ORAL AND GENERAL HEALTH INDICATORS FOR LEBANESE ELDERLY IN ORAL SURVEYS: REVIEW ARTICLE

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Abstract
Various factors are taken into account in assessing objectively the dental status and the quality of life related to oral health, particularly in elderly. Basic socio-demographic characteristics and oral hygiene habits must be identified and screened, respectively. The dental health can be evaluated using indicators such as the ASA score or by determining the person's level of autonomy. Cognitive ability of older people must be checked prior to use oral health questionnaires. This competence can be assessed by the Mini Mental State score (MMS). The use of Mini Nutritional Assessment (MNA) evaluates the nutritional status of patients. The aim of the article is to identify the most relevant indicators that can be used in epidemiological studies to assess the oral health of Lebanese elderly.

Keywords: Elderly – oral health - quality of life - nutritional status.

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INDICATEURS DE SANTÉ ORAUX ET GÉNÉRAUX POUR LES LIBANAIS ADULTES DANS LES ENQUÊTES ORALES

Résumé
Divers facteurs sont pris en compte dans l'évaluation objective de l'état dentaire et de la qualité de vie liée à la santé bucco-dentaire, en particulier chez les personnes âgées. Les caractéristiques sociodémographiques et les habitudes d'hygiène orale doivent être identifiées et dépistées. La santé dentaire peut être évaluée en utilisant des indicateurs tels que le score ASA ou par la détermination du degré d'autonomie de la personne concernée. Les capacités cognitives des personnes âgées peuvent être évaluées en utilisant le score « Mini Mental State » (MMS). L'utilisation du score « Mini Nutritional Assessment » (MNA) permet d'apprécier l'état nutritionnel des patients. Le but de cet article est d'identifier les indicateurs les plus pertinents qui peuvent être utilisés dans les études épidémiologiques pour évaluer la santé bucco-dentaire des personnes libanaises âgées.

Mots-clés : personnes âgées - santé orale - qualité de vie - statut nutritionnel.

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Introduction

Health is not only the absence of disease or infirmity, but a state of complete physical, mental and social well-being [1]. Oral health is integral to general health, and a determinant factor for the quality of life. It implies being free of chronic oro-facial pain, oral and nasopharyngeal cancer, oral tissue lesions, birth defects, and other disorders that affect the oral, dental and craniofacial tissues. The interrelationship between oral and general health is particularly pronounced among elderly. Since the proportion of older people continues to rise worldwide, the WHO oral health program proposes to develop strategies to improve oral health and quality of life for ageing populations [1].

In Lebanon, the ageing population is expanding due to a decline in birth rate and an increase in life expectancy [2]. According to local statistics, individuals aged 65 years and more counted around 10% of the total population [2]. Promotion of health became an important issue, especially that the process of ageing amplified the risk of oral diseases interrelated to general health. Hence, compromised oral health reduces chewing and eating abilities, increases malnutrition and affects general health. Similarly, systemic diseases and polymedication reduce the salivary flow, alter the taste sensations and increase the risk of alveolar bone resorption and teeth mobility. Furthermore, impaired mobility, financial hardship and negative attitudes block oral health care among elderly [3, 4]. Pain, difficulty when eating and chewing, esthetic problem can adversely affect people's daily lives and well-being.

Different types of indicators are listed in international literature; they served in collecting information, monitoring changes, assessing the effectiveness of the service and planning for oral health services [5]. However, they appeared to be of limited benefits in determining therapeutic needs. Additional measures, known as oral health related quality of life (OHRQoL) measures, are used to assess the impact of oral conditions on social activity. OHRQoL instruments are important to improve the outcome of our practice, as well as to provide accurate data for health promotion. General health indicators are also exploited in oral surveys to appraise mental and cognitive status as well as dependence status, and they are designed for the choice of the inclusion criteria in oral surveys. Nutritional indicators are used to assess nutritional status in elderly.

The purpose of this article is to identify pertinent oral and general health indicators suitable for the assessment of oral health programs in Lebanese ageing population.

Crown	Root	Description
0	0	Sound
1	1	Decayed
2	2	Filled with decay
3	3	Filled with no decay
4	-	Missing due to caries
5	-	Missing for other reason
7	7	Bridge abutment, special crown or veneer/implant
-	8	Unexposed root
T	-	Trauma with no evidence of caries
9	9	Cannot be recorded

Table 1: Numerical coding of dentition status in elderly [7].

Clinical oral examination

Several clinical indices are commonly used to evaluate dentition status in elderly. Edentulism, caries and periodontal status are essential parameters reflecting oral health status.

Edentulism refers to the loss of all natural teeth. Therefore, edentulous patients are those who have lost all their natural teeth, while dentate patients are those who have at least one natural tooth [1].

Dental caries assessment

The DMFT (Decayed, Missing, and Filled Teeth) index recommended by the World Health Organization WHO was created to describe the prevalence of dental caries. The maximum value of DMFT is 28, meaning that all teeth excluding wisdom teeth are screened [6]. This indicator can be used to measure the effectiveness of self-care and oral health services in controlling the decay process in Lebanese elderly [7]. While assessing treatment needs for a population based on DMFT screening is incomplete without radiographic control, the recommended protocol for oral health surveys is based on clinical examinations since radiographic equipment is not always available in health care facilities [6]. The criteria for diagnosis and coding teeth in elderly are given for crowns and roots (Table 1).

The root status of a missing tooth is coded 7 to indicate that an implant has been placed as an abutment, whereas crown status of missing teeth replaced by a bridge are coded 4 or 5. A fully edentulous arch is coded 4 or 5. Tables are used for scoring crown and root status (Table 2).

The D-component consists of all teeth with codes 1 or 2. The M-component includes missing teeth with code 4 or 5. The F-component contains teeth with code 3. Teeth coded 7 are not included in DMFT.

Periodontal status

There is no consensus in the literature that recommends the use of a particular epidemiological index for determining the periodontal status

Maxilla	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
Crown																
Root																
Mandible	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
Crown																
Root																

Table 2: Score of dentition status.

0	Healthy periodontal conditions
1	Gingival bleeding on exploration
2	Gingival calculus and bleeding
3	Periodontal pockets 4 - 5 mm
4	Periodontal pockets of 6mm or more
X	Excluded sextant (less than two teeth present)
9	Not recorded

Table 3: CPI index score [6].

0	0-3mm (Cement-enamel junction (CEJ) invisible and community periodontal index 0-3)
1	4-5mm (CEJ within black band)
2	6-8mm (CEJ between upper limit of black band and 8.5mm ring)
3	9-11mm (CEJ between 8.5mm and 11.5mm ring)
4	12mm or more (CEJ beyond 11.5 mm ring)
X	Excluded sextant (less than two teeth present)
9	Not recorded

Table 4: Loss of attachment [6].

[5, 8]. Epidemiological studies have deployed a variety of clinical parameters, such as gingival inflammation, pocket depth, attachment loss, or bone loss. Variations due to factors such as type of probe, applied pressure on probing, or inter-examiner errors make standardization and calibration necessary [6].

The Community Periodontal Index of Treatment Needs (CPITN) applied by (WHO) in 1987 was used to assess prevalence of periodontal disease [9]. It used the following clinical parameters: pocket depth, gingival bleeding and gingival calculus. It was considered inappropriate by the scientific community because CPITN scores do not correlate strongly with attachment loss scores and it underestimates prevalence and severity of periodontal disease particularly in older population [5, 8].

In 1997, the Community Periodontal Index (CPI) and attachment loss have been implemented by WHO and the International Dental Federation (IDF) for collecting data on periodontal treatment needs among elderly [1, 6]. The CPI index assesses the type and level of preventive and/or treatment services required and estimates the overall prevalence of periodontal diseases [7].

CPI commonly used among elderly can be used among Lebanese elderly. The indicators used for the assessment of periodontal status are: pocket depth, gingival bleeding and gingival calculus. A CPI periodontal probe with 0.5 mm ball tip is thoughtfully inserted into the pocket. The mouth is divided into 6 sextants, four posteriors and two anteriors. A sextant is examined if two or more teeth are not indicated for extraction. For dentate elderly, the teeth to be examined are: 17, 16, 11, 26, 27, 47, 46, 31, 36, and 37; the mesial, distal, facial and lingual/palatal surfaces of each index teeth are probed. In the absence of the index teeth, all the remaining teeth in the sextant are examined and the highest score is recorded except the distal surface of third molars [6]. The scores of the CPI system are listed in the table 3.

The most severe periodontal status recorded using the CPI is the presence of periodontal pockets ≥6 mm; this measure is presented as the percentage of patients with one or more 6 mm periodontal pockets [1, 6].

The degree of attachment loss is recorded on the index teeth in terms of scores (Table 4).

Functional dental units

Dental status is the main factor affecting mastication. It has been dem-

onstrated that the number of functional dental units (natural and/or artificial) controls chewing efficiency [3, 10]. Functional teeth are determined by the placement of a dental articulating paper strip of 200µ of thickness between teeth on the two sides and the recording of marked mandibular teeth in normal occlusion. This examination must be realized with the removable prostheses in mouth.

Functional Occlusion Prevalence defined by the proportion of elderly with 21 or more natural teeth in functional occlusion, is used for planning current and future prosthetic needs [7].

Additional assessment

Further assessments are executed on clinical examination. The prevalence of edentulism is calculated to provide information on oral health status and needs particularly in residential homes and institutions; prevalence of removable denture (complete or partial) is estimated to assess current and future prosthetic needs; evaluation of the temporomandibular joint (TMJ) have to be performed; presence of symptoms, signs of clicking, or reduced jaw mobility are noted [1, 6].

Furthermore, lesions of oral mucosa are screened systematically within dentate and edentulous elderly for early diagnosis of oral cancer and for estimating the number of new cases of oral cancer in Lebanese elderly. Thus, suspected oral tumor, ulceration, abscess, candidiasis, lichen planus, or other lesions as well as their locations are to be inspected [7].

Oral health related quality of life (OHRQ0L)

The main role of dental care for elderly is not only to increase survival (presence of teeth, absence of oral cancer), but also to improve the quality of life. Oral diseases entail physical, social, psychological and economic consequences. They seriously impair quality of life and affect oral function, appearance, and interpersonal relationship [14]. The notion of Oral Health Related Quality of Life (OHRQoL) appeared in the early 1980s [11, 12]. The United States Surgeon General defines OHRQoL as a multidimensional construct that reflects people's comfort when eating, sleeping, and engaging in social relations, their self-esteem and their satisfaction with respect to their oral health [13].

In the World Oral Health Report (2003), WHO listed the impact of oral health on the quality of life as an important element of the Global Oral Health Program [1]. The assessment of OHRQoL is essential in oral health surveys, clinical trials and studies evaluating the outcome of preventive and therapeutic programs intended to improve oral health [14].

OHRQoL are measured with a compound collection of items, scales, domains and measurements. An item refers to a single question; a scale contains the available categories for expressing the response to the question. A domain identifies a particular focus of attention, such as functional capacity and may comprise the response to a single item or responses to several related items. The dimensions adopted at international level for use in the questionnaires are self-reported oral disease symptoms, perception of oral well-being, as well as social and physical functioning [5]. A measurement is the collection of items used to obtain the data [14].

Various OHRQoL instruments have been developed in the past 30 years. Oral Health Impact Profile-49 (OHIP49), Geriatric Oral Health Assessment Index (GOHAI), Subjective Oral Health Status Indicators, Dental Impact on Daily Living, Oral Health Impact Profile-14 (OHIP14), and Oral Impact on Daily Performances (OIDP) were considered as instruments of choice to assess the impact of oral conditions on the quality of life of elderly; they are efficient and easy to estimate [15].

Most of these instruments were initially developed and validated in English speaking countries then subsequently translated and validated into several languages. The concept of OHRQoL varies according to the social, cultural and political context and background. Items or indicators must be tailored to the studied populations and their civilizations; otherwise the measurements would be inaccurate [16].

ASA 1 : Normal healthy patient
ASA 2 : Patient with mild systemic disease
ASA 3 : Patient with severe systemic disease
ASA 4 : Patient with severe systemic disease that is a constant threat to life
ASA 5 : Moribund patient who is not expected to survive without the operation
ASA 6 : Declared brain-dead patient whose organs are being removed for donation purposes

Table 5: ASA physical status classification system [17].

General health status

The determination of physical status, autonomy and cognitive functions in elderly are essential for selecting the adequate inclusion criteria in oral epidemiological surveys.

Physical status score

The American Society of Anesthesiologists (ASA) score is a used to assess the physical status of patients before surgery. It is sometimes referred to ASA-PS, because it is a measure of physical status (Table 5). Anesthesia providers use this scale to indicate the patient's overall physical health preoperatively. Hospitals and other health care groups use scale to predict risk, and decide if a patient should have or should have had an operation. In oral epidemiological studies, ASA score is assessed before recruiting patients in a survey (ASA1, ASA2, ASA3, and ASA4) [17].

Areas of cognition	Points	Description
Orientation time	0 – 5	State the year, season, date, day and month
Orientation place	0 – 5	Name the state, country, town or city, hospital or clinic and floor
Registration	0 – 3	Repeat promptly 3 named words
Attention and calculation	0 – 5	Count from 100 by removing serial seven or spell WORD backward
Memory	0 – 3	Recall of 3 items
Language and comprehension	0 – 8	Name 2 objects , repeat a meaningless sentence, follow 3-stage command, read and obey, write a sentence
Visual construction	0 – 1	Copy 2 intersecting pentagons

Table 6: Description of MMSE categories [18, 20-22].

Cognitive function

The Mini-Mental State Exam (MMSE) introduced in 1975 by Marshall Folstein et al. [18], is one of the most widely used instruments for cognitive functions' quantitative evaluation and for dementia screening. Cognitive impairment in elderly must be checked for before filling in any questionnaire in oral surveys, for the credibility of the results. Studies have revealed that MMSE is a valid and reliable tool when applied to elderly [19]. It has been published in over 50 languages, translated into Arabic and shown to be applicable for Lebanese elderly after modification of some of the items in respect to the country's cultural background [20]. In fact, the Arabic version of MMSE is recommended for diagnostic of dementia in practice and medical studies in Lebanese elderly [21, 22]. The MMSE is a brief (5-10 min), structured 30-point questionnaire test. It provides an assessment of many cognitive domains including time and place orientation, simple and complex attention, memory, linguistic skills and visual construction [18, 20] (Table 6). MMSE Lebanese global scores vary from 0 to 30. The scores superior to 24 are usually considered normal, scores between 10 and 19 indicate moderate impairment, and scores less than 10 indicate severe dementia [20-22].

Dependence assessment

Defining dependent and independent persons is essential before performing any study in gerodontology. Several evaluation tools have been described; ADL tool commonly referred to as Katz ADL was the most effective and the widely used instrument to assess basic activities of daily live in elderly, i.e., self-care functions (bathing, dressing and toileting, transferring, continence, and feeding) [23, 24].

ADL tool has been published in several languages and translated into Arabic to acquire its reliability and validity among Lebanese elderly. The ADL Arabic translated version appeared to be consistent, valid and provided objective screening of dependency among elderly [25].

The total ADL score of the Lebanese version lies on an ordinal scale from 0 to 6, where 6 indicates full function and 0 refers to a very dependent patient.

Nutritional status

Ageing is accompanied by physiological changes that can negatively impact nutritional status. Poor oral health and dental problems can lead to chewing problems that increase the risk of malnutrition. The latter is associated with increased morbidity and mortality in institutionalized patients, as well as in independently living older people [3, 4, 26, 27].

Several evaluation tools have been described in literature. The Mini Nutritional Assessment (MNA) is a reliable assessment tool, recommended by national and international clinical scientific organizations [26]. MNA was particularly developed and validated to identify malnourished or at risk of malnutrition elderly people (≥65 years-old). It has been translated and is now available in 14 languages including Arabic.

The MNA screening process includes anthropometric, general, dietary, and subjective assessment. It consists of a two-steps process, the MNA-SF and the full MNA. The MNA-SF screens subjects using six questions on the decrease in food intake, the weight loss, the mobility, the psychological stress, the neuropsychological problem, and the measure of BMI. Scores >12 indicate nutritional status and require no further screening. The full MNA must be completed if the scores are <12. Twelve additional questions have a maximum possible score of 16, related to lifestyle and medication, number of meals, food and fluid intake, autonomy of feeding, self- perception of health and nutrition, arm and calf circumferences. Combining the scores of the MNA-SF and the remaining twelve questions provides the full MNA score or "Malnutrition Indicator Score". A total score of 17-23.5 indicates risk of malnutrition and scores <17 indicate current malnutrition [26-30].

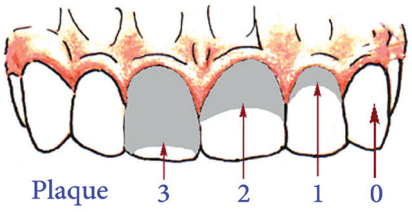

Fig.1: Debris score on the teeth [32].

Scores	Criteria
0	Absence of debris or stain
1	Soft debris covering less than one third of tooth surface, or presence of extrinsic stains
2	Soft debris covering more than one third but less than two thirds of tooth surface
3	Soft debris covering more than two thirds of the tooth surface

Table 7: Criteria for debris classification [6, 32].

Scores	Criteria
0	Absence of calculus
1	Supra-gingival calculus covering less than one third of the tooth surface
2	Supra-gingival calculus covering less than two thirds of the tooth surface and/or presence of fleck around the cervical portion of the tooth
3	Supra-gingival calculus covering more than two third of the tooth surface and/or continuous amount of calculus around the cervical portion of the tooth

Table 8: Criteria for calculus classification [6, 32].

Scores	Criteria
0	Absence of plaque
1	Little accumulation of plaque in the gingival and cervical margin of the tooth detected by probe
2	Moderate accumulation of plaque in gingival pocket, or the tooth and gingival margin eye detected
3	Abundance accumulation of plaque in gingival pocket and/or on the tooth and gingival margin

Table 9: Criteria for plaque index [33].

Other Indicators

Socio-demographic characteristics

Gathering information on socio-demographic variables is mandatory in oral surveys. Age, gender, marital and social status, education and employment influence the patient's motivation for oral health care. International studies showed that older people visited a dentist less frequently than younger. Females attend more regularly dental clinics than males. Low education level can influence perceptions of oral health cares and needs. Studies on Lebanese elderly population are needed to compare with these results [7, 31].

Oral hygiene assessment

Oral hygiene is a key determinant of oral health; many clinical studies have reported the importance of oral hygiene in prevention and control of oral diseases. Risk factors of poor oral hygiene in elderly are inappropriate dental care, functional dependence and salivary dysfunction [1, 4, 6, 9]. Objective oral hygiene assessment can be clinically evaluated by assessing standardized plaque indices as used in several epidemiological studies. In edentulous patients, food debris is detectable on prosthesis and oral mucosa [3]. In dentate Lebanese elderly, the indicators that can be used in studies are: Simplified Oral Hygiene Index, Silness-Löe Index and Quigley Hein Index Modified by Turesky.

Simplified Oral Hygiene Index (OHI-S)

Described by Greene and Vermillion, it has two components: The debris index (DI-S) and the calculus index (CI-S) (Table 7, 8). Four posterior and two anterior teeth are screened. For each individual, DI-S scores are added and divided by the number of the scored surfaces (Fig. 1). The same protocol is used to obtain the CI-S. The DI-S and CI-S values range from 0 to 3. These two values are combined to obtain the OHI-S. The OHI-S values range from 0 to 6 [32].

Silness-Löe Index

The measurement of oral hygiene by Silness-Löe plaque index is based on assessing plaque deposits on the surfaces of the following teeth: 16, 12, 24, 36, 32 and 44. A score of 0 to 3 is assigned to each surface of the teeth (Table 9). The scores from the four areas of the tooth are added and divided by four in order to get the plaque index. The patient's index is obtained by adding the indices of the six teeth then dividing the sum by six [33].

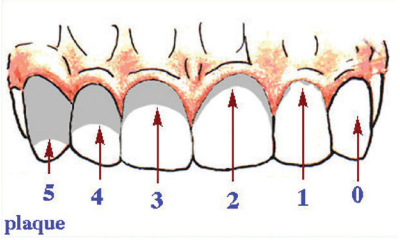

Fig.2: Plaque score on the teeth [6].

Scores	Criteria
0	No plaque
1	Separate flecks of plaque at the cervical margin of the tooth
2	Thin continuous band of plaque at the cervical margin of the tooth
3	Band of plaque (>1mm) covering less than one-third of the tooth
4	Plaque covering less than two-thirds of the tooth
5	Plaque covering more than two-thirds of the tooth

Table 10: Plaque index system [6, 34].

Quigley Hein Index Modified by Turesky

A score of 0 to 5 is given for recording the presence of plaque on facial and lingual surfaces of all teeth except third molars (Fig. 2, Table 10). An index for the entire mouth is determined by dividing the total score by the number of surfaces. A maximum of 56 surfaces are examined [34].

Conclusion

Dental epidemiological surveys are essential among Lebanese elderly since planning oral health care programs can't be organized in the absence of basic information on oral conditions and treatment needs. According to WHO recommendations, OHI-S, DMFI and CPI with attachment loss are used to assess respectively oral hygiene, caries and periodontal status in Lebanese elderly. Thus, MMSE, ADL tool, and MNA are used to appraise respectively mental, dependence, and nutritional situation, and are available in Lebanese version. Finally, WHO, in 2003, listed the impact of oral health on the quality of life.

Unfortunately, this field of health has not received enough interest in Lebanon, where the OHRQoL has not been implemented. A conceptual study is required because the application of conceptual models developed and validated for other civilizations could lead to inaccurate measurement.

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