compatible with health and non-interference of oral problems with normal activities and dignity in older people. Research is needed to standardize the definition of FU (anterior, posterior and combined segments), its differential weight (double or single weight for posterior teeth contacts), its relationship to restorations, and its application in a way similar to DMFT. FU is high when a denture restores occlusion and mastication, and low without this restoration. The quality of dentures may also be explored. Thus, a functional index should be developed to objectively quantify chewing ability and comfort or pain, possibly a standardized FU added to chewing ability and associated comfort and pain. Comparisons across countries and healthcare systems may then reflect the optimal oral care in older people.

The current study has its limitations and offsetting strengths. The cross-sectional nature of the study means that temporal or causal inferences cannot be made, and the convenient sampling confined to an urban population in the Greater Beirut area precludes making any generalizations to the entire older population of Lebanon. Nonetheless, the study targeted older people from nondiscriminating social organizations, and therefore represents the population of community-dwelling older people within the capital and its suburbs. Moreover, the study included a comprehensive list of indicators that shed new light on geriatric health in Lebanon and allowed for comparisons with regional and international geriatric data as well as the recommendation to standardize the evaluation of FUs.

The calibration of oral health assessment by an experienced dentist before data collection enhanced the validity of the findings. The Community Periodontal Index of Treatment Needs, recommended by WHO, was not used, reducing comparability with other published data. However, the PSR provided information about tooth mobility, furcation involvement and recession; all symptoms expected to occur with periodontal disease particularly in an aged population (34). Another limitation is that some conditions such as xerostomia, oral cancer, mucosal lesions, and oral and temporomandibular joint pain were not factored in the analyses; they were not within the scope of the research and would require longer and more advanced examinations.

The findings of high oral health burden invite action from policy-makers and government agencies to prioritize oral health awareness, prevention and treatment for people who have already contributed to society through long-term work and parenting. A national data registry following WHO guidelines should be established to periodically collect data on various indicators within diverse segments of the population from different socioeconomic levels, including oral health risk factors such as general health condition, smoking status, nutritional information, oral hygiene practice and other details known to be associated with oral health. Problems in mastication, oral dysfunction, discomfort and related psychological issues can affect general health. By recognizing that oral health is part of total health, relevant authorities should aim to provide affordable essential care for older people and integrate it into general health insurance schemes (35). Oral health awareness campaigns could be integrated into general health campaigns and medical care instructions provided by physicians and hospitals.

Until national programmes are developed, smaller steps may be based on prioritizing problems associated with missing teeth and low FUs. Accessibility to dental care could be increased through the allocation of dentists to social organizations that provide health services to older people. Dentists, especially new graduates, should be encouraged to treat older people, hopefully motivated by the developed competence in geriatric dentistry increasingly embedded in dental schools' curricula. Emphasis on improved quality of care in private and public arenas should be accompanied with education on oral disease and means of prevention and change of unhealthy behaviours, as well as early prevention at younger ages underlining the need for regular professional care.

Conclusions

Community-dwelling older people in urban Lebanon experienced mainly loss of teeth, associated low FUs, and correspondingly acceptable but camouflaging decay levels and periodontal health. The results disclose the lack of national and institutional policies that should address this oral health burden by considering the inclusion of oral care as part of total health care in governmental and insurance programmes.

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État de santé bucco-dentaire dans une population gériatrique libanaise

Résumé

Contexte : La croissance constante du nombre des personnes âgées et la transition épidémiologique des problèmes de santé transmissibles aux problèmes de santé chroniques ont fait porter une attention accrue sur le bien-être gériatrique, y compris la santé bucco-dentaire.

Objectifs : Évaluer la santé bucco-dentaire des personnes âgées vivant dans les communautés urbaines et identifier leurs besoins prioritaires en matière de santé bucco-dentaire.

Méthodes : Nous avons recruté 352 adultes âgés de 65 ans et plus en 2015 auprès des organisations sociales et des centres de soins de santé primaires à Beyrouth et dans sa banlieue. Les personnes âgées se sont soumises à un examen dentaire comprenant l'indice DCAO (dents cariées, absentes et obturées), la santé gingivale [indice de plaque (IP) et de dépistage et d'enregistrement parodontal] et les unités dentaires fonctionnelles (UF). Des données socio-démographiques ont été collectées au moyen d'un questionnaire structuré lors d'un entretien en face à face. Les participants ont été stratifiés en trois tranches d'âge, et selon la restauration avec une prothèse dentaire partielle, complète ou sans prothèse. Les analyses statistiques comprenaient les tests de Mann-Whitney, Kruskal-Wallis et $\chi 2$ pour explorer l'état de santé bucco-dentaire en fonction des données sociodémographiques.

Résultats : Les dents manquantes étaient le principal élément qui contribuait à un indice DCAO élevé. Les

indices IP et de caries radiculaires moyens étaient élevés. Les scores d'UF moyens étaient faibles, mais ils étaient plus élevés chez les femmes et les porteurs de prothèses complètes. Les tranches plus âgées présentaient un nombre plus faible de dents mandibulaires antérieures et maxillaires postérieures restantes, des indices DCAO plus élevés, mais un meilleur état parodontal (indice de dépistage et d'enregistrement parodontal plus faibles). Les participants les plus éduqués présentaient des indices plus sains.

Conclusion : Nous avons observé une mauvaise santé bucco-dentaire chez les personnes âgées ; cela concernait en particulier les dents manquantes et les scores UF faibles, nécessitant des interventions pour intégrer la santé bucco-dentaire dans le champ de la santé générale gériatrique.

WHO EMRO | Oral health status in a Lebanese geriatric population

الإحصائية اختبارات مان - ويتني، وكروسكال - واليس، واختبار مربع كاي χ2 لاستكشاف حالة
صحة الفم حسب الخصائص الاجتماعية السكانية .

: ساهم فقدان الأسنان في معظم الحالات في ارتفاع درجة تقييم الأسنان المسوسةالنتائ ج
والمفقودة والمحشوة . وكان متوسط مؤشرا اللُّويْحات السنية وتسوس الجذور مرتفعًا . وكان
متوسط درجات الوحدات الوظيفية منخفضًا، بينما كان مرتفعًا في صفوف النساء والأفراد
الذين يرتدون أطقم سِنية كاملة . وانخفضت أعداد الأسنان الفكية الأمامية والفكية
العلوية الخلفية المتبقية، وارتفعت درجات تقييم الأسنان المسوسة والمفقودة
والمحشوة، بينما سادت حالة أفضل للدواعم السنية انخفضت درجات تحري الدواعم السنية)
وتسجيلها (في صفوف الفئات العمرية الكبرى . وأظهر المشاركون الحاصلون على مستوى تعليمي
أعلى درجات أفضل من الناحية الصحية .

: لاحظنا تردِّيًا في صحة الفم في صفوف كبار السن، وظهر ذلك في فقد الأسنانالاستنتاجات
وتراجع الوحدات الوظيفية، وهو ما يستدعي إجراء تدخلات لإدراج صحة الفم ضمن نطاق خدمات
الصحة العامة المُقدَّمة للمسنين .

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