Chapter

Oral Health and Prevention in Older Adults

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Abstract

The most prevalent oral diseases such as tooth decay and chronic periodontitis, are the main responsible for tooth loss, this causes a disability in the chewing function, which alters the selection of food, the pleasure of eating, and the state of nutrition. Even the use of total prostheses to replace this loss is not always satisfactory. In the emotional sphere, poor oral health causes discomfort and a decrease in self-esteem. Unfortunately, this continues to occur in older people despite the great scientific and technological advances in dentistry today. Health promotion, which includes health education and prevention, must be present in the course of people's lives. In the prevention of oral diseases, consider not only biological factors as the only causes, but also alleviate and modify the social determinants of the disease. All those involved in the care of the older adults must promote prevention as the most important tool in favor of oral health, and make older people enjoy life with quality. Oral health is an invaluable asset and reward at this stage of life.

Keywords: oral health, prevention, older adults, health promotion, socioeconomic determinants

1. Introduction

Population aging is a human success story. A reason to celebrate the triumph of public health, medical advancement, and economic and social development over the diseases, injuries and early deaths that have limited human life spans throughout history. Globally, there were 703 million people aged 65 and over in 2019. In the next three decades, the number of older people in the world is projected to double, reaching more than 1.5 billion in 2050. All regions will see an increase in the size of their older population between 2019 and 2050.

There are not only improvements in life expectancy at birth, but also even faster improvements in life expectancy at later ages. Globally, a 65-year-old could expect to live 17 more years in 2015-2020 and 19 more years by 2045-2050 [1]. The World Health Organization (WHO) notes that life expectancy in older age is increasing at a much faster rate in high-income countries than in lower-resource settings conditions. See **Figure 1** [2].

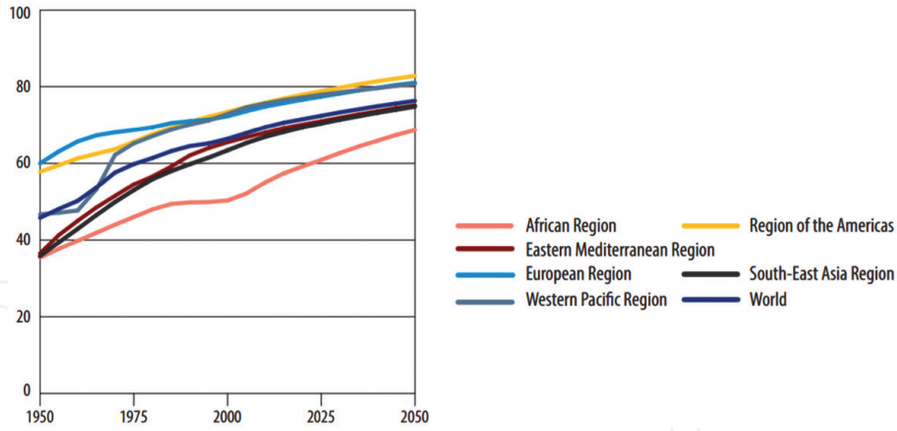

Figure 1.
Changes in life expectancy from 1950, with projections until the year 2050, by region of the WHO and worldwide [2].

This demographic transition is a major challenge for health authorities around the world, particularly as disease patterns will change at the same time. With age, the risk of losing years of healthy life is compounded by low individual resistance, poor nutritional status, chronic diseases, and adverse socio-environmental conditions [3]. Responding to this challenge requires the whole society.

One of the most important strategies we have to control and lessen the danger that this represents is the promotion of health. Health promotion uses education, prevention and health protection. This is of particular importance among developing countries where economic resources are scarce and where the largest growth in the older adult population is taking place in the world [4]. All these efforts to keep away older people from suffering and physical, emotional and social limitations as a result of disease must include the maintenance of oral health.

2. Health promotion and the prevention of health risks in older adults

In the last decades of the 20th century and the beginning of the 21st, a global agenda has been disseminated on the implementation of public policies that reduce the burden of disease in the older adults. For example, since 1995, in response to the global challenges of population aging, the WHO launched a program on aging and health. This was designed to promote knowledge about health care in old age through specific research and training activities, information dissemination, and policy development.

In 1998 in the World Health Report, WHO reported the need to strengthen health promotion among older people. The health implications of aging should be better clarified and understood. Later, in 2000, WHO reiterated the priority of older people's health through the "Aging and Life Cycle" program, which focused on the concept of "active aging". In 2002, WHO published a document entitled "Active Aging: A Policy Framework", which outlines essential approaches to achieving healthy aging. The proposed policy framework was based on three basic pillars: health, social participation and security [4].

2.1 The burden of oral diseases in old age

The WHO in its report on aging and health, 2015, emphasized: "Oral health is a crucial and often neglected area of healthy aging" [5].

In this regard, oral health is a key component in maintaining and promoting a healthy body and a high quality of life [6]. The growing body of scientific evidence confirms that good oral health is integral and essential to a person's overall health. Oral health and disease are closely related to health and disease in general. Unfortunately, older people are representative of a vulnerable population group that suffers heavily from oral diseases.

Given the comorbidities associated with the chronic disease profiles of older people, poor oral health further compromises healthy aging. The literature consistently describes oral health as a significant determinant of an individual's quality of life [7].

Health authorities around the world now face a growing public health problem, including an increasing burden of oral disease among older people. Globally, poor oral health in this age group has been shown particularly in high levels of tooth loss, decay tooth, periodontal disease, xerostomia, and oral cancer [2].

In oral health, global inequalities persist both within and between regions and societies and undermine the fabric, productivity and quality of life of many communities of the world [8]. Despite advances in prevention, restorative techniques, and dental materials, tooth loss remains a reality in both industrialized and developing countries [9]. While there have been significant improvements in oral health in the last 30 years, inequalities persist and a marked social gradient in oral health is observed similar to that of general health [8].

According to the WHO Oral Health Database, high levels of decay tooth are found in national surveys of older people; regionally, the average number of teeth affected by decay varies from an average of 9 teeth in the countries of the African region to an average of 24 teeth in Europe. In all regions, the experience of decay tooth in older people led to tooth loss, while the number of teeth treated after decay is quite limited, especially in the countries of the African region.

Regarding periodontitis, globally, surveys have reported that the percentage of older people with deep periodontal pockets is within the range of 5–30%. Data from Madagascar reported that 17.1% of people aged 65 to 74 had superficial or deep periodontal pockets, while these conditions were observed in 55.5% of Chinese older adults [10].

Poor oral health negatively affects the daily performance of older people, this condition can lead to reduced chewing performance, limited food choices, weight loss, poor communication, low self-esteem and well-being. Obviously, these conditions influence the quality of life. The increase in life expectancy without a better quality of life has a direct impact on government spending on health, and is becoming a key public health problem in the most developed countries. It will also be of great concern to developing countries and countries with high population density and emerging economies, such as China and India [2].

2.2 Oral health promotion in older adults: preventive strategies

At all ages, a healthy natural dentition and a pleasant dental appearance contribute to quality of life. Bad breath and tooth decay can promote social isolation, limit participation in social activities, and influence our judgments about personality traits [9].

Older people in good health can contribute to society, their families, their communities and economic productivity through formal or informal channels, e.g. through volunteer work, etc. [11]. Searching for effective, systematic and wide-ranging interdisciplinary solutions aimed at the current and future burden of oral diseases in our older people will be a great challenge and opportunity in the 21st century [6].

Goals in dentistry cannot be achieved solely on the basis of providing clinical treatment alone. As for any age, health promotion and self-managed disease prevention measures are important to achieve better oral health outcomes. Health promotion interventions are key to improving oral health in old age, as it encourages older people to be proactive about their health [11].

Through the Ottawa Charter, WHO, 1986, health promotion was defined as: "the process of allowing people to increase control over their health and improve it". To achieve a state of complete physical, mental, and social well-being, an individual or group must be able to identify and realize aspirations, satisfy needs, and change or cope with the environment [12].

Failure to prevent or control the progression of oral disease can increase the risk of adverse health outcomes. A recent systematic review in Cochrane found evidence that periodontal disease treatment improved metabolic control among people with type 2 diabetes. Also, it was shown that better care of oral hygiene can prevent respiratory infections and death from pneumonia. in older people in hospitals and nursing homes. Furthermore, frequent tooth brushing was reported to be associated with lower levels of cardiovascular disease [13].

The literature also indicates that health promotion activities should include the active participation of stakeholders in their planning, implementation, and evaluation. This will ensure that health promotion activities are based on the target group's own goals and needs.

Greater efforts should be made to identify opportunities for health promotion activities and the development of community models that encourage older people to improve and maintain their oral health. Ignoring health promotion and disease prevention opportunities in these groups is unfair and can increase inequalities in health standards [11].

2.2.1 Health education for older adults

Health promotion uses education, prevention and health protection. This is of particular importance among developing countries where economic resources are scarce and where the world's largest population growth is taking place [3].

Health literacy, which is within the framework of health promotion and preventive strategies, is necessary to counter oral diseases. Health literacy has been defined as "the cognitive and social skills that determine people's motivation and ability to access, understand, and use information in a way that promotes and maintains good health." In the case of older people, it is important to take into account, in addition to health literacy, functional literacy. Health professionals should consider literacy difficulties among older people than younger adults, if they associate aging with visual and/or cognitive impairments, or think that older cohorts had more likely to have missed school as children. Therefore, they need to provide clear or improved oral instruction to older people [14].

2.2.2 Preventive strategies for oral diseases, WHO recommendations

In recent years, the WHO developed a series of essential principles for the prevention of oral and general diseases and the quality of life, which must be followed by all actors involved in the health care of older people. In the report on health in the world of 2015, the strengthening of health promotion and the creation of healthy environments adapted to the older adults are highlighted in the first place. Promote a healthy

diet and nutrition, especially less sugar consumption and increased consumption of fruits and vegetables, in accordance with the "WHO Global Strategy on Diet, Physical Activity and Health, and Reduction of Malnutrition."

One of the most relevant recommendations of this report is to emphasize the importance of educating caregivers about oral health knowledge, to dependent older people, in addition to involving their families, it is extended to independent older adults. As well as, to "other important people", which can be interpreted as the entire team that cares for older people. A relevant point is to ask that care models be developed thinking of older people with primary oral health care capacity. As well as, nursing homes and institutions for dependent older people in order to meet the needs of the many people neglected.

On the other hand, the economic cost of treatments is identified as a barrier to oral health care in older people. So it is requested to improve social security for this age group, and to establish health care financially fair mouthpiece for the older adults. Attention is paid to evidence-based medicine, and this report calls for the implementation of national evidence-based public health programs to achieve better oral health, general health, and quality of life. Finally, within these principles of the WHO, the surveillance of the oral health of the older adults and important risk factors is recommended [10].

2.2.3 Educational action plans

Meeting the oral health needs of the growing older population will require a diverse and capable dental workforce. A two-pronged approach is required, focusing both on (a) new entrants to the profession through dental schools and (b) existing dentists. The latter will be achieved through the continuing professional development of most dentists, but there will also be a greater need for postgraduate education and training. Undergraduate education is the hotbed of conscientious professionals, so it is important to place appropriate emphasis on oral health care for older patients in the undergraduate curriculum [15].

In this regard, the group made up of The common Task and Finish of the European College of Gerodontology (ECG) and the European Society of Geriatric Medicine (EUGMS), proposes a series of educational training actions aimed at dentists, and non-dentists in order to improve dental care for the older adults. They call this strategy "Educational Action Plans", and which in our opinion are of such importance for the prevention of oral diseases in older adults that we underline them.

According to this proposal, educational action plans should involve dental and non-dental health care providers, giving them the opportunity for interprofessional training, practical training and improvement of attitudes towards the promotion of oral health. Better training for dental professionals in oral care for frail dependent older people.

Non-dental health professionals should receive education at the undergraduate, graduate and specialty levels, in the evaluation and promotion of oral health. This includes physicians, nurses, nursing assistants, physical therapists, occupational therapists, medical assistants, pharmacists, dietitians and others. It is proposed that these health providers should recognize oral health as part of multimorbidity. Also relate medication to the impact on oral health, initially assess oral health status, and demonstrate oral hygiene measures for the older adults and their caregivers. All this by developing strategies to overcome barriers to maintaining oral health and access to dental care, deciding when to refer to the dentist, and supporting collaborative practice [16, 17].

2.2.4 Educational interventions in oral health

As the population ages, one of the main challenges for the future will be to translate existing knowledge and strong experiences in disease prevention and health promotion into appropriate programs [3]. Educational interventions on oral health in older people have shown their potential benefit to improve the level of knowledge and their application in preventive oral care measures. The most remarkable result to emerge from the data is the significant decrease in the O'Leary index and in the index of tongue coating [18].

Educational interventions have shown to significantly reduce the number of plaque-covered teeth and improve prosthetic hygiene in older people who require the care of a home health nurse. However, multiple approaches based on individual needs are required to improve the oral health of vulnerable older people, including integrating preventive dental care into the daily care plan carried out by home care nurses. It is important to consider the functional capacity and cognitive function of the older adult, as it has been associated with poorer oral hygiene [19]. Oral hygiene education programs for institutionalized older people caregivers have shown a positive impact on improving this condition of residents. The ratio of residents to caregivers should be considered, as it could play an important role in the provision of oral hygiene services, and has received little attention in the literature [20].

Unfortunately, oral health competence and attitudes towards oral care have been reported to be inadequate in nursing home care. Poor oral health has been reported for people most dependent on care, showing the need for preventive actions [21].

3. The social gradient and biological factors as causes of oral diseases

Considering only biological factors as the cause of oral diseases is not enough to explain the social differences in oral health. Consequently, addressing these factors alone, has led to reductionist approaches to prevention and treatment. Unfortunately there is a lack a sound theoretical basis and which, in general, have also failed to reduce the burden of oral diseases, and oral health inequalities [22].

In this regard, as reported by Link & Phelan, 1995, it is necessary to "contextualize risk factors" and understand the "fundamental social causes" of the disease. "Contextualize" risk factors based on the individual means that it is required (1) use an interpretive framework to understand why people become exposed to risk or protective factors and (2) determine the social conditions under which individual risk factors are related to disease [23].

3.1 Social determinants of oral diseases

In the case of oral health, there is considerable evidence of the influence of the social gradient on the oral health status of individuals. We know that many oral diseases are associated with socioeconomic status, which is linked to family income, educational level, employment status, housing, physical health, and mental health [23].

The fundamental social causes of disease essentially involve the resources that determine the degree to which people can avoid the risks of morbidity and mortality. Resources broadly can include money, knowledge, power, prestige, and the types of interpersonal resources incorporated into the concepts of social support and social

network. Variables examined by medical sociologists and social epidemiologists, such as race/ethnicity and gender, are linked to resources such as money, power, prestige and/or social connection that should be considered as possible root causes of the disease [24].

3.2 Biological risk factors and the social gradient of oral disease in old age

Oral diseases share the same determinants and risk factors as the major Non-communicable Diseases (NCDs), which include heart disease, cancer, chronic obstructive pulmonary disease, diabetes, dementia, and stroke [23]. For NCDs, risk factors have been identified and many are related to lifestyle. Risk reduction is associated with smoking cessation, diet control (including reducing excessive consumption of calories, saturated fat and salt), moderate alcohol consumption, and exercise. Furthermore, many of these risk factors are important for the development of oral diseases. **Table 1**, resumes both biological and social risk factors [25].

3.2.1 Age as a risk factor

It is important to recognize that in the older adults, there are risk factors, biological and social that favor the prevalence of oral pathologies such as tooth decay and chronic periodontitis [26]. These diseases continue to appear in old age. Global data indicate that the incidence of untreated tooth decay shows an upward trend after age 60. It was suggested that this was due to the development of root decay among older people. Similarly, periodontal diseases and their sequelae are highly prevalent among older people. The age-standardized prevalence and incidence of severe periodontitis showed a slight increase worldwide during 1990-2010, with a peak incidence in the fourth decade of life [27].

From a biological perspective, the etiology of periodontal disease has consistently been related to the interaction between the microbial plaque and the host's immune response. Previous research shown, although periodontal conditions are initiated by dental plaque, the perpetuation of inflammation and the severity and progression of the disease depend on the effectiveness of the innate immune response to the bacterial biofilm. For its part, tooth decay is an essentially diet-mediated disease, in which host factors such as immune components in the microbial biofilm and saliva contribute to its progression [22].

Biological risk factors	**Social risk factors**
Interaction between the microbial plaque and the host's immune response Aging of oral tissues: Changes in the healing capacity of cells and tissues	Related to lifestyle: Smoking, alcohol consumption, Diet: excessive consumption of carbohydrates
Decreased salivary gland secretion; xerostomia	Socioeconomic status
Medical conditions: Disabling musculoskeletal disease Cognitive and functional impairment Frailty syndrome Depression	Educational level
	Ethnicity and gender

Table 1.
Biological and social risk factors of oral disease in old age.

Age can affect both oral diseases directly. When analyzing national studies of older people from the USA and Germany to observe, among other issues, the vulnerability to periodontitis and tooth decay in this population. The results showed that changes in susceptibility to periodontitis with age could be explained by exposure to pro-inflammatory conditions and changes in the healing capacity of cells and tissues [26].

The greater severity of periodontal diseases with age has been related to the length of time that periodontal tissues have been exposed to dentogingival plaque and is considered to reflect the accumulated oral history of the individual. However, the susceptibility of the periodontium to microbial plate induced periodontal degradation can be influenced by the aging process or by health problems specific to the aging patient. Differences in eating habits, increased flow of gingival exudate from the inflamed gum, and possible age-related changes in salivary gland secretions can similarly alter the conditions for growth and multiplication of microorganisms in the biofilm [28].

On the other hand, due to accumulated periodontal destruction, the number of surfaces at risk of tooth decay increases. The sequelae of restorative treatment contribute to an increased susceptibility to tooth decay development. Risk indicators for root decay include tooth decay experience, number of surfaces at risk, and poor oral hygiene [26].

With regard to tooth decay and the immune system and the impact of aging, a systematic review showed that studies are still in an early stage. A small number of studies have reported components of innate and adaptive immunity that affect the composition of dental saliva and biofilms with possible impacts on caries progression. Some conclusions could, at this stage, be considered more theoretical [29].

3.2.2 Medical conditions and their relationship with oral disease in old age

The general health of older people involves a variety of medical, cognitive and functional conditions and/or limitations that can have a direct effect on the onset and progression of oral diseases. And, by extension, the self-sufficiency of older people with respect to the performance of oral hygiene and the search for timely professional dental care [27].

3.2.3 Musculoskeletal conditions and oral health

In general, obtaining medical or dental care is known to be a problem for many older people with impaired functional status, especially those who are homebound or reside in long-term care facilities. People with disabling musculoskeletal conditions are likely to be among those affected in this way.

It is estimated that 10% of the world's population aged 60 years or older have significant clinical problems attributable to osteoarthritis, a condition that is associated with joint pain, limited movement and sensation and occurs most frequently in the knee, hip and joints of the hands [30]. While the prevalence of rheumatoid arthritis is lower, it also affects a large number of people and is associated with aging [31].

Many people with these conditions, osteoarthritis and arthritis in the hands, cannot maintain proper oral hygiene, causing plaque and stone buildup, increasing the likelihood of tooth decay and periodontal disease. The limitation of mobility resulting from these diseases, particularly in the lower extremities, makes it difficult for those affected to visit dental offices for both routine hygiene and treatment [32].

3.2.4 Cognitive and functional impairment, risk factors for oral care

Although cognitive impairment has not yet met the diagnostic criteria for dementia, people with mild cognitive impairment have been found to have poorer oral hygiene, a high gingivitis score, and more impaired root surfaces than those with intact cognition [33]. Tooth loss was reported to be independently associated with the development of cognitive impairment among older people living in the community. This finding supports the hypothesis that tooth loss may be a predictor or risk factor for cognitive decline [34].

Frail older patients in hospitals and long-term care homes, who depend on others for oral hygiene care, are at risk of poor health due to impaired functional and cognitive abilities. They are at high risk for tooth decay because foods containing sugar and refined carbohydrates remain in contact with the teeth for long periods between brushing [35].

3.2.5 Xerostomia: risk of caries and chronic periodontitis

One of the oral conditions that affect the quality of life of the older adults is xerostomia. A high prevalence of xerostomia and hypofunction of the salivary glands has been found in vulnerable older people. Etiologic factors include polypharmacy (especially with antihypertensives, antidepressants, and antipsychotics), poor general health, female sex, and advanced age. People with dry mouth require preventive measures against the consequences of the absence of saliva, including tooth decay, periodontal disease, and candidiasis [36].

3.2.6 Depression is a risk for oral care

Older people with depressive symptoms are less likely to make self-care, including oral hygiene and preventive dental care, a priority - many older people experience a chronic course of depressive symptoms. Depression in old age and depressive symptoms may be associated with poor nutrition, decreased salivary flow, distorted taste, increased oral lactobacillus counts, dental caries, advanced periodontal disease, and oral discomfort [37]. Older people with tooth loss were shown to be at increased risk of depressive symptoms [38].

3.2.7 Risk factors for oral cancer

Oral cancer poses a great threat to the health of adults and the older adults in high- and low-income countries [36]. Oral cavity cancer can be easily prevented and treated if it is diagnosed early [39].

It includes cancer of the lip, oral cavity, and pharynx, and is the eighth most common cancer worldwide. Incidence and mortality rates are higher in men than in women. The prevalence increases with advancing age, and oral cancer is of particular concern among people over 65 years of age. Variations between countries are attributable to differences in risk profiles and the availability and accessibility of health services, among others [36].

Oropharyngeal cancers, a subset of head and neck cancers, have the human papillomavirus (HPV) as a major risk factor. Modifiable lifestyle behaviors, such as smoking and alcohol use, are implicated in the etiology of oral cavity cancers. Previous studies demonstrated that smoking was associated with a 2-fold increased likelihood

of oral cavity cancers among those who had never drunk alcohol and binge drinking was associated with a higher likelihood of oral cancers among those who never had they had smoked [40].

Other risk factors are the consumption of betel quid and areca nuts, poor oral hygiene, poor nutrition, a weakened immune system, genetic and immune predisposition. In most cases, it is preceded by visible painless changes in the mouth known as precancerous lesions, such as a whitish (leukoplakia) or reddish (erythroplastic) discoloration of the mucosa, an ulcer, or a swelling. The self-examination of the mouth serves for prevention and early detection. It is an easy to perform, non-invasive method, and low-cost [39].

4. Social determinants of health and life-course related to oral health

In the context of social determinants in health, as mentioned above, these have a significant influence on health inequalities. It will modulate people's health and disease during the life course. Returning to the concept of the WHO [41], which defines them as "the combination of the social conditions in which the individual is born, grows and the ages that affect his health". Cueto et al. [42] in a deeper analysis revealed two edges in this matter. In first place, older adults linked to work have less of time to go to a dentist appointment. They commonly attend when there is an emergency or pain that affects their job performance or social life. On the other hand, the older adults that are unemployed, or not perceive a pension are more likely to suffer damage to their health by the psychic instability that this condition entails, leading to a deterioration of their oral health.

An unhealthy lifestyle appears to be the most relevant SDH in older adults [43].

Kuh and Ben-Shlomo [44] defined life-course epidemiology as the "study of long-term effects on chronic disease risk of physical and social exposures during gestation, childhood, adolescence, young adulthood and later adult life". In other words, it links exposure to risk factors and consequences by considering the importance of the duration and timing of the development of the illness.

The sum in the biological systems could be influenced by independent and individual exhibitions. Specifically, the person is vulnerable to the risk factors, a series of separated situations at different phases of life and this combination increases the illness risk in later life. This is the "*accumulation risk model*". From this model follows the framework of "*chain of risk*", in which a negative or beneficial exposure guide to another negative or beneficial exposition. This version suggest a synergy between intrinsic factors (behavioral resources, self-esteem, conflict-solving abilities and coping methods) and extrinsic factors (family, sociocultural connections and material circumstances).

As stated by the WHO [45] clinically, oral diseases are caused by bad oral habits such as poor oral hygiene, high consumption of sugars, the use and abuse of alcohol and tobacco and a lack of fluoride. Moreover, it is well known that oral illnesses share behavioral risks with non-communicable diseases. For instance, a diet high in added sugars is the principal cause of dental decay and it is related to obesity and overweight.

Heilmann et al. [46] proposed a theoretical framework for oral health. In which they integrated a life course perspective, with the models of the social determinants of oral health illness and their effect on the usual risk factors that link general health and oral health. The model highlights the significance of socioeconomic factors in the

infancy and adulthood, like as education and salary. These elements are affected by economic, political and social variables at the societal level. In this sense, the model shows the degree in which infancy socioeconomic status will influence adulthood socioeconomic status. For example, the advancement of dental decay over the course of life follows different patterns directions, to be specific caries levels calculated at one age predicts dental caries levels al later ages.

In 2010, Sheiham and Sabbah [47] reported in their study that the presence of caries in the infancy is a strongly precursor of caries in permanent dentition. Likewise, Hallet and O'Rourke [48] the incidence and severity of dental decay in the primary dentition is linked to the individual, together with socio-economic aspects just as income and maternal education.

However, this is not particularly surprising given the fact that the most significant outcome of enamel defects is a high susceptibility to dental decay. Seen from the *chain of risk* framework, smoking and low birth weight are an example that early stressors of life, lead to enamel defects, which are related to a higher risk to dental caries at later ages [49].

5. The relationship between oral health and general health

Caries and periodontal disease are thus more common than other chronic health conditions and increase in older age. Good oral health is an important aspect of general health and wellbeing contributing to self-esteem, dignity, social integration and nutrition.

5.1 Oral health and nutrition

Aging is a physiological process that affects in unique ways to each person. It is influenced by different factors such as social, economic, environmental conditions and lifestyle of the individual developed through the course of life. It represents a challenge for the professional due to the oral cavity is the first place of the body where the signs of the nutritional deficiencies are manifested clinically [50].

According to the WHO [51] malnutrition refers to "deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients". Who enlists some of the causes that lead to malnutrition in older adults. See **Figure 2**.

It is important to highlight the fact that polypharmacy, chronic diseases and aspects associated to mental health also affect the nutritional status, circumstances that are frequently present in older adults. Poor oral health conditions in this group are associated with discomfort, pain and a reduced appetite, which lead to an inappropriate selection of aliment, with a low or none nutritional content. There is a reduced intake of harder foods, fruits, proteins, vegetables, fiber, vitamins and minerals and a high intake of cholesterol and saturated fat, which alters the nutritional status [52].

Dental loss is related to the reduction of masticatory ability, affecting the maximal biting force and leading to problems in bolus formation. As the number of teeth present in mouth diminishes, the bolus size increases, generating a swallowing dysfunction. This decline can impact seriously in older adult's health, resulting in of chronic disease like cardiovascular problems, diabetes, frailty, sarcopenia and an increased risk of malnutrition [53]. This last condition increases the risk of oral infections.

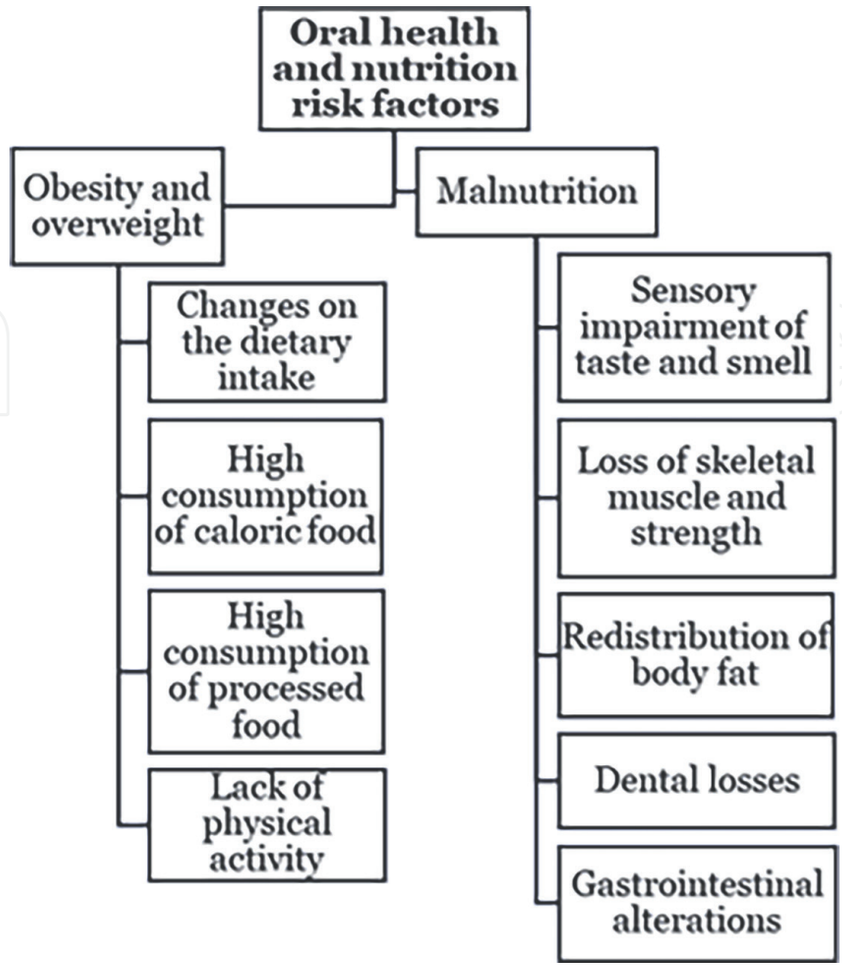

Figure 2.
Oral health and nutrition risk factors enlisted by the WHO [51].

5.2 Oral health and frailty

Frailty is defined as a state, highly prevalent in older adults, of diminished functional reserves that lead to an increased vulnerability to stressors and adverse health results. It includes falls, reduced strength, mortality, growing dependency, a reduced ability to recover from tension situations and increased health care usage [54]. When taking care for frail people is important to be aware of seemingly minor issues. Clegg et al. [55] declared "an apparently small insult (e.g. a new drug; "minor" infection; or "minor" surgery) results in a dramatic and disproportionate change in health state: from independent to dependent; mobile to immobile; postural stability to falling; lucid to delirious".

As mentioned by Castrejón-Pérez et al. [56] the relation that lies between oral health and frailty is considerable and it comes from different pathways:

- nutritional, as dentition impact the nutritional status
- biological, through the relation with chronical inflammatory answer in the body
- psychological, by the impact of oral health on depression and self-esteem.

Hakeem et al. [54] study demonstrated that frailty index was associated with periodontal disease and tooth loss in older adults. Poor nutritional status contributes to

the progression of many morbidities involved in the complex and multiple etiology of frailty. This low nutritional intake leads older adults to an increased risk of oxidative stress, malnutrition, inflammation and frailty. There is a strong association between oral health and frailty. This last condition affects the oral status through loss of functions, which guide older adults to complications to take care of their oral hygiene and access to dental services [57].

6. Barriers to accessing dental care

The concept of vulnerability can be described as that subject who will not necessarily experience damage, but who is in fact more susceptible since it has higher inequalities. This condition is specially associated with individual and community situations and contexts. Aging involves an augmented risk for the development of vulnerability, since it is a process of variations that influence on life and health conditions of the individual [58].

Vulnerable groups commonly experience barriers to access oral health and are affected by oral diseases. The World Dental Federation [FDI] made a classification of this barriers [59]. See **Table 2**.

On a previous study, we found some different barriers that affect how older adults take care of their health. Lack of time, was reported as the main concern. Older adults sometimes have up to three jobs, because of their working record, since they do not count with a pension. Another example of lack of time is that some older adults (e.g. wife, mother) are caregivers of their partner or parents and therefore no time left for themselves. This is more rooted in women as part of the sociocultural inheritance and traditions; women are more tended to be a caregiver, which affects their social life and self-esteem, increasing stress factors and physical and mental fatigue.

On the other hand, education plays an important role too. Even knowing the consequences of not having good habits, older adults let the time go by without receiving oral health attention and only assist to the dentist in case of an emergency and when the pain is unbearable [60].

Moreover, is important to identify that some subjects experience accumulative challenges as they relate to simultaneous vulnerable groups. For example, an unemployed adult with physical disabilities living in a non-urban community, from a native group. In this way, more efforts are needed to facilitate access for this groups and specially be focused in address the complicated nature of the barriers meted [61].

Main causes	Examples
Individuals themselves	Low income, lack of perceived need, psychological reasons such as fear and anxiety
Dental profession	Lack of sensitivity or compassion to patient's attitude, inappropriate work team resources, difficult location access
Society	Lack of public support to healthy attitudes, low support for research and inadequate dental health work team planning

Table 2.
Barriers for access on oral health services.

7. Oral health and healthy aging

As mentioned by the WHO, healthy aging is described as "the process of fostering and maintaining the functional capacity that enables well-being in old age. Functional capacity consists of having the attributes that allow all people to be and do what is important to them" [62]. Oral health is an important element of healthy aging as the mouth influences the whole body through the course of life. A healthy mouth contributes to good nutrition, promotes a safer swallowing and prevents infections [63].

Poor oral health conditions could be inescapable in the aging process, but through prevention, patient care and education, these objectives can be achieved. Therefore, professional clinicians and researchers should work together to develop behavioral interventions for the promotion of dental health in family, community and health care settings [64].

A growing body of literature has analyzed that keeping a healthy natural dentition in old age has many benefits including the psychosocial, functional and structural point of view. Knowing this, the goals of mouth healthcare should be targeted to treat and prevent oral infection, promote oral health related to quality of life and give the resources to restore oral health function where necessary and guarantee an acceptable dental appearance [9].

8. Conclusions

Among the great challenges that humanity is facing, there is the aging population. Promoting healthy aging is a task of the whole society. Oral health is part of general health, and participates in a relevant way in the quality of life. Proper oral health promotion activities are essential to protect the oral health of the population.

Understanding the pathways through which social determinants and biological risk factors interact over the life course and shape oral health inequalities can help achieve healthy aging.

Oral health care for older people should begin with interprofessional education, and the exchange between different health care providers for older people should be expanded. The older person, and their family, should be included. Knowing the risks involved in oral diseases allows us to prevent them.

Conflict of interest

The authors declare no conflict of interest.

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