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Chapter 10

Does the Demographic Transition Impact Health? The Oral Epidemiological Profile of the Elder Population

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http://dx.doi.org/10.5772/59266

1. Introduction

The term "demographic transition" was introduced more than 70 years ago to refer the process of changing from a traditional demographic model identified with high levels of mortality and birthrate to another one characterized by a fall on these indicators.

Between these conditions two phases can be identified: during the first one the growth rate of the population increases like a consequence of the decrease of the mortality, and during the second phase a deceleration of the population growth can be observed because of the decrease of fertility. Among the causes of this change of profile in the population we can find the process of industrialization, economic modernization, urbanization and the social and cultural changes.

The increase on life expectancy and the exposition to unhealthy lifestyles have modified the main causes of the morbidity and mortality, increasing the prevalence of non transmissible diseases. The first causes of mortality now fall in chronic degenerative diseases like diabetes *mellitus*, cardiovascular diseases or respiratory diseases. This change has been reflected as well in the oral status, determined by the life course of the individuals and the exposition to different risk factors. Through this chapter some of the oral conditions on elderly will be analyzed as well as the relationship between oral status and quality of life.

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2. The demographic and epidemiologic transition

2.1. Demographic trends of the aging population — The international perspective

One of the best indicators of the improvement of the health of a population is ageing which is an intrinsic process of the demographic transition. The decline of the birthrate and the progressive rise of the life expectancy impact directly on the composition of the age groups of the population, reducing the number of persons in the younger age groups and expanding the segment of more advanced age groups.

The birthrate and mortality of the world population have decreased considerably particularly during the second half of the last century. The birthrate decreased between 1950-1955 and 2005-2010 from 37.0 to 20.0 births per 1000 persons [1]; while the mortality changed from 19.1 deaths per 1000 persons to 8.1 during the same period[2]. This transformation is known as demographic transition and has provoked a progressive increase of the size of the world population as well as its aging.

Migration can also affect aging in different ways, for example massive emigration due to circumstances like getting a better job, improving quality of life, or other motivations can reduce the number of young people, which can increase the ageing population [3].

The proportion of the world population over 60 years of age, of the most developed countries, will be increasing 1% per year before 2050 and it is expected to have increased 45% by mid-century, going from 287 millions in 2013 to 417 millions in 2050. In other words, 8% of the current population is 60 years old or more, but this proportion will be duplicated by 2050, reaching 19% that year[4].

The increase in life expectancy of the general population and particularly of the elderly around the world, should be considered like a success for humanity. The advance in preventive and curative technology of many diseases, coupled with the low exposure to risky conditions, increases the expectation to reach the elderly in better health conditions to live an adequate old age [3]. The increase in the life expectancy of the population poses a major challenge for public health, especially when we are going through a period in which poverty persists in those countries facing developing problems generating a bigger pressure on the already burdened health systems.

Aging is a continuous universal and irreversible process that can lead to a progressive lost of the ability to adapt. In healthy old individuals, many physiological functions are maintained, but when they are placed under stress, a loss of the functional reserve is revealed.

Aging is not a condition that is necessarily associated with disease and dependency, but it is a fact that the accumulative effect of multiple exposures and the unfavorable psychological, physical and social conditions increase the risk of older people to get sick [5]. It starts during the early years of the adult life, but it manifests some decades later, when people are called old. One unfair way to define elderness is to affirm that it starts with the age of retirement (60 or 65), but physiologically individuals get older in a different rate and some persons live more

http://dx.doi.org/10.5772/59266

than 80 years. In developed countries, a person is considered old when he/she reaches the age of 65 years or more, but in developing countries 60 is considered as the starting point [6]

The countries with a more advanced stage of demographic transition recognize the need to evaluate the models for provision of health services for the elderly and achieve the maintenance of the pension systems and sanitary assistance despite all the requirements of the fast growing segment of older people in the population. However, the difficulties in the attention of the sanitary, social and economical needs may vary considerably by region. A common principle for the action is the need to focus on health promotion and the reduction of the dependency of elders.

Daily, seniors face risk situations that threaten their integrity and can alter the functions and structures of their body, if this happens, they face their environment in a different way and frequently the environmental and personal factors can force them to limit their activities. Therefore the functioning or disability of the individual must be seen as the result of the interaction between the health condition and the environment. Although different geographic, social or economical factors contribute to the functional dependency of seniors, chronic diseases are one of the main factors that impact this functioning and can even be its direct cause; this has been demonstrated in some previous studies in different populations. [7,8,9]

The aging process can affect the individual and social development, as well as the relative well-being of the younger persons. Among the factors with the greatest repercussion are the pension and retirement systems, the active population and its participation, the arrangements with the family and home, the intra-family transfers from one generation to other and the health condition of seniors. The importance of each one of these aspects can vary and depends of the demographic regimens and the institutional idiosyncrasy of every country. All countries in different levels and in different moments will have to include the topic of the repercussion of aging of the population in their priority issues on the health public and economic field.

3. Oral health problems in the elder population

The analysis of the oral health of elders has taken interest recently due to the accelerated changes on the demographic structure. Old people have poorer oral health, they seek oral health services less, and lose more teeth due to chronic conditions, they represent an important part of the health budget. [11, 12, 13].

The knowledge of the main problems of oral health of this population, is valuable in the planning of effective strategies that optimize the programs and has a positive effect in oral and general health. Among the main problems that affect the oral health there are:

3.1. Disorders of the oral mucosa

In the oral mucosa of old people there may be atrophy of the epithelium, decrease of the keratin and number of cells of the connective tissue, an increase of the intercellular substance and decrease in the oxygen consume. When there is a lack of elasticity of the mucosa with dryness

and atrophy, hyperkeratosis can be found. The oral mucosa can present changes related to local factors that are acquired through the course of life like malnutrition, systemic diseases, the use of pharmacological drugs, unhealthy habits and others that can cause the thinning of the mucosa, making it smooth, dry and more permeable to harmful substances. Oral squamous cell carcinoma and pemphigoid carcinoma are almost exclusive of the elderly. [14,15]

3.2. Tooth loss

Complete or partial prosthesis is the most common treatment for tooth loss. Tooth loss has a deep emotional meaning; it symbolically reveals ageing and weakness. It is important to point out that in developing countries the oral care for the elderly has focused on dental extraction, and is the principal cause of the low number of remaining teeth. [16, 17]

Although the number of persons keeping their natural dentition has grown considerably during the last decades, the mean number of remaining teeth may vary according to the school level and the income. Thus it is pertinent to study tooth loss like a social issue according to the social determinants of health, since individuals with lowest school levels tend to a major loss of teeth [18].

3.3. Conditions related to the use of dentures

Denture stomatitis is one of the most frequent diseases that affect the oral tissues in denture wearers. [19] The prevalence of denture stomatitis is from 11 to 67% [20] and there are some factors involved like:

3.3.1. Hygiene of the prosthesis

The prevalence of denture stomatitis has been strongly correlated with hygiene [21,22]. The surface of the prosthesis can be a reservoir for plaque that conforms an ecosystem with a particular pH that can be influenced by the diet, saliva and other factors [23].

3.3.2. Prosthetic trauma

This is caused by maladjusted prosthetic devices and bad habits in their use [19, 20].

3.3.3. Candidiasis infection

The presence of plaque promotes the colonization of fungi species like candida on the prosthetic surface or the mucosa [19,20,22]. The Candida fungi, mainly the genre *Albicans* is a part of the normal flora of the oral cavity, but in some circumstances it is able to develop and produce infection, although some authors mention that there are other involved species [24, 25].

The typical lesions of oral candidiasis are white plaques that are easy to remove on the oral, oropharyngeal and palatal mucosa; in some cases there is angular cheilitis as well. The predisposing factors are xerostomy, treatment with broad-spectrum antibiotics, the use of inhaled corticosteroids and alterations of the cellular immunity [25,26].

When candidiasis infection is associated with old removable prosthetics or maladjusted devices, it can induce the formation of denture stomatitis [27,28]. The treatment for the condition is the eradication of the local factors and therefore the prosthetic devices must be removed a long period, good hygiene conditions should be kept as well as using mouth rinses and antifungal medication.

3.4. Dietetic factors

The diet of the elderly is characterized for being very limited since the lack of a denture in good conditions avoids eating fresh fruits and vegetables or raw food. The diet is regularly is composed of canned food, which can cause vitamin deficiencies and therefore hematological deficit [29]

3.5. Caries

Caries can be considered an infectious disease caused by multiple factors: biologic, social, economical, cultural and environmental. Its formation and development is conditioned by the lifestyle of the individual. It affects the crown and root of the teeth and in the absence of dental attention it can cause the loss of the tooth and it constitutes a source of infection for the organism.

This disease occurs on the dental structures in contact with the microbial deposits (biofilm) and due to the imbalance between the tooth substance and the plaque surrounding fluid, there is a loss of minerals on the dental surface which leads to located destruction of the hard tissues.

The prevalence of dental caries in developed countries has decreased because a high sector of the old population has access to dental services promoting a major use of dental prevention measures, this allows, that the individuals keep a higher number of functional teeth [18,30]

The other kind of caries, root caries, is very common in the elderly since it is a consequence of the gingival recession. The root surface, composed by cementum and dentin is more susceptible to the oral environment than the crown surface composed by enamel and dentin [31,32]

The reported prevalence of root caries is from 24 to 37% in some populations [33]. Almost all the published studies reporting incidence have included old people from public institutions, patients with periodontal disease, participants of some clinic studies and some communities, however they have reported to 10 to 40% incidence [32,34].

Loss of periodontal attachment, low salivary flow, presence of caries in the past, cognitive impairment, use of some kind of medication, low scholar level, high number of cariogenic microorganisms, and the lack of dental attention are among the most studied risk factors for root caries [35].

3.6. Periodontal disease

Periodontal disease constitutes one of the main causes of tooth loss [16]. Traditionally it was accepted that the loss of epithelial attachment and alveolar bone was caused by the periodontal

changes related to the ageing process, however nowadays the theory indicates that is not like that.

The periodontum reacts to ageing in two ways: if there is low hygiene, the plaque accumulation affects the periodontal tissues causing gingivitis and in some susceptible patients the retraction of the gingival tissue, formation of gingival pockets and dental loss. However in some old patients there can be tissue recovery with a minimal change on the marginal gingival, narrowness of the periodontal ligament, firm adherence of the teeth, and accumulation of cementum [14,36]

3.7. Xerostomy or low salivary flow

Saliva is a complex exocrine secretion, important for the maintenance of the homeostasis of the oral cavity. The salivary functions in relation with the flow and molecular composition (proteins, glycoproteins and phosphoproteins) are well known: the protection of the oral tissues against desiccation and the environmental attacks, the modulation of the desmineralization-remineralization processes, the lubrication of the occlusal surfaces and the maintenance of the ecological balance [37].

The protection of the salivary flow in the elderly can be reduce because of the medical prescription of some drugs for the treatment of certain conditions in this age group like depression or other systemic conditions like hypertension [38,39].

Although it has not been well demonstrated, a physiological decrease of the salivary flow may occur with aging, however it seems that structural alterations may occur in some salivary glands, concretely submandibular and minor glands, however, despite all these conditions the global functioning and the salivary volume is not modified.

The cause of the xerostomy or the decrease on the salivary flow is more related to the existence of some diseases like hypertension, diabetes *mellitus*, Sjögren syndrome, rheumatoid conditions, cystic fibrosis, neurological conditions, depression and immune system dysfunction and their treatment, since most of them have a repercussion on the salivary glands [40,41].

3.8. Oral cancer

This disease is related with aging, since nearly 95% of the cases take place in people 40 years of age and older and the mean age of the diagnosis is around 60. It is estimated that half of the cases of cancer are in people 65 years of age. [42,43,44].

The etiology of oral cancer and precancerous lesions is multiple. The most common cited factors are: tobacco and alcohol consumption, genetics, nutrition, the presence of some virus, radiations and occupational risks in addition to use of maladjusted dental prostheses, destroyed teeth by caries or trauma and low oral hygiene.

Most of these factors have an accumulative effect with time, and due to this effect, many authors affirm that age is the main risk factor for the development of oral cancer [44,45]. The early detection of the malignant lesions is fundamental for providing the best prognosis of this disease.

3.9. Pain

Pain is often a manifestation of the oral problems reflected on other facial structures like the orbital frontal region that can be confounded with classic headache.

Sometimes, pain appears like a consequence of the degenerative phenomena of the structures that support the oral cavity (bones, joints muscles and others). Among these phenomena we can find osteoarthritis and osteoporosis of the jaw, or disorders on the temporomandibular jaw that can cause pain, snaps and the added locking of joint function like limitation to the mouth opening and difficulty for chewing [46].

The temporomandibular dysfunction is frequent in old people and it is characterized by constant pain on the periauricular area, otic pain that can increase while the patient is chewing, or in patients with bruxism, when they clench teeth consciously or unconsciously during stress [47,48].

4. Links between oral health and systemic diseases

It is clear that oral health problems affect the general condition of old people. Many systemic diseases have specific signs in the mouth that allow the diagnosis. Among them we can find genetic diseases, systemic infections, immune alterations, neoplasms, nutritional problems, connective tissue diseases, gastrointestinal diseases, renal diseases, cardiovascular diseases, endocrine diseases, dermatologic diseases, neurologic diseases and skeletal diseases. There are also some medications that can affect the consistency and characteristics of the saliva and that can alter the texture of the tongue, or affect the gingiva [36,37,48,49,50]

4.1. Periodontal disease related to systemic diseases

Among the conditions related to periodontal disease and the cardiovascular system we can find bacterial endocarditis, myocardial infarction, ischemic heart disease, thrombosis, coronary heart disease and varicose veins [51].

The links between periodontal disease and respiratory diseases can be established only if the defensive mechanisms fail. The most commonly associated conditions are the bacterial pneumonia, bronchitis, chronic obstructive pulmonary disease and lung abscesses [52,53,54].

The bacteria create their own ecological niches on different surfaces of the mouth like teeth, gingival sulcus, dorsal area of the tongue and oral and pharyngeal mucosa using the saliva and crevicular fluid like their main nutritional source, and through bacteremia, derive in systemic processes. The sepsis is the responsible for the beginning and progression of diverse inflammatory diseases like arthritis, peptic ulcers and appendicitis [54]

Pneumonia is the infection of the lung parenchyma caused by several infectious agents that include bacteria, fungi, parasites and viruses. Bacteria of the oral flora like *Actinobacillus actinomycetem-commitans*, *Actinomyces Israeli*, and the anaerobic *P gingivalis,* and *Fusobacteri-*

um, can be aspirated and taken to the lower airways and cause pneumonia [55,56]. The source can be from bacteria of the normal flora or from periodontal cases [56].

5. Oral health related quality of life in the elder population

The relationship between quality of life and oral health has been understood like a multidimensional concept that reports the aspects concerning to oral health including the functional, social and pshycological aspect of the individuals [57,58,59,60].

One of the major contributions of dentistry is to improve and maintain the quality of life of the person since most oral diseases and their consequences have an impact on the performance of daily activities [36].

The contemporary concepts of health suggest that oral health could be defined as the physical, psychological and social wellbeing in relation to the dental status as well as the hard and soft tissues of the oral cavity and not only absence of disease [36]. This definition proposes that the measure of oral health not only has to take into account oral indexes that measure the presence or severity of a pathology (physical well-being) but it must also complemented with social and pshycological measures [36,60,61].

Traditionally, the methods used to estimate oral health, have been limited to clinic indicators or oral indexes, and the presence or absence of disease. This view leaves out all the subjective measures, in other words the perception of the persons about their oral health status.

This view about oral health related quality of life (OHRQOL) promotes the knowledge of the origin and behavior of the oral diseases, largely because the social factors and the environment are the main causes of these diseases and some interventions can be applied [62,63,64]).

In elder people, the self-perception of oral health can be affected by the perception of other personal values, like the belief that some pains and disabilities are unavoidable because of the ageing. These ideas can lead to the over and under estimation of the oral health condition. The available information about self-perception is subjective, and for this reason the perception about how oral health affects the quality of life must be evaluated according to instruments that have been adapted and validated on specific populations.

The dental status in old people has a repercussion on their ability to perform daily activities affecting their quality of life with a bigger impact on some activities such as eating, speaking and pronunciation [61]

The existing subjective measures on oral health as well as the focus on oral health cannot provide data that helps the decision makers to allocate the resources related with improving the oral health of the elderly, however they can give an idea about the degree of affection for the individual and populations [62].

http://dx.doi.org/10.5772/59266

6. Conclusions

Oral health problems among old people are caused mainly by the accumulation of sequels that the null assistance to the dental services has left as well as the lack of self-care in this age group.

The most common affections are the tooth loss, coronal and root caries, periodontal diseases, lesions derivated from the use of defective prosthesis and temporomandibular joint pain. Besides, this group, can also present oral cancer and oral manifestations of other systemic diseases. These conditions are associated with pain when chewing, a frequent reason of consultation in primary care.

It is important to continue studying the convergence of sociodemographic information with the oral health diagnosis, to determine the therapeutic needs and the factors that make it difficult to access the dental services and to design adequate interventions to solve the most common oral health problems of this group of the population.

Public and private oral health services must prevent the onset of diseases that can produce serious effects on quality of life of the elderly.

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