AMERICAN UNIVERSITY OF BEIRUT

ASSESSMENT OF ORAL HEALTH AMONG A LEBANESE URBAN GERIATRIC POPULATION: A CROSS-SECTIONAL STUDY

by
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AN ABSTRACT OF THE THESIS OF

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Title: Assessment Of Oral Health Among A Lebanese Urban Geriatric Population: A Cross-Sectional Study

Background: The sustained growth of elderly populations prompts increased attention to geriatric oral health.

Objectives: Assess oral health of elderly population, and the patterns and correlates of their dental health care seeking behavior.

Methods: A sample of 352 adults aged 65 years and older was obtained from interviewing all available elderly people during visits to various social organizations and primary health-care centers within a radius of 25 km from Beirut (capital city of Lebanon). A structured dental examination was conducted to gather data on oral health (caries rate and missing and filled teeth [DMFT score], gingival health [plaque index], and dental functional unit [FU]). A face-to-face interview yielded additional oral health and treatment seeking behaviors and other correlates (e.g. smoking, dietary habits). Statistical methods included bivariate analyses exploring the oral health status by socio-demographics, oral hygiene practices and general health behaviors. Regression analysis was performed to predict oral care treatment seeking patterns.

Results: A high DMFT score (23.35±6.57) was observed, mostly contributed by the "Missing" component. Mean plaque and Root Caries indices were high (0.3 ±0.38) and mean FU was low (7.48±5.17). Less than a third of the elderly had sought dental care in the past year. Oral health was related to education, income, soda consumption and cigarette smoking (p-value<0.05). Potential determinants of treatment-seeking included perception that oral health is as important/more important as general health, having medical insurance, reporting an income greater than minimum wages and wearing a complete denture.

Conclusion: These data suggest that oral health represents a burden for the geriatric population that nevertheless perceives medical and dental care as a health continuum. Increased treatment seeking by the elderly would require interventions to communicate the importance of oral health, and increase access primarily by third party coverage.

CONTENTS

CHAPTER I

INTRODUCTION

In the year 2050, it is expected that more than 2 billion individuals will be aged 60 years and above. These would represent 20% of the total population at that time, more than a twofold increase compared to the 9% corresponding fraction in 2010 (El Hélou, Boulos, Adib, & Tabbal, 2014; Osta, Tubert, Naaman, Osta, & Geahchan, 2010; Petersen, 2004).

This demographic shift, resulting from the higher life expectancies and fertility declines as well as from the ageing of the baby-boom generation, paired with an epidemiological transition from communicable to more chronic diseases (Petersen, Bourgeois, Ogawa, Estupinan-Day, & Ndiaye, 2005), have defined a new global focus: on one hand, an interest in the increasing population size of older age groups (Bloom, Canning, & Finlay, 2010) and on the other hand, more extensive studies of non-communicable conditions(Alwan, 2011).

Of particular interest about the elderly (aged 65 years and above) is one of these non-communicable diseases as per the World Health Organization classification (Petersen & Ogawa, 2005): oral health, defined as the absence of any disease or disorder affecting the craniofacial complex, which includes dental, oral and craniofacial tissues(Petersen, 2003). The elderly, in contrast to the younger population, have a higher risk of developing xerostomia or dry mouth (from the medications they usually take), a condition that can lead to oral infections and dental caries (Lamster, Takamura, & Northridge, 2008; Paik, Bae, & Chung, 2004) . Tooth loss is another aspect of elderly's oral health, which can also affect functionality and lead to chewing problems (in turn leading to poor dietary habits) or the use of dentures (Kikutani et al., 2013; Lamster et

al., 2008; Mendes et al., 2012; Petersen, 2008; Petersen et al., 2005), which can be ill-fitting and can cause pain and discomfort (Petersen et al., 2005). The incidence of oral cancer is also higher in the elderly population mainly because of cumulative tobacco and alcohol consumption (Kandelman, Petersen, & Ueda, 2008). Oral health of the elderly is indeed strongly linked to their general health status: this inter-relationship manifests itself on several fronts such as diet, comorbidities and psychological health (Abyad, 2001; Kandelman, Petersen, & Ueda, 2008).

The elderly share a double burden as a result of their oral health problems considering that treatment-seeking practice shave been shown to decline with age (Holm-Pedersen, Vigild, Nitschke, & Berkey, 2005).

Issues of accessibility and affordability of oral health services, among other barriers, such as perceived need, or lack of, are particularly of concern to the elderly population. Geriatric oral health is indeed a complex public health problem given the lack of awareness of its important health repercussions among the general public, particularly the elderly. Moreover, the limited access to available oral healthcare services also hinders oral health-care seeking, especially among elderly who are either physically impaired or who reside in rural areas with poor public transportation (Braine, 2005). This is not to mention the typically expensive nature of available dental treatment (Chrisopoulos, Beckwith, & Harford, 2011; Petersen, 2003; Stella, Bellamy, Schwalberg, & Drum, 2001), which remains the primary obstacle for seeking health care among the elderly, particularly that most governments, even within developed countries, allocate only 5-10% of the national public health resources for dental care (Braine, 2005).

The oral health status of elderly has been well researched and understood in several countries globally including Northern America (Lamster et al., 2008; McQuistan, Qasim, Shao, Straub-Morarend, & Macek, 2015) and Southern America (Castrejón-Pérez, Borges-Yáñez, Gutiérrez-Robledo, & Ávila-Funes, 2012), France (Arrivé et al., 2012), Korea (Paik et al., 2004), Japan (Furuta et al., 2013)and Turkey (Ünlüer, Gökalp, & Doğan, 2007). Across all studies, the major oral health issue seems to be missing teeth (Arrivé et al., 2012; Castrejón-Pérez et al., 2012; Furuta et al., 2013; Paik et al., 2004).Nonetheless, data on elderly in the Arab countries remain scarce: articles pertain to only a few countries, namely Jordan(Al-Hadi Hamasha, Sasa, & Al Qudah, 2000; Haddad, Haddadin, Jebrin, Ma'ani, & Yassin, 1999), Saudi Arabia(Al-Shehri, 2012), Kuwait (Behbehani & Scheutz, 2004) and Lebanon(Boulos, Salameh, & Barberger-Gateau, 2013; Boulos, Salameh, & Barberger-Gateau, 2014; Doumit, Nasser, & Hanna, 2014; El Hélou et al., 2014; El Osta et al., 2014; El Osta, Tubert-Jeannin, et al., 2012; Farhat-Mechayleh et al., 2011). The Kuwaiti study is a review of all studies pertaining to the oral health status of the Kuwaiti population, and mentions oral health of the Kuwaiti elderly individuals especially when it comes to decays, missing teeth and denture wear (Behbehani & Scheutz, 2004). As for the Jordanian seniors, the number of remaining teeth as well as the reasons for extracting them are detailed for all age groups, particularly those aged 65 years and above (Al-Hadi Hamasha et al., 2000) and those aged more than 60 years (Haddad et al., 1999), respectively. The Saudi Arabian institutionalized seniors are described in terms of DMFT as well as root caries, periodontal and prosthetic statuses (Al-Shehri, 2012).

As for Lebanon, studies tackling oral health show that the heaviest burden in oral health problems among the Lebanese elderly individuals is related to the high

number of missing teeth and the unrestored edentulousness that may follow (Boulos et al., 2013; Boulos et al., 2014; Doumit et al., 2014; El Hélou et al., 2014; El Osta et al., 2014; El Osta, Tubert-Jeannin, et al., 2012; Farhat-Mechayleh et al., 2011). Another oral health burden in the Lebanese context resides in the dental needs, whether self-reported or objectively determined: those can be related to pain (TMJ pain), functionality (dentures for better chewing and higher FU) or decays and periodontal problems (El Hélou et al., 2014; El Osta et al., 2014; El Osta, Tubert-Jeannin, et al., 2012; Farhat-Mechayleh et al., 2011).

Internationally, the psycho-social and medical determinants and consequences of oral health status and oral health care seeking have also been studied, and associations have been found with socio-economic status (Hosseinpoor, Itani, & Petersen, 2012; Mendes et al., 2012; Tsakos, Demakakos, Breeze, & Watt, 2011), nutritional or dietary habits(Furuta et al., 2013; Hsu et al., 2014)oral health coverage and accessibility (Portella et al., 2013), as well as the individuals' quality of life (Hsu et al., 2014),and general health status (Kandelman et al., 2008; Polzer, Schimmel, Müller, & Biffar, 2010). Nonetheless, very few studies from Lebanon or the Arab world have investigated the factors influencing the elderlies' oral health status in this region: these factors include gender(Al-Shehri, 2012), nutritional status (Boulos et al., 2014; El Hélou et al., 2014; El Osta et al., 2014), cognitive capacities (Boulos et al., 2013)as well as the quality of life(El Osta, Tubert-Jeannin, et al., 2012).

In Lebanon, the proportion of elderly was estimated at 9.2% in 2007 (El Osta, Tubert, et al., 2012), and is expected to reach more than 10.2% in 2025 (Sibai, Sen, Baydoun, & Saxena, 2004). For the elderly population residing in Lebanon, oral health care is generally neither affordable nor covered by existing financing schemes, whether

private or public, except for those enrolled in the Armed Forces and in the Public Servants Cooperation (Ammar et al., 2000). Data are unavailable on the percentage of elderly covered by either of these two insurance schemes. Moreover, and while in 2005, Lebanon was described as having the highest dentist-to-population ratio among the Arab countries (Doughan, Kassak, & Bourgeois, 2005), the number remains unequally distributed across all Lebanese regions, illustrating differential access to oral health care (Daou, Karam, Khalil, & Mawla, 2015). What may also limit physical access is the reality that Lebanese seniors are increasingly lacking the traditional family proximity support due to high youth emigration (Abdulrahim, Ajrouch, Jammal, & Antonucci, 2012).

Study objectives

The goal of the present study is to draw a clearer picture of the oral health status and oral health care seeking practices of the elderly in Lebanon. Specifically the study aims to:

1. Assess the prevalence of a wide range of selected oral health indicators, and explore their correlates including socio-demographics, dental care habits and selected behavioral practices;

2. Assess the oral health treatment seeking behaviors of elderly, and explore the association with oral health indicators, controlling for socio-demographics, dental care habits and selected behavioral practices

This study is primordial as a first detailed assessment of the oral health status of Lebanese urban community-dwelling elderly individuals aged 65 years and above. Such data would help create baseline estimates that could inform strategies to improve geriatric oral health.

CHAPTER II

LITERATURE REVIEW

A. Global Demographic and Epidemiological Transitions

Both the number and percentage of population aged 65 years and above are growing fast worldwide (Sibai et al., 2004), given the increasing life expectancy and reduced fertility rates (Furuta et al., 2013).In 2050,it is expected that, for the first time in history, older populations will exceed the number of children younger than 15 years of age (Osta et al., 2010; Petersen, 2004).This demographic shift reflects the situation in almost all countries, whereby 25.6% of the population in North America and17.5% of the population of South America are expected to be 60 years or more in 2030 (Gaio et al., 2012).The same applies to Lebanon where the proportion of elderly Lebanese, according to one study has been steadily increasing since 1970 (doubled form 4.9% in 1970 to 9.6% in 2007) (Osta et al., 2010) and is estimated by another study to reach 10.2% in 2025 (Sibai et al., 2004).

This demographic shift has been accompanied by an epidemiological transition from communicable diseases to chronic and non-communicable conditions (Petersen et al., 2005), such as oral health, which has been integrated by the World Health Organization (WHO) into the non-communicable diseases prevention programs (Petersen & Ogawa, 2005).

B. Oral Health and the Elderly

According to WHO, oral health is defined as "a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum)

disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing" (World Health Organization, 2012). Clearly, oral health does not only mean healthy teeth, but also includes the relationship between oral and general health, whether through the mouth presenting early warning signs of systemic problems or by the mouth affecting other systems and organs (Bokhari & Khan, 2009).

Elderly individuals share most of the oral health-related issues of their younger counterparts. However, they do have some additional problems that start to develop with ageing, such as loss of teeth leading to complete edentulism, periodontal problems, caries (whether coronal or radicular), xerostomia, oral mucosal lesions, denture-related conditions, oral cancer, oral pain and discomfort (Castrejón-Pérez et al., 2012; Petersen, 2004).The above-mentioned problems affect the geriatric population's quality of life, whether at the individual or community level, by means of pain, impaired functioning, disfigurement, loss of productivity and job security, social marginalization, and even death in the case of oral cancer or noma (Petersen, 2004; Petersen & Kwan, 2011). The following paragraphs expand on each of these oral health problems in terms of definition, indices used to measure them, and their impact if left undetected and untreated.

1. Common oral health problems: definitions and implications

a. Edentulism

While edentulism is known to be the absence of all natural teeth leading to chewing and nutrition impairment, partial edentulism corresponds to having between 1 and 24 natural teeth. Individuals having 25 teeth or more are described as completely

dentate (Castrejón-Pérez et al., 2012; Polzer et al., 2010). In less developed countries, the rate of edentulism is increasing because of the frequent extraction of painful teeth instead of undergoing conservative treatment, in contrast to developed nations, where seniors are conserving their teeth more than ever before (Komulainen et al., 2013).Although unrestored edentulism is rare, it is still present mainly among institutionalized and disabled seniors, and it negatively affects daily activities such as eating and social interactions (Polzer et al., 2010).

Edentulism per se is measured through the number of missing teeth in an individual's mouth: this index usually does not take into account the third molars and therefore ranges from no to 28 missing teeth.

More important than the number of missing teeth and edentulism is the functionality of the mouth. This component is best evaluated by the number of functional units, which takes into account the number of teeth that come into contact in occlusion, whether the senior wears a denture or not. The functional unit count (FU) considers each tooth in contact as a functional unit, except for the molars which are considered as two functional units(El Osta, Tubert-Jeannin, et al., 2012).

b. Periodontal status

Periodontal diseases are all kinds of problems that affect the gingiva and/or the bone surrounding it, ranging from mild gingivitis (inflamed gingiva) to severe periodontitis (bone and soft tissue loss) leading to the loss of the tooth in the extreme cases (National Institute of Health, 2008). People having severe periodontal disease (that can lead to tooth loss) constitute 5-15% of most worldwide populations(Petersen, 2004).These kinds of problems cannot exist without plaque, which is a mix of bacteria

and mucus and other particles forming a colorless sticky film around the tooth, and can lead to the accumulation of calculus or tartar: hardened plaque (National Institute of Health, 2008; Yellowitz & Schneiderman, 2014). Therefore, assessing the plaque amount on an individual's teeth plays an important role in evaluating his/her oral hygiene and, indirectly, periodontal status. This is possible through the plaque index that scores the amount of plaque on 6 specific teeth that represent the entire mouth (Silness & Löe, 1964).

Additionally, assessing the level of fibrous attachment of teeth, as well as their gingival and boney structures, are part of routine periodontal evaluations such as the Periodontal Screening and Recording scoring system(El Osta, Tubert, et al., 2012). This indicator measures the probing depth as well as the periodontal status of all teeth. Every sextant of the mouth bears the score of its most affected tooth (American Academy of Periodontology, 1992).

Unfortunately, plaque does not accumulate only on natural teeth; it can also be present around acrylic, metallic and ceramic dental structures, causing problems to the dentures in the mouth (Preshaw et al., 2011). This can lead to the loss of surrounding natural teeth, especially the pillar teeth on which the partial dentures lie. Plaque accumulation also results in more periodontal problems, gingival inflammation and dental mobility among denture-wearing seniors as compared to all other seniors (Preshaw et al., 2011).

The biggest problem related to this particular oral health issue among denture wearers is the lack of evidence when it comes to the best hygienic practices involving dentures (de Souza et al., 2009).

c. Decays

Dental decays or caries are the destruction of dental hard tissues by acidic products derived from the fermentation of dietary carbohydrates in the presence of bacteria. Decay usually starts in fissures or interproximal areas (between teeth) making it invisible through the traditional dental instruments and/or radiographs. With its progress, decay leads to the cavitation of dental structures. It is initially reversible and can be stopped at any stage of the process as long as the bacterial biofilm can be removed. This dental disease can be seen on crowns (coronal decays) or roots (radicular decays). This long process starts from within the bacterial plaque at the level of the dental enamel (outermost surface of a tooth's crown) or the cementum (outermost surface of a tooth's root), reaching the dentin (softer layer under enamel and cementum) and even the pulp in the most extreme cases, leading to mutilation and destruction, and sometimes loss of the tooth (American Dental Association, 2013; Moukarzel, 2012; Selwitz, Ismail, & Pitts, 2007).

The most common indicator used for decay assessment is the DMFT, which stands for Decayed, Missing and Filled Teeth. This index counts all decayed teeth as well as filled teeth, which reflects a history of decay that was restored, in addition to missing teeth which hint that these teeth were problematic (whether related to caries or periodontal problems) (Arrivé et al., 2012; El Osta, Tubert, et al., 2012).DMFT is also indirectly indicative of the lifetime access to oral health care, whereby a senior with several filled teeth has probably had more access to dental services than other seniors with a high number of decayed teeth. On the other hand, a higher decayed component shows poor oral health of the mouth with an active decay on some teeth. Another way of looking at these components would be to combine the filled and decayed scores in

order to assess lifelong decay experience. The missing teeth are not part of this assessment because teeth can be lost from other reasons than decays (periodontal problems or trauma).

2. Global epidemiology of common oral health problems

When assessing the international literature on oral health among the elderly, one could note that the highest burden comes from missing teeth and edentulism, while the level of decay and other periodontal problems seem quite acceptable. Still, the percentage of edentulism varies widely among developing countries (1.3% in Nigeria and 78% in Bosnia Herzegovina), as well as industrialized nations (13.8% in Switzerland versus 58% in Canada) (Polzer et al., 2010). This variation is also visible among the seniors in the Middle East and North Africa region, where 7% of Egyptian seniors are edentulous, compared to 31% to 46% of Saudi Arabian elderly individuals (Bokhari & Khan, 2009). Missing teeth seem to carry the highest burden of oral diseases; subsequently, DMFT is mostly driven by edentulism (Arrivé et al., 2012; Behbehani & Scheutz, 2004).

When considering the active decays, translated by the number of decayed teeth (D component of the DMFT), the results globally seem acceptable, with a mean number of 5.3 decayed teeth among the elderly in Madagascar, in contrast to no decayed teeth in French seniors (Arrivé et al., 2012; Petersen, Razanamihaja, & Poulsen, 2004). However, in order to truly compare these numbers, the "filled" component should be taken into account: the number of filled teeth in Madagascar was 0.4, while in France this number was as high as 4. Therefore, the lifelong experience of decays in elderlies is

almost the same in these 2 countries despite the difference in active decays (Arrivé et al., 2012; Petersen et al., 2004).

The results yielded by the addition of decayed and filled teeth together are somewhat similar around the world (Behbehani & Scheutz, 2004; Hong-Ying, Jin-You, & Bo-Xue, 2002).

The percentage of elderlies suffering from severe periodontitis varies among countries. The numbers can be as low as those in Mexico (8.9%) and as high as those in China (22.2%) (Castrejón-Pérez et al., 2012; Daradkeh & Khader, 2008; Petersen & Yamamoto, 2005).

As for plaque and calculus accumulation, it is consistently high among the elderly across studies worldwide whether on natural teeth or on dentures. For example, 44.8% of French community-dwelling seniors present calculus accumulation on their natural teeth (Arrivé et al., 2012), which is close to the 36% of English denture-wearers that present calculus around the acrylic part of their partial dentures (Preshaw et al., 2011).

3. Dental care seeking behavior: prevalence and patterns

Seeking dental healthcare behaviors of the elderly is far from being well documented, and most of the available evidence is concentrated within Europe and the US, as detailed below.

In fact, according to Wall et al. (2012) who used the NHIS (National Health Interview Survey) database, around 70% of the dentate American seniors visited their dentists yearly in the period between 2000 and 2010(Wall, Vujicic, & Nasseh, 2012). However, this is different from the results of the NHANES, who claimed that about half

of American seniors visited their dentist yearly between 1999 and 2004 (Dye et al., 2007).

This difference in results may be related to the fact that the sample of seniors has dissimilar characteristics in these 2 studies, respectively dentate seniors versus all seniors.

The proportion of seniors aged more than 50 years, who sought dental care in Europe, was thoroughly studied through a cross-national dataset that combined information about dental care utilization among 14 European countries (Listl, 2011). The evidence clearly indicates country differences, whereby in Sweden, 81.23% of the surveyed seniors sought dental care versus 23.77% in Poland. Different trends were also observed on reasons for seeking dental care. Preventive care seeking was more commonly reported by seniors from Denmark (47.39%) and was very rarely reported within the Polish population (3.17%). As for operative treatment, it was reported by 22.23% of the French seniors as opposed to 3.96% of the Danish elders. Finally, Sweden has the highest percentage of older adults seeking both operative and preventive oral care (29.95%), while Spain has the lowest such figure(6.80%) (Listl, 2011).

This difference in numbers might be due to the different health systems in these countries, with most of them financing oral health services through social insurance, while others use the taxation system, and the rest relies on out-of-pocket payments (Listl, 2011).

The exact reason for seeking oral care among seniors is not documented per se. However, according to Slaughter et al., there is no perceived dental problem without pain. In fact, those who had pain were 4 times more likely to seek treatment care (Slaughter & Taylor, 2005). Another study by Kiyak et al. found that current seniors

tend to seek care for esthetic purposes, with a higher demand of esthetic results nowadays(Kiyak & Reichmuth, 2005). These findings corroborate those of Strauss et al., in 1993, who also found that esthetics can be a powerful motive to seniors seeking oral health care (Shay, 2004; Strauss & Hunt, 1993). Finally, older adults consider nowadays that keeping a healthy mouth is reason enough to seek oral care(Strauss & Hunt, 1993).

4. Methodological and other challenges to cross-country data comparison

In reviewing the literature, one understands the complexity behind comparing internationally published findings, given the differences in methodologies; conclusions are thus neither easy to make nor as accurate as one would like. In fact, culture and geographic location are primordial. When oral health problems are described in the literature, several determinants such as cost and dental insurance are identified (Butani, Weintraub, & Barker, 2008). However, an essential part of these problems, especially when the cross-country differences are remarkable, is the cultural diversity among the world regions and sometimes within these regions.

The differences are also related to differential care access to seniors, availability of technology, resources, living conditions and access to research funding (Butani et al., 2008; Petersen & Yamamoto, 2005).

Aside from these problems, a major challenge resides in the measures used to assess oral health status: these should be exactly the same, carrying the same meaning across the countries being compared (Hawthorne et al., 2006). Validation is not always enough, adaptation to the country is sometimes necessary to end up with the same meaning and weight of the used indices (El Osta, Tubert-Jeannin, et al., 2012).

Additionally, the sampling strategies, as well as the timeframe of the studies, make it very difficult to extrapolate conclusions from cross-country examination. In fact, studies relevant to institutionalized seniors (Castrejón-Pérez et al., 2012; Hsu et al., 2014)cannot be compared to others who focus on community-dwelling elders (Weening-Verbree, Huisman-de Waal, van Dusseldorp, van Achterberg, & Schoonhoven, 2013). The same issue arises when comparing rural samples to urban ones (Gluzman et al., 2013; Quandt et al., 2009).Finally, conclusions pertaining to oral health status and utilization cannot be drawn from studies with a wide time difference (Listl, 2011; McGrath, Bedi, & Dhawan, 1999).

C. Factors Influencing Oral Health Problems in the Elderly

The following section focuses on the determinants of oral health problems in the elderly. Those determinants, although proven to be related to oral health status, have different occurrences in the World, mainly due to cultural differences between countries. These cultural beliefs and practices, such as values placed on expectations about preventive or therapeutic interventions, influence the seniors' oral health status and play a role in the relationship between oral health problems and their reasons. Whether migrants or indigenous to the countries in which they are found, various ethnic groups have their own beliefs and attitudes towards oral health, prevention of disease, care seeking and self-care practices (such as oral hygiene).This is why, in this section, the focus is on the determinants that have been consistently shown in the literature to affect oral health.

1. Socio-demographic and socio-economic factors

Oral health inequity has been discussed in the literature when it comes to socio-demographic and socio-economic factors.

In fact, the main socio-demographic risk factors are the elderlies' age and gender (Gaio et al., 2012). With age, oral health status deteriorates: tooth loss and oral health problems increase (Gaio et al., 2012; Polzer et al., 2010). Although edentulism is declining with new modalities and treatment advancement, it is still prominent. Amidst an increase in the size of the older population worldwide, and the higher life expectancy, the number of edentulous seniors will still be high in the coming years (Polzer et al., 2010). However, with elderly individuals retaining their teeth longer, the risk of periodontal disease and root caries is higher (McQuistan et al., 2015).

As for gender, although women report more barriers to seeking oral care, compliance with treatment and success of oral treatment are significantly higher in women (N. Kronfol, 2012a). However, this global conclusion does not apply everywhere. For example, in Mexico, elderly females have more tooth loss than males, with a mean of 16.4 vs. 13.2 missing teeth respectively (Gaio et al., 2012).

Variations have also been noted by urban city: specifically, regional disparities in edentulism have been identified, with poorer status in the rural parts (Polzer et al., 2010). Worth noting is the much smaller number of dentists practicing out of the cities and in the rural areas (N. Kronfol, 2012a). Accessibility and the presence of public transportation systems are fundamental where healthcare is far and domiciliary care not available (Petersen, 2004). This problem is aggravated when the elderly person is not ambulatory whether due to age itself or any health condition impeding mobility (Petersen, 2004). This brings up the role of marital status in oral health (Tsakos et al.,

2013). Widowed or divorced/separated older people have significantly more edentulousness, periodontal loss of attachment and less frequent dental attendance than the other seniors – all of which have been linked back to the lack of social support in these marital instances (Tsakos et al., 2013).

Finally, another risk factor for oral health inequity among the geriatric population is socio-economic status, with more oral problems in poorer individuals (Tsakos et al., 2011). It is the case of tooth loss, oral cancer and destructive periodontal disease that increase in the most deprived populations (Petersen & Kwan, 2011). The financial status of the elderly enters into play when it comes to dental affordability, especially in contexts such as the Arab world where the provision of dental care is not covered by most insurance plans (N. Kronfol, 2012a; Polzer et al., 2010).

2. General health and oral health problems: a bidirectional relationship

The relationship between oral health and general health is associated with food selection and nutrient intake as well as social life, pain and systemic chronic conditions, whether by sharing common risk factors or by affecting the metabolism of other organs (Castrejón-Pérez et al., 2012; Weening-Verbree et al., 2013).

a. Oral health and diet

Both the number of teeth present in the elderly's mouth as well as the status of these teeth affect nutrition. Tooth loss has been associated with both obesity and loss of weight (Griffin, Jones, Brunson, Griffin, & Bailey, 2012; Tsakos et al., 2011).

In fact, when a dentate senior has less than 19 teeth with no dentures replacing them and/or shows signs of dysphagia, he/she experiences altered nutrition, daily

activities and cognitive function (Furuta et al., 2013). Additionally, whatever the number of teeth present, older individuals alter their dietary behavior when the number of functional units present is low (El Osta et al., 2014).

The culprit in this nutritional shift is the chewing efficiency since chewing with dentures is 30-40% less efficient than chewing with one's natural teeth: the chewing cycles become smaller, and the bite force, along with the muscle activities, are reduced (Griffin et al., 2012; Polzer et al., 2010). When it comes to complete denture wearers, the chewing efficiency is affected by physical retention, pain of the underlying oral tissues, and stability which is more difficult to achieve in the mandible than in the maxilla (Polzer et al., 2010).

This chewing difficulty causes the elderly to choose foods that are rich in saturated fats and cholesterol over those with more fibers, vitamin C and carotene, because the former are easier to chew (Griffin et al., 2012).

Furthermore, the high consumption of sugar as well as the inadequate exposure to fluoride are major risk factors of dental caries (Petersen, 2004).

Finally, diet is also related to periodontal diseases: the risk increases with high consumption of foods and drinks containing free sugar as well as acidic beverages, especially when any of these foods is consumed more than 4 times per day (Petersen, 2004).

b. Oral health and comorbidities

The relationship between oral health and general health is a two-way relationship. On one hand, oral health affects general health, whether by periodontal diseases or loss of teeth (Castrejón-Pérez et al., 2012; Furuta et al., 2013; Tsakos et al.,

2011). On the other hand, general health alters oral health mainly by medication that affects the mouth (Petersen, 2004).

In fact, systemic problems sometimes manifest in the mouth with some cases, such as the HIV, where the first sign of disease can be found in the oral cavity (Petersen, 2004).

Oral health problems share common risk factors with a plethora of systemic diseases. According to the American Dental Association, the connection between oral and general health conditions is identified in the literature with more than 200 associations found (Bricker, Langlais, & Miller, 2001). It is not without any reason that the mouth is thought to "reflect a person's health and well-being throughout life" (Griffin et al., 2012).

Below are instances of major inter-relationships between general and oral health problems:

- Endocrine diseases: Diabetes: Diabetic patients present more periodontal diseases with higher pocket depths and clinical attachment loss, more tooth loss and dental caries and poorer oral health status (Bokhari & Khan, 2009; McQuistan et al., 2015). A recent Cochrane systematic review has shown that the improvement of the periodontal status of type 2 diabetes patients has improved their metabolic control (Simpson, Needleman, Wild, Moles, & Mills, 2004). This bidirectional relationship can be explained by the micro vascular changes experienced by diabetic patients, as well as the alteration in the gingival crevicular fluid components, in the collagen metabolism, in the sub-gingival flora, and the host response, along with a genetic predisposition and monoenzymatic glycation (Bokhari & Khan, 2009).

- CVD: Oral health is also related to cardio-vascular diseases: whether through carotid calcification, stroke, myocardial infarction or angina, periodontal parameters are related to cardio-vascular problems (Bokhari & Khan, 2009). This association is discerned when prevention and control of periodontal diseases influence the initiation and development of cardio-vascular diseases. The provided explanation provided relates to the changes in hemostatic and inflammatory factors (Bokhari & Khan, 2009; Petersen, 2004).

- Boney & endocrine problems: Additionally, some minor relationships have been found between oral status and osteoporosis as well as chronic renal failure (more severe if the patient undergoes hemodialysis) (Bokhari & Khan, 2009).

- Respiratory tract: Moreover, aspiration of bacteria, end toxins and enzymes from saliva promotes the infection of the lower respiratory tract and may develop into chronic obstructive pulmonary disease (COPD) (Bokhari & Khan, 2009).

c. Psychosocial effects of oral health problems: impact on quality of life

Oral health problems in the geriatric population start earlier in life and promote the decline of these persons 'quality of life (Castrejón-Pérez et al., 2012). In fact, the most important problem affecting the social component of seniors' lives is tooth loss. First, tooth loss implies the loss of the orofacial bones, nerves, muscles and receptors. Therefore, orofacial functions are altered in those individuals (Polzer et al., 2010).

Moreover, the loss of teeth affects speech and induces a social marginalization of these people. It also detracts from physical appearance and lowers one's self-esteem (Griffin et al., 2012).

However, this social impact is not exclusive to edentulousness. In fact, any oral disease, if left untreated, affects nutrition status, causes oral dysfunction and alters the person's quality of life (Wu, Plassman, Crout, & Liang, 2008).

The World Oral Health report in 2003 emphasized oral health as being a part of general health and an important component of quality of life (Petersen, 2003). This emphasis takes into account the effect of oral health problems on self-esteem, well-being and daily life through speech, food ingestion, denture wearing habits… (Kandelman et al., 2008).

According to Macentee et al., the most important factors of oral health-related quality of life are the ability to maintain a proper hygiene, lack of pain and a healthy mouth (Macentee, Hole, & Stolar, 1997).

Recently, the World Health Organization has placed importance on this subject by insisting that oral health-related quality of life be incorporated in the evaluation of community-based oral health promotion (Kandelman et al., 2008).

One example of a measure to assess this dimension is the Geriatric Oral Health Assessment Index (GOHAI). According to the original article describing it, the index aims to evaluate problems affecting older people in the following three dimensions: "1) physical function, including eating, speech and swallowing; 2) psychosocial function, including worry or concern about oral health, dissatisfaction with appearance, self-consciousness about oral health, and avoidance of social contacts because of oral problems; and 3) pain or discomfort, including the use of medication to relieve pain or discomfort from the mouth"(Atchison, 1997). This index was associated with having natural teeth, not wearing dentures, being free of radicular and coronal caries, and of dental mobility. The impact of having natural teeth was positive on the limitation in

food choices, discomfort while eating, sensitivity to food temperature, psychological marginalization in general (more contact with others) and while eating in particular (less discomfort of eating in front of others). However, no effect was noticed on worries and troubles related to oral problems, speech problems or satisfaction with dental appearance (Atchison, 1997).

3. Psychological determinants of oral problems

When considering the psychological determinants of oral health, social support emerges among all other factors: seniors who have more friends have less root decays than their counterparts (Tsakos et al., 2013), and those who have depression and/or are socially isolated tend to avoid using their dentures if they are denture-wearers (Polzer et al., 2010).

4. Lifestyle-related determinants

Smoking is the major modifiable environmental risk factor of poor oral health. It has been associated with periodontitis, bone and tooth loss in the elderly (Gaio et al., 2012). In fact, smoking has been found to be responsible for more than 50% of adult periodontal diseases: when smoking stops, the risk decreases (Petersen, 2004).

This is reinforced when assessing the oral status of the elderly living in countries implementing tobacco control: periodontal disease is reduced (Petersen, 2004).

Therefore, in the low and middle-income countries where the prevalence of smoking is still high, the risk of several oral problems remains high. In fact, tobacco consumption is related to halitosis, oral cancer and its recurrence, congenital defects

such as cleft lip and/or palate, and periodontal disease (Petersen, 2004). Tobacco suppresses the individual's immune response and affects the healing process of any wound whether surgical or accidental, it promotes periodontal problems in the diabetics and affects the cardio-vascular system (Petersen, 2004).

Findings that would not corroborate the relationship between tobacco consumption and periodontal degeneration might be due to the fact that periodontally compromised teeth have been previously extracted (Gaio et al., 2012).

Furthermore, alcohol consumption has been reported to affect oral health of seniors worldwide (Petersen, 2004).

5. Oral hygiene practices

Oral hygiene practices, as well as the access to safe water and sanitary facilities, are determinants of oral health status (Petersen, 2004). Brushing of natural teeth, regular cleaning of the denture, daily use of floss and/or mouthwash are primordial to preserve oral health and maintain teeth as long as possible(Shah & Sundaram, 2004). Of fundamental role is the flossing that is not very common among seniors: the importance of flossing resides in the removal of food impaction between teeth, that could otherwise lead to radicular caries (Shah & Sundaram, 2004).

The contrasting results that may be found in the literature regarding brushing teeth are also due to this practice being more common among the wealthy, who usually consume more sugar and refined carbohydrates (Doifode, Ambadekar, & Lanewar, 2000; Shah & Sundaram, 2004; Thomas, Raja, Kutty, & Strayer, 1994).

6. Dental care seeking: determinant of oral health status

A large number of seniors do not seek dental care as frequently as necessary; therefore, oral problems tend to worsen and lead to complications that could have been avoided if treated earlier. This is visible when asking the elderly about the time interval since the last dental visit: this interval can range from less than a year to more than 5 years(Slaughter & Taylor, 2005). Those who do not seek oral care for a very long time tend to have more oral problems and complications than the others. However, dental care seeking per se has its own determinants, detailed as follows.

D. Factors Influencing Dental Care Seeking

1. Enablers of dental care seeking

a. At the individual's level

- Oral health status: dentate seniors (mostly those with twenty natural teeth or more) seek more dental care than their edentate counterparts. This may be explained by the lower perceived need among edentulous patients compared to dentate seniors (Holm-Pedersen et al., 2005)

- Education: As for education, the higher the level achieved, the higher the likeliness of seeking care (Holm-Pedersen et al., 2005). This educational difference is visible in Chinese seniors for example, whereby those who obtained at least a college degree tended to have visited their dentist within the past year more than their less educated peers (261% more likelihood of seeking care for those with a higher education) (Wu, Tran, & Khatutsky, 2005). This may be due to the fact that those seniors are more knowledgeable about the importance of preventive dentistry and the urgency of treating oral problems (Wu et al., 2005).

-Occupation: Additionally, occupational status influences the dental utilization behavior of people, with blue-collar workers half as likely as other workers to seek treatment (Kiyak & Reichmuth, 2005).

-Social network: Seniors who are still in contact with their families, as well as those who meet their friends on a weekly basis, tend to visit the dentist more frequently than their counterparts (Wu et al., 2005). This is more reinforced by loneliness and a small social network, which seem to impede dental care utilization among seniors (Holm-Pedersen et al., 2005).

- Perceived severity: Furthermore, functional abilities despite oral problems might delay dental care seeking: people who can still chew and eat in spite of decays, missing teeth, periodontal problems or any other dental issues will not easily seek dental care (Kiyak & Reichmuth, 2005). However, esthetics has been increasingly important to older adults, with more plastic surgeries and esthetic procedures undertaken by the baby-boomer generation: more seniors are going through orthodontics and cosmetic dentistry to enhance their dental appearance and whiten their teeth. This new dimension might be a propeller towards maintaining healthy teeth for a longer time in the future older generations (Kiyak & Reichmuth, 2005).

2. Barriers to dental care seeking

a. At the individual's level

- Age: The first determinant of dental care seeking is age: the older the individual, the less likely he/she is to visit the dentist (Kiyak & Reichmuth, 2005). This age-related factor is somewhat controversial since in some studies, age is not related to treatment seeking patterns (Holm-Pedersen et al., 2005). On one hand, older seniors

who are mostly retired usually have lower incomes and less dental coverage than before retirement(Manski, Goodman, Reid, & Macek, 2004; Manski et al., 2010). Coupled with the usual lack of perceived need for dental services and the rate of edentulism that increases with age, this tends to reduce the likelihood of seeking care(Wu et al., 2005). On the other hand, these seniors usually have more free time for dental appointments, which may play a role in increasing the number of dental visits (Manski et al., 2010).

- Perception of dental need: In fact, perceived dental need and the importance attached to these needs play a major role in seeking dental care (Holm-Pedersen et al., 2005). This is related to the expectation of the elderly, and translates into two different perspectives: first, the patient's belief that he/she does not need treatment might be related to a lack of awareness of the problems in his/her mouth (McQuistan et al., 2015).The other view of this perception is related to the low expectation of good oral health: whether through acceptance of poor oral status or through the seniors' resignation by considering oral problems as part of the ageing process, this complacence leads to a belief that they do not need dental care (Kiyak & Reichmuth, 2005).

- Other health priorities: Seniors with chronic health problems tend to use dental care less than others because of other priorities or even because of high medication costs (Kiyak & Reichmuth, 2005). An interesting way of proving this would be to ask the senior to rate the importance placed on oral health versus general health.

- Fear/anxiety: The elderly may be anxious towards seeking dental care, either due to an unpleasant previous experience or due to an overall negative view of the dental treatment/dentist through the sound of the drill or the images portrayed by the media (Bell et al., 2012; Borreani, Wright, Scambler, & Gallagher, 2008). Another

factor of fear is the character of the dentist and his/her ability to put the patient at ease (Borreani et al., 2008).

- Perception of oral health: this perception is very diverse among older adults. It is usually gathered through self-rating the oral health on a likert scale. However, a very interesting way of tackling this issue would be to check the priority of this oral health by self-rating it compared to general health.

The diversity in oral health perception is mostly visible when it comes to tooth loss. On one hand, it is seen as the natural consequence of ageing, which in extreme cases leads to psychological resignation related to tooth loss (Petersen, 2004). People who experience systemic problems with constriction of life space, loss of mobility and weakness, tend to be more resigned and expect less about their oral health (Castrejón-Pérez et al., 2012).

On the other hand, tooth loss is seen as a traumatic experience by some seniors who associate it with ageing and loss of vitality: in extreme cases, this perception leads to delaying the extraction of compromised teeth as much as possible. Coupled with a lack of awareness about available treatment options other than extraction, this can lead to avoidance of the dentist (Polzer et al., 2010).

b. At a macro level

- Cost: Moreover, the cost of dental care and the economic status of seniors have a fundamental role in motivating seniors to seek care (Borreani et al., 2008; Holm-Pedersen et al., 2005). This is even more critical when considering dental insurance. When private insurance is the only choice, seniors are less likely to be covered, with rates as low as 10% (Kiyak & Reichmuth, 2005).

- Geographic residence: Seniors living in rural areas seek less dental treatment than those living in the cities because of inaccessibility, unavailability, unaffordability or unfavorable oral health attitudes (Kiyak & Reichmuth, 2005).

-Dentist's characteristics: These characteristics encompass his/her communication skills, his/her self-confidence as a practitioner and the perception of the level of care in private/public sectors (Borreani et al., 2008). Additionally, the dentists' perspectives, stereotypes and discomfort around the geriatric population, as well as their beliefs that these people cannot afford dental treatment, might push away some potential patients (Kiyak & Reichmuth, 2005).

E. The Case of Lebanon

1. The context of oral health care services

Lebanon illustrates the worldwide reality in a very accurate fashion: the demographic shift in the world is reflected within the Lebanese population, whereby the proportion of elderly among the population of Lebanon has been steadily increasing and is expected to keep the same pattern, reaching a figure of10.2% in 2025 (Osta et al., 2010; Sibai et al., 2004).

This shift, along with the epidemiological transition that naturally follows, should lead us to increase the attention placed on chronic conditions, notably the oral health of this population (Petersen et al., 2005; Petersen & Ogawa, 2005).

Subsequently, the number of dentists is primordial to address the issue of availability of dental care. In fact, Lebanon has the highest dentist-to-population ratio in the Arab World, steadily rising from 1:1000 in 1994 to 1:800 in 2005 (Doughan et al., 2005). This number is higher than most of the global numbers whether from developing

countries (for example 1:150000 in Africa) or from industrialized ones(1:2000 in most of these countries) (Petersen et al., 2005).

Despite the ratio, distribution of available dentists remains unbalanced among the regions: the majority of dentists registered in the Beirut Lebanese Dental Association work in Mount Lebanon (2065 dentists, yielding a dentist-to-population ratio of around 1:750), and Beirut (983 dentists yielding a dentist-to-population ratio of 1:360), then in the Bekaa and Southern Lebanon (around 300 each, yielding a dentist-to-population ratios of 3:5000 and 1:2200 respectively) (Central Administration of Statistics - Lebanon, 2008; Daou et al., 2015).

On the other hand, despite the availability of oral care, the difficulty in accessing these services plays a big role. This is especially true for the 12% who have been estimated to be living alone (Abdulrahim et al., 2012), which is a high number compared to seniors in Africa (8%), in Asia (7%) and in Southern America (9%); however, it is still low compared to those living in Northern America and Europe (26% in each) (United Nations Department of Economics, 2005). This is not to mention the poor public transportation system in Lebanon, which is an important barrier to accessing oral healthcare globally (Petersen, 2004).

As for the affordability of dental care, the Lebanese health care system does not provide support for the elderly when it comes to oral healthcare. In fact, the only citizens who benefit from dental coverage are those enrolled into the Armed forces and the Public Servants Cooperation (Ammar et al., 2000), but their numbers are minimal (7.33% are enrolled in Public Servants Cooperation and 11% are in the Armed Forces)(El Osta et al., 2015).Indeed, 58% of total general health expenditures are out-of-pocket in Lebanon(N. M. Kronfol, 2012b), and although Lebanon has a Social

Security healthcare plan covered by the government, the latter plan does not cover dental care. Mode of payment, particularly if out of pocket, is an important factor in the patient's decision to restore his/her teeth versus extracting them when their status is compromised (Preshaw et al., 2011).

2. State of research

When it comes to oral health status of the Lebanese elderly, available numbers from the World Health Organization database, which includes the percentage of Lebanese edentulous seniors, are used in most of the articles tackling worldwide edentulism (Bokhari & Khan, 2009; Jones, Orner, Spiro, & Kressin, 2003; Petersen, 2004).According to this source, the level of edentulousness is decreasing, mimicking the reality in international geriatric populations: in 1994, 35% of the seniors were edentulous in Lebanon versus 20% in 2000 (Bokhari & Khan, 2009; Jones et al., 2003; Petersen, 2004).

However, in a study conducted in 2014 among hospital-based elderly, it was found that 70% of seniors aged more than 70 years have complete edentulism (El Hélou et al., 2014). Among those who need dentures, only 78% actually wear any, while 25% of denture-wearers complain from a poor fit of their dentures(El Hélou et al., 2014).Percent estimates from other studies are somewhat different: 41.2% experienced a complete edentulism while 33% of those did not wear any denture according to Farhat-Mechayleh et al., who conducted a study in 2011, recruiting seniors from a social organization in Beirut (Farhat-Mechayleh et al., 2011) (see appendix1).

Moreover, Boulos et al. undertook a national study of rural seniors aged 65 years and above and found that, when asked about their oral status, 66.1% of Lebanese

seniors report being partially or totally edentulous, while 47.2% wear dentures and 28.4% complain from chewing problems (Boulos et al., 2013). On the other hand, Doumit et al., in a study dated 2014 focusing on institutionalized seniors, reported that 55.7% of the elders perceive that they have an oral problem (Doumit et al., 2014).

Finally, as per El Osta et al.'s finding in 2012, from a treatment-seeking sample drawn from primary healthcare centers, 37% of seniors are edentulous, while 34% of dentate elderly Lebanese participants wear dentures (El Osta et al., 2012).

In terms of natural teeth, according to El Osta et al. (El Osta, Tubert-Jeannin, et al., 2012), around one third of the Lebanese seniors had poor oral health and were dissatisfied with their oral health status. Oral health problems mostly included a very high number of missing teeth (a mean of 17.1) as well as a very low (mean of 4.7) count of functional units(El Osta, Tubert-Jeannin, et al., 2012).

The mean number of decayed teeth was 3.32. Additionally, around 68% of the participants had experienced a dry mouth sensation and 16.5% felt joint pains at the level of the mouth (Temporo-mandibular Joint) (El Osta, Tubert-Jeannin, et al., 2012).

When comparing oral health status by nutritional status, only poor GOHAI scores were associated with nutritional deficit(El Hélou et al., 2014). This association with nutrition was also investigated by Boulos et al. and Osta et al. (Boulos et al., 2014; El Osta et al., 2014): the former found that chewing problems, edentulousness and denture wearing were significantly associated with poor nutritional status (p-value <0.01) (Boulos et al., 2014). As for the latter, it established that malnutrition was significantly associated with lower numbers of functional units, a perception of xerostomia, as well as a poor oral health-related quality of life (reflected by GOHAI scores) (El Osta et al., 2014).

As for gender differences, females have more edentulism but wear more dentures than males ($p<0.001$) (Boulos et al., 2013). These differences also exist with regard to the cognitive capacities of the seniors: more chewing problems, edentulousness and denture-wearing in cognitively impaired seniors (p-value<0.001) (Boulos et al., 2013).

Differences in numbers reside mainly in the recruitment process of these studies: some investigate seniors in nursing homes (Doumit et al., 2014) while others assessed community-dwelling elders (Boulos et al., 2013; Boulos et al., 2014; Farhat-Mechayleh et al., 2011) or even care-seeker older adults(El Hélou et al., 2014; El Osta et al., 2014; El Osta, Tubert-Jeannin, et al., 2012). Age cut-off was also variable among studies and ranged from 60 years (Doumit et al., 2014; Farhat-Mechayleh et al., 2011)to 70 years(El Hélou et al., 2014). As for the sample size, it was small in some papers (El Hélou et al., 2014; Farhat-Mechayleh et al., 2011) as compared to others(Boulos et al., 2013; Boulos et al., 2014).Moreover, the geographic location should also be taken into account with some studies focusing only on rural elders(Boulos et al., 2013; Boulos et al., 2014) while others tackle urban seniors(El Osta et al., 2014; El Osta, Tubert-Jeannin, et al., 2012; Farhat-Mechayleh et al., 2011) or even national geriatric populations (Doumit et al., 2014). Finally, the way the oral health indicators are obtained is not the same: most of the studies rely on the elderly self-reporting their oral problems (Boulos et al., 2013; Boulos et al., 2014; Doumit et al., 2014)while few use some indices such as DMFT and FU(El Osta et al., 2014; El Osta, Tubert-Jeannin, et al., 2012).

As helpful as these articles are, every one of them has its gaps. The only study that focused on non-treatment seeking community-dwelling urban Lebanese elderly was

that of Farhat Mechayleh et al. However, the small sample size of this study and the lack of periodontal indicator in the assessment of that sample (Farhat-Mechayleh et al., 2011) emphasize on the need to undertake a new study with a larger sample size trying to explore the different facets of oral health among a sample of urban community-dwelling elderly.

CHAPTER III

OBJECTIVES AND HYPOTHESES

The overall aim of this study is to explore and understand the oral health status and oral health care seeking practices of a sample of Lebanese elderly.

The specific objectives (and corresponding hypotheses) are to:

1. Describe the status of a wider range of selected oral health indicators (DMFT: Decayed Missing Filled Teeth), PSR (Periodontal Screening and Recording), RCI (Root Caries Index), Plaque Index and FU (Functional Unit Count), as well as prevalence of dental care behaviors.

2. Explore differences in oral health status through selected socio-demographics (age, gender, education, monthly household income…), behavioral practices (smoking, diet…), general health status, quality of life, and sleeping problems (Epworth Sleepiness Scale). The corresponding hypotheses to objectives 1 and 2 were:

a) Elderly people living in Beirut with high education, high monthly income, as well as those who are currently employed, have lower dental care needs in comparison with their counterparts;

b) Elderly with poor oral hygiene, unhealthy dietary habits and behaviors, as well as higher health-related needs, have worse dental health in comparison with their counterparts;

c) Better oral health status is associated with a higher quality of life.

3. Assess the prevalence and correlates of oral health treatment seeking.

CHAPTER IV

MATERIALS AND METHODS

A. Study Design and Sample

A cross-sectional study was undertaken among elderly individuals (aged 65 years or above) recruited in social organizations located within a 25 km radius from Beirut. All elderly present at the time of the visit were approached to participate.

Exclusion criteria:

Elderly who were too ill to be examined or to open their mouth at the time of the visit were excluded. The cognitive status was assessed through the Decision Making Competency test (see Appendix 2), performed on all the elderly individuals. First, the research details were explained along with the consent process, thereafter, the participants were asked to repeat some main information that had just been explained to them. If they were able to recall and understand the information, they were considered competent. Only those who were competent and could make a conscious consent were included. We encountered only 2 seniors who were excluded because of their cognitive abilities.

The response rate was of 85.2%, it ranges between 60% and 100% according to the center visited (appendix 3).

B. Sampling and Sample Size

To create a sampling frame including all social organizations within a 25 km radius from Beirut, the Ministry of Public Health manual related to elderlies' social and medical organizations, was carefully reviewed and all eligible centers/organizations

were identified. Of the 28selected, 19 centers agreed to be part of our research project (distributed alongside the coast of Jounieh and Damour, towns equidistant from the capital Beirut). Three of the centers that refused to be part of the study had a dentist and the other 6 were unreachable. The administrators of the centers were visited prior to the data collection process and the procedures were presented in details before the centers agreed.

An a-priori sample size calculation was performed to anticipate the number of participants needed in the study (350 elderly with a confidence interval of 95%, a power of 80%, a marginal error of 5%, and a prevalence of plaque index being higher than 2 of 35%), keeping in mind that with non-probability convenient sampling , sample size calculation is not needed. Ultimately, a total of 352 elderly (from the 19 centers visited) were recruited into the study. A list of all the participating centers, along with a small description and the total number of elderly recruited from each center, is available in Appendix 3.

C. Calibration

In order to ensure a good accuracy and validity of the results obtained, a calibration process of the examiner preceded the data collection. A total of 12 elderly persons were examined separately by each of the student investigator (Dr. Sandra Andari) who is a dentist and a trained orthodontist from the American University of Beirut Medical Center (AUBMC) and an experienced dentist practicing at AUBMC (Dr Nada Afeiche). The inter-rater agreement was very high ($0.88<r<0.98$) for all measures.

D. Data Collection: Process and Instruments

Data were collected from two sources: a dental examination and a questionnaire using a face-to-face interview (both requiring 10 minutes on average).

Data were gathered by the investigator at least 3 times per week, over a period of 4 months. The visits to each center were pre-scheduled at a mutually convenient time. The elderly attending the participating institutions were first approached by the investigator. Once the elderly person agreed to hear more about the study, the examiner read to him/her the consent form (Appendix 4) aloud in a private room provided by the center. If the participant was visually impaired or illiterate, the nurse/social worker was present to help during the consent process. Following consent, the student examiner interviewed and physically examined the participant.

1. Dental examination

Collection of the oral indices took about 10 minutes. Non-invasive dental instruments including mouth mirrors and probes were used. These instruments were all sterile and disposable, eliminating the risk of cross-infections. Disposable latex gloves and facial masks were used during the examination. Hand hygiene norms were enforced. To detect dental decays, a thorough inspection of all the visible surfaces of erupted teeth was conducted using the probe and the mouth mirror.

The assessed oral health indicators were coded on a clinical examination sheet (appendix 5). They included:

- **Description of the participant's mouth status**: On a schematic view of teeth from the maxillary and mandibular left third molar to the right third molar, every

missing tooth was marked with a cross, and every crown was circled. The reference to a denture was indicated by underlining the teeth replaced in the denture.

- The **DMFT Index** (WHO Oral Health Report, 2003) measures the number of decayed teeth (untreated carious lesions) (D), the number of missing teeth, whether extracted or congenitally missing (M), and the number of filled teeth (F). The total number of Decayed, Missing and Filled teeth was calculated for each participant, the sum of the 3 components yielding the DMFT score for each individual. The DMFT indicator does not take into account the third molars.

- The **Root Caries index (RCI)** targets the number of radicular caries in every subject (Katz, 1980). The RCI was calculated by counting the number of filled or decayed root surfaces, and dividing it by all visible root surfaces (whether filled, decayed or sound). It should be noted that no root caries could occur without a gingival recession uncovering the root surface of the tooth.

- The **Plaque Index** (Sillness and Loe, 1964) evaluates the oral hygiene and records both soft debris and mineralized deposits on the 4surfaces of 6 teeth: 3 maxillary teeth (teeth number 16-12-24) and 3 mandibular teeth (teeth number 36-32-44), when available (not extracted or missing). Missing teeth are usually not replaced. However, since we expected a high number of missing teeth in elderly individuals, we replaced the missing teeth by the adjacent tooth of the same type (whether molar, premolar or incisor).

Each tooth surface was given a score from 0 to 3 and the scores of the 4areas were added then divided by 4to obtain the plaque index of the tooth. The total plaque index score was divided by the number of the teeth examined. The scores represent the following: [0: no plaque; 1: a film of plaque adhering to the free gingival margin and

adjacent area of the tooth. The plaque can be seen in situ by using the probe on the tooth surface; 2: moderate accumulation of soft deposits within the gingival pocket, or the tooth and gingival margin, which can be seen with the naked eye; 3: abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.]

- **Periodontal Screening and Recording (PSR) index** (American Academy of Periodontology, 1992) to help assess the periodontal health. Every tooth was screened individually but only the highest score in each sextant of the mouth was recorded. Those scores were then added and divided by the number of sextants assessed to yield the total PSR score. Six measurements for each tooth were taken. First, the pocket depth, then the furcation involvement, tooth mobility, muco-gingival problem and recession were noted when present. The results were coded as follows: [code 0: Pocket depth < 3.5 mm with no calculus or defective margins visible and no bleeding after gentle probing; code 1: Pocket depth < 3.5 mm with no calculus or defective margins visible but with bleeding after gentle probing; code 2: Pocket depth < 3.5 mm with calculus (sub or supra gingival) and/or defective margins visible; code 3: Pocket depth between 3.5 mm and 5.5 mm; code 4: Pocket depth > 5.5 mm; code *: can be added to any code obtained when there is furcation involvement or increased mobility or muco-gingival problems or recession of more than 3.5 mm].

- **Functional Unit Count (FU)** (Adiatman et al., 2013; Samnieng et al., 2011): Using the articulating paper, it consisted of counting the number of mandibular teeth involved in mastication. Every tooth represents a functional unit except for the molars, which are considered 2 functional units each.

2. The face-to-face interview

A questionnaire including 64 questions (of which 12 questions are from GOHAI and 8 from Epworth Sleepiness Scale) was administered, and took about 5minutes to complete for each interviewed participant. A copy of this questionnaire is shown in appendix 6. The questions were written using simplified straightforward and comprehensive language. The questions, developed in English and then translated to Arabic, assessed socio-demographic and socio-economic status; behavioral factors; health status; knowledge about oral care centers availability and cost in their area; participants' utilization of dental services, and their main reasons for doing so; and oral health behaviors encompassing dental hygiene habits, frequency of tooth brushing and frequency of visits to a dental office. Questions were inspired from the literature and based on our prior work in the field of dentistry (Chaaya et al., 2004; Karam, 2013; Hanna, 2013; Moukarzel, 2012). The detailed components were:

1- Socio-demographic information: age, gender, occupation, monthly income and education of individuals (highest educational level reached).

Age was recoded into a categorical variable "age groups" that contains the following categories: aged 65-70 years, 70-80 years, more than 80 years. As for monthly income, the highest two categories (1million-3 million LBP/ month & more than 3 million LBP/month) were lumped since they did not contain a lot of participants.

Oral health measures gathered from the interview included:

2- Data on dental services were assessed through the following measures:

a) Use of dental services. Two questions were included, one inquiring whether the respondent had sought dental treatment within the past year (yes/no) and if yes, the frequency of utilization (once per year, more than twice per year), and the reasons for

dental service utilization (regular check-up, preventive care or dental treatment, which included treatment of a single tooth (extraction, fillings, root canal, and crowns restorations) or more (bridge, implant, denture etc.). Using the above two questions, a third variable was created to categorize the elderly as: never seeking dental care, seeking preventive treatment, and seeking curative treatment (elderly who sought both preventive and curative care were considered as seeking curative treatment);

b) Knowledge of affordable dental care centers (Yes/No);

c) Willingness to use the less expensive centers (yes/no); if not, the reason behind this refusal.

3- Dental hygiene practices and behaviors (frequency of tooth brushing, use of dental floss and mouthwash, frequency of brushing the denture if applicable and the way of cleaning it).

4- Dietary habits (frequency of soda, coffee, alcohol and sugar intakes), and the participant's smoking status (both cigarettes and water-pipe). Dietary habit frequencies were recoded as follows: never, rarely/occasionally and frequently/daily.

5- Epworth sleepiness scale: previously validated in Arabic (Ahmad et al., 2014) this index is used to identify people with excessive daytime sleepiness. Since 84% of the patients with obstructive sleep apnea experience daytime sleepiness (Seneviratne et al., 2004), this questionnaire has been used to identify possible Obstructive Sleep Apnea (OSA) in patients (Rosenthal et al., 2008). It consists of 8 questions about the sleepiness experience of the participant in several conditions. The results were recoded as follows: elderly with a score of 0-10 represented the normal group, 11- 14 experienced mild sleepiness, 15-17 moderate sleepiness, and 18 or higher severe sleepiness.

6- Geriatric Oral Health Assessment Indicator (GOHAI): questionnaire aiming at assessing the self-perceived oral health of every individual; it consists of 12 items assessing pain, discomfort, physical and psychosocial functions. A version that has already been validated in Arabic and adapted to the Lebanese culture was used. (El Osta et al, 2012) The response scale is: always/very often, often, sometimes, seldom or never. The scoring can be either an addition of the weights given to each answer or a simple count of the items answered “sometimes”, “often” or “very often/always”. The interpretation for the count result basically reflects: the higher the score, the poorer the quality of life.

E. Ethical Considerations

The study was granted ethical approval by the International Review Board (IRB) at the American University of Beirut. All participants gave their consent before being included in the study. No cognitively impaired individuals were recruited. Therefore, all participants consciously consented before being included in the sample. Additionally, examining every single participant in a quiet and private room provided by the centers ensured privacy and confidentiality of the results. No identifiers were collected, besides the age/birth year; stressing on the confidentiality of the data collected. Furthermore, every senior recruited was given appropriate instructions and tips related to his/her specific dental status. All participants were provided with a list of centers providing affordable oral treatments, and those in need of treatment were referred to the center closest to their homes (see appendix 7). An IRB-approved flyer explaining in detail how to keep healthy teeth and take care of the oral cavity was distributed to all participants.

F. Statistical Analysis

The plan of analysis is described below per objective.

1. Describe the status of a wider range of selected oral health indicators as well as prevalence of dental care behaviors.

First, an exploratory data analysis was conducted for all variables. All continuous outcome measures were tested for normality and expectedly were not normally distributed (PSR, RCI, Roots exposed, Roots decayed/filled, FU, D, M, F, DMFT, total plaque index, number of sites with plaque index more than 2, upper anterior, upper posterior, lower anterior, lower posterior).

2. Assess differences in oral health status by selected socio-demographics, behavioral practices, general health status, quality of life, and sleepiness problems.

Non-parametric tests including the Mann-Whitney test or the Kruskal-Wallis test were used (depending on the number of categories of the predictor variables) when testing for bivariate associations with categorical covariates. When dental health outcomes (e.g., denture status) were of a categorical nature, a chi-square test was performed for the same bivariate associations with the categorical covariates. The bivariate association between each dental outcome was first examined with the socio-demographic variables, then with the dental hygiene practices and behaviors, and finally with the general health behaviors, ESS and the GOHAI.

3. Assess the prevalence and correlates of oral health treatment seeking.

Treatment seeking was analyzed in a bivariate way through a chi-square test with each oral health indicator separately, socio-demographics, dental hygiene practices and behaviors, as well as lifestyle-related behaviors.

Finally, a logistic regression analysis was conducted to model the treatment seeking behaviors with all the covariates that were associated with both dental care utilization and oral health status.

CHAPTER V

RESULTS

First the descriptive statistics pertaining to the socio-demographics and correlates are presented to describe the sample and set the stage for the main results. The results are then presented by objective.

A. Descriptive Statistics

1. Socio-demographics

All descriptive statistics related to socio-demographics are presented in Table D1.

The sample consisted of Lebanese elderly with an average age of 73 years (±7.03). Almost 40% of these seniors were between the ages of 71 and 80 years, while around a third were between 65 years and 70 years elders, and a quarter were aged more than 80 years. The sample included predominantly women (approximately70%). Around half the sample was widowed at the time of the survey, and less than a third never married. Two-thirds of the participants had reached primary education or less, but around 7% had reached college education. Most of the elderly reported residing with their children (34.94%) or alone (29.55%) at the time of the survey.

Around one fifth of them (18.75%) claimed that they were financially independent. Simultaneously, more than three quarters of the sample reported a monthly household income of 1 million Lebanese pounds or less, with two thirds of these earning less than 500,000 Lebanese pounds, which is a very close figure to the minimum wage in Lebanon. Less than 10% were employed, with half of these being paid a stable salary.

About a third (29.26%) reported having medical insurance, with a majority having Social Security coverage (38.83%) or being enrolled in a private insurance (33.98%). Finally, when assessing the reported medical insurance coverage vis-à-vis the Lebanese healthcare coverage system, 27 seniors (7.8% of the total sample) should be dentally covered (whether through Armed Forces or Public Servants Cooperation). However, only 16 out of these elders reported having a dental coverage.

2. General health and lifestyle-related behavioral practices

Table D2 displays the general health and lifestyle-related behaviors of the sample. Most of the elderly (90.06%) sampled in this study have reported at least one general health problem, mainly cardio-vascular (65.06%) and musculo-skeletal health conditions (53.13%).

Around 70% of the sample reported not smoking cigarettes (69.89%) and very few (4.26%) smoked water pipe; more than half (53.77%) of the current cigarette smokers at the time of the survey reported smoking half a pack or less per day. When considering diet, 49.44% reported that they consumed sweets frequently or daily, versus 28.98% for soda, 79.83% for coffee and 6.25% for alcohol. Most of the sample had a normal range of ESS scores, while 4.63% experienced severe daytime sleepiness. As for the quality of life, nearly half of the sample complained from a high burden of physical function impairment (46.82%).

3. Dental health: oral health indicators, oral health care seeking patterns, dental hygiene practices and knowledge of and attitude towards dental health

a. Oral health status

The oral health indicators are summarized in table A1.1, and represent the findings pertaining to the first objective of describing the oral health status of the sampled elderly.

The elderly surveyed had on average 19.6 missing teeth, with a median of 26 and a functional units count of 7.5 (median=8), which is considered as non-functional (less than 20 functional units). Moreover, the maximal functional unit count was 22.

The periodontal status was reflected by a mean PSR score per sextant of 1.01 (median 0.5) and a plaque index of 1.96, which was close to its median (median=2). Three quarters of the sites had a plaque index score of 2 or less.

As for decays, the root caries ratio was on average 0.3; however, the median RCI was null. The range of the RCI was very wide [0;1]. As for the coronal caries, when considering both decayed and filled teeth together, an average of 3.75 teeth per person were either decayed or filled (median=0).

Most of the remaining teeth were mandibular teeth, more so anterior than posterior teeth. As for the maxilla, the count of remaining teeth was equal, whether anteriorly or posteriorly (2.05 remaining teeth on average, but median equal to zero). The anterior teeth consisted of incisors and canines.

Finally, in terms of denture wearing pattern, most of the participants wore dentures (54.83%), more having complete than partial dentures (39.77% and 15.06% respectively). As for edentulism, 80.68% were considered edentulous, defined as having less than 21 remaining teeth. Out of those, 25.00% had unrestored edentulism.

b. Oral care seeking within the past year

Findings pertaining to past-year dental care utilization are presented in table A1.2, and represent partial results for Objective 3. Three quarters of the sample had not visited the dentist within the past year. The main two reasons given were the lack of perceived need for dental treatment and the cost of the treatment.

Among those who had sought care, only a third had seen a dentist more than once in the preceding year. Half of them had visited a private clinic and a quarter had visited a dispensary offering oral care services. Three quarters of those seniors had sought care for preventive dental services (for a regular check-up and/or a cleaning session). Around half of those who had sought care paid the dentist out of pocket, while a third enjoyed a free session of dental services, and the majority (75.00%) reported being satisfied or very satisfied from their dental visits.

c. Dental hygiene practices and behaviors

The results pertaining to this section are presented in table A.1.2. Among elderly who reported wearing dentures, one third reported cleaning the denture after each meal while half of them cleaned it daily. When doing so, most of them used water, toothbrush and toothpaste. About 10% used special denture cleanser, and 20% of the sample used detergent (ranging from regular soap to chlorine bleach). Most (54.40%) slept with their dentures.

As for the dentate seniors, only a tenth cleaned their natural teeth 3 times per day, with around 20% who never cleaned them. They mostly used their toothbrush with water and toothpaste in order to clean their teeth. Those who used mouthwash, floss or any other supplementary products to clean their teeth, were very scarce.

d. Knowledge of and attitude towards dental health

When asked about knowledge on affordable dental services, half of the sampled elderly were aware of these centers, with half of this group not visiting them because of a lack of perceived need to visit them or the cost still being high. Nearly 2/3of the sample (59.38%) reported that oral health was more than or as important as general health. Among those, only 8.24% thought that oral health was a priority when compared to general health.

B. Correlates of Oral Health Problems among the Elderly

Section B concerns the findings of objective 2, which explores the association between each of the oral health indicators/problems and selected socio-demographics (age, gender, education, monthly household income…), behavioral practices (smoking, diet…), general health status, quality of life, and sleeping problems (Epworth Sleepiness Scale).

1. Differences by socio-demographics

The results are expressed in terms of means and standard deviations, as well as medians and sums of ranks for continuous variables, and numbers and percentages for categorical variables. Non-parametric tests and their respective p-values were performed when data were not normal. For covariates with more than two categories, when the Kruskal-Wallis test revealed a significant result, pair wise comparisons, using a Mann-Whitney test with a Bonferroni correction, were performed in order to identify the categories that were significantly different.

a. Gender

When assessing the different oral health indicators by gender, the functional unit count, as well as the filled teeth, were significantly higher in females compared to males. As for the plaque index, it was borderline significant with higher plaque indices within males. When coupled with the counts of remaining teeth in all areas of the mouth (maxillary and mandibular anterior and posterior teeth) that were lower in males, it seems that oral health was somewhat better among females versus males (Tables A2.1 and A2.21).

b. Age

The only indicator that was statistically significantly different among the three age groups was the number of remaining mandibular anterior teeth. This number decreased with age and was particularly different between those aged 65-70 years (4.52) and those aged more than 80 years (2.94). However, while not significantly different, there also seemed to be a pattern of reduction in periodontal indices (PSR and plaque index) with age, accompanied by the increase of the DMFT and specifically the number of missing teeth when age group increased. This might be affected by the number of observations that are higher in lower age groups: since missing teeth increase with age, the number of natural teeth assessed for the periodontal status are lower in older people, and therefore, the numbers are affected (Tables A2.2 and A2.21).

c. Education

Differences by education are displayed in tables A2.3 and A2.21. Education seems to be a very important factor in discriminating oral health status, particularly root

caries index, the functional unit count, the DMFT with all its components except for the number of decayed teeth, the count of maxillary anterior and posterior teeth, as well as that of mandibular posterior teeth, were significantly associated with the highest educational level achieved. These variables differed with education as follows: for RCI, those who had reached college had lower scores than all the other groups except for those illiterate and those who reached secondary education; on the other hand, seniors who reached secondary education also had lower RCI scores than all the others except for those who reached college level. As for the functional unit counts, college attendants had a higher count than all the others except elders with a secondary education level. Moreover, the number of present teeth was lower for illiterate seniors when compared to seniors who reached primary education, at the level of the upper anterior and posterior segments and the lower posterior segment. The numbers of upper anterior and posterior remaining teeth, along with the DMFT score, were also lower for illiterate seniors versus college attendees.

Overall, better oral health status was observed with a higher educational level. Additionally, the denture-wearing status was significantly different with education: the higher the education achieved, the more likely the senior was to keep his/her natural teeth versus wearing a denture.

d. Employment status

All indices related to oral health status were not found to be statistically significant with employment, probably because of the very low number of employed elderly in this sample (8.24%) (Tables A2.4 and A2.21).

e. Household monthly income

Tables A2.5 and A2.21 include differences by household monthly income. Financial status, translated by the monthly household income, was significantly associated with the RCI, the functional unit count, the DMFT and all its components, the plaque index as well as the number of remaining maxillary anterior and mandibular posterior teeth: these significant differences suggest a better oral health status with a higher monthly income. In fact, the differences between elders with a monthly income less than 500,000 LBP/month and those with more than one million LBP per month were noted concerning RCI, DMFT, plaque index, FU, lower posterior and upper anterior teeth. As for the differences between seniors with an income lower than 500,000 LBP/month and seniors with an income ranging between 500,000 LBP and one million LBP per month, they involved plaque index. Comparing seniors with a monthly income of more than 1 million LBP and those with an income ranging between 500,000 LBP and 1 million LBP, the functional unit count was found to be statistically significantly different.

2. Differences by dental hygiene practices and behaviors

a. Perception of oral health

When comparing seniors by their perception of oral health compared to general health, differences were noted between elders who perceived that oral health was less important than general health, and those who thought that both oral and general health carried the same importance: these differences in terms of missing and filled teeth, as well as DMFT score and number of remaining teeth (upper and lower, anterior and posterior), revealed a better oral health status among those who gave equal priorities to

both oral and general health. Although only borderline significant, the FU count also yielded similar results (Tables A2.6 and A2.22).

b. Frequency of denture cleaning

In terms of denture cleaning frequency, oral health indicators were similar along the different denture cleaning frequency groups (Table A2.7).

c. Pattern of sleeping with dentures

Only the PSR score was higher among those who do not sleep with their dentures (2.9), when compared to seniors who sometimes sleep with their dentures (0.72). No other difference in oral health status was noted (Table A2.8).

d. Frequency of natural teeth cleaning

As for the frequency of dental cleaning, seniors who cleaned their teeth less than once per day (irregularly or never), had more missing and filled teeth, lower FU counts, more roots decayed or filled, higher plaque index score, less upper anterior and posterior remaining teeth, as well as lower posterior than both those who cleaned their teeth once or twice per day and those who did so three times per day. Additionally, remaining anterior lower teeth, PSR score and the number of exposed roots were worse among those who cleaned their teeth once or twice daily, when compared to seniors who did so three times per day. No differences were noted between the former group and those who did not clean their teeth daily. Finally, the RCI score was higher among those who did not clean their teeth daily (0.42) versus those who did so three times per day (0.04) (Table A2.9).

e. Awareness of affordable dental services

No differences were noted in oral health status between seniors unaware of affordable dental services, those who knew about them but did not visit any, and those who actually visited these dental care centers (Tables A2.10 and A2.22).

3. Differences by lifestyle-related behaviors

a. Cigarette smoking

In terms of cigarette smoking, the status of the senior was a predictor of the root caries index, the missing and filled teeth as well as the total DMFT, the total plaque index and the remaining teeth (maxillary and mandibular anterior and posterior teeth) as follows (Tables A2.11 and A2.22).

The difference between past smokers and smokers at the time of the survey showed higher DMFT, higher plaque index, and lower number of upper anterior and posterior teeth, as well as less lower anterior and posterior teeth for current smokers. Further differences showed higher RCI scores as well as less upper anterior and posterior teeth remaining in the current smokers versus the never smokers (Tables A2.11 and A2.22).

b. Water pipe smoking

Whether smoking water pipe or not, the seniors seemed somewhat similar when it comes to oral health status. This might be related to the very low number of water pipe smokers in the sample: only 15 out of the 352 elderly smoke water pipe (Tables A2.12 and A2.22).

4. Differences by dietary habits

a. Soda Consumption

Soda consumption frequency significantly affected the number of missing teeth, filled teeth, remaining maxillary teeth present and denture wearing status.

In fact, those who never consumed soda had less missing teeth, more filled teeth and more upper posterior and anterior teeth remaining when compared to those who consumed soda frequently/daily. Additionally, higher plaque index and less upper anterior teeth were visible among seniors who consumed soda frequently/daily when compared to those who did so rarely/occasionally. The results yielded by this analysis showed that the higher the frequency of soda consumption, the poorer the oral health status (Tables A2.13 and A2.22).

b. Sweets Consumption

The frequency of sweets consumption did not seem to be related to oral health status (Tables A2.14 and A2.22).

c. Coffee consumption

As for coffee drinking frequency, only the number of present maxillary posterior teeth was borderline significantly lower in daily (3.65) compared to occasional drinkers (5.5) (Tables A2.15 and A2.22).

d. Alcohol consumption

Regarding the frequency of alcohol consumption, the oral health status was similar across all groups. However, only 7 persons drank alcohol frequently or daily, versus 91 who never did (Tables A2.16 and A2.22).

5. Differences by General Health status

a. Systemic Conditions

When comparing elders who had at least one general health problem to those free of comorbidities, only the number of decayed teeth was significantly higher among the seniors who had at least a systemic problem (2.99 versus 1.35). No other indicator was different with the presence or absence of systemic conditions (Tables A2.17 and A2.22).

The number of comorbidities did not seem to affect the oral health status of the seniors, since no index was significantly different among those groups (Tables A2.18 and A2.22).

b. Epworth Sleepiness Scale

The only oral health indicator that was significantly different between the various ESS scores was DMFT. The difference was significant among elders who experienced mild sleepiness and those with severe sleepiness. The latter seemed to have a better DMFT score according to those results (24.33 compared to 18.91) (Tables A2.19 and A2.22).

6. Differences by oral health-related quality of life (GOHAI)

Tackling quality of life through the highest component constituting a burden in the GOHAI yielded the following results, presented in tables A2.20 and A2.22:

Those who had a high burden of physical function tended to have more missing teeth, less filled teeth, lower functional unit counts, a higher DMFT score, as well as less teeth remaining in all segments (maxillary and mandibular anterior and posterior regions), when compared to those whose components carried the same burden.

As for seniors with physical function issues, they had more missing teeth, less filled teeth and less teeth remaining in maxillary anterior and posterior regions, as well as mandibular posterior region, when compared to those who experienced pain and/or discomfort.

Filled teeth were also lower among elders with physical issues (2.49) versus those with psychosocial problems (4.45), and missing teeth were higher in those with psychosocial issues (11.55) versus those with pain/discomfort (9.65).

Finally, quality of life was also related to the denture wearing pattern: most of seniors who complained from pain or discomfort did not wear dentures (61.54%), while those who experienced a high burden of physical function impairment tended to wear more complete dentures (44.44%). As for psychosocial issues and worries, they were more common among those who did not wear dentures (53.45%).

C. Dental Care Seeking Behavior

In the following section, we will be discussing the bivariate analysis of dental care seeking pattern with socio-demographics, oral health status, dental hygiene practices and behaviors, lifestyle-related behaviors, dietary habits, general health status

and quality of life. Utilization of dental care will be looked upon as a dichotomous variable first, indicating seeking or not seeking care. Then, it will be considered as a categorical variable with three categories (not seeking care, seeking preventive care and seeking curative care).

Regression analysis considering all correlates will be discussed in section D.

1. Differences by socio-demographics

Looking at utilization as a dichotomous variable, education and general health coverage plan were found as two significant predictors. Seniors with higher educational levels, as well as those covered medically by any kind of insurance, sought care more than their counterparts. Although not significant, income was higher among those who utilized dental services within the past year, versus those who did not (Table A3.1.0).

When exploring this seeking behavior further, it can be deduced that those who sought treatment for a preventive reason had a higher educational level and a higher household monthly income than those who did so for a curative reason, or those who did not seek oral care. The presence of a medical insurance scheme was borderline significant among these groups (Table A3.1.1).

2. Differences by oral health status

When treatment seeking behavior was analyzed with oral health indicators, missing teeth, filled teeth, DMFT, total plaque index, upper anterior and posterior teeth as well as lower posterior teeth, were significantly better in those who sought treatment within the last year (Table A3.2.0).

When treatment seeking was explored into more details, taking into account the type of dental visit, the following differences were found: more missing teeth, less filled teeth, less upper anterior teeth remaining, as well as upper and lower posterior teeth present, were found in elders who did not seek oral treatment, versus those who sought preventive treatment on one hand and curative on the other hand. However, no difference was noted between curative and preventive treatment seekers (Table A3.2.1).

3. Differences by dental hygiene practices and behaviors

The oral health perception by seniors in regards to their general health was significantly different among those who sought oral care, compared to those who did not: in fact, the former tended to perceive oral health as equally or more important than general health. The same was found for the frequency of natural teeth cleaning and the awareness of the presence of affordable dental services in dispensaries or university-based centers: those who sought care within the past year were more aware of affordable oral care, and usually cleaned their teeth more frequently than those who did not seek oral care (Table A3.3.0).

The same variables carried the same prediction pattern when considering those who did not seek care, those who sought preventive care, and those who sought curative care within the past year (Table A3.3.1).

4. Differences by lifestyle-related behaviors

Regardless of the way we looked at the oral health care seeking behavior, lifestyle-related behaviors were not statistically different among the seniors.

5. Differences by dietary habits

No habit related to soda, sweets, coffee or alcohol consumption was associated to dental care seeking behavior, whether this behavior was considered as a dichotomous or categorical (with 3 categories) variable.

6. Differences by general health status

The general health of the seniors was not found to predict oral care utilization of the elders. In fact, neither the presence of at least one systemic problem nor the number of comorbidities present was related to seeking care pattern.

7. Differences by oral-health related quality of life

The quality of life of the seniors played a role in their decision and/or motivation to visit the dentist, with elders who complained from pain or discomfort being more prone to seeking oral care, whether curative or preventive (Tables A3.4.0 and A3.4.1).

D. Oral health as a predictor of dental care seeking patterns: a detailed exploration

1. Dental care utilization as a binary outcome: treatment seeking versus non treatment seeking

a. Association between each oral health indicator and treatment seeking

In this section, the results of three main models will be presented. Model 1 examined associations between each oral health indicator and treatment seeking. Model 2 adjusted for socio-demographics and model 3 further adjusted for dental hygiene-related factors and behaviors and lifestyle-related behaviors.

When modeling treatment seeking with each oral health indicator separately and controlling for socio-demographics, we noted that a higher total plaque index and DMFT score, as well as wearing a complete denture (versus a partial denture),were all related to lower odds of treatment seeking. In addition to that, a higher number of remaining teeth in all regions (upper anterior and posterior, and lower anterior and posterior)was found to be associated with increased odds of treatment seeking: similar numbers were found for all the regions yielding an increase of around 30% in the odds of treatment seeking with every additional tooth present, while all other variables in the model were held constant (Table A4.1).

When we further adjusted for dental hygiene practices and behaviors, as well as lifestyle-related behaviors, only upper anterior and posterior teeth remained positively related to treatment seeking, while wearing a complete denture (versus partial) continued to be negatively associated with treatment seeking (Table A4.1).

b. Oral health indicators and treatment seeking: examining independent effects, controlling for significant covariates

To assess which indicators remained independent predictors adjusting for different covariates, model 4 included all the oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, denture status) in the same model. Socio-demographics were added in model 5, and dental hygiene-related factors and behaviors, as well as lifestyle-related behaviors, were added in model 6.

Since denture status cannot be part of the same model as plaque index and RCI scores, the same models were repeated for DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index; and were named models 7, 8 and 9 respectively.

When all the oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and denture status) (models 4,5 and 6) were included in the same model to explore which of the oral health indicators would continue to predict treatment seeking, only complete denture wearing remained statistically significantly negatively associated with treatment seeking, whereby the odds of treatment seeking was 70% less among those with a full versus partial denture (Table A4.2). This continued to be true even after adjusting for socio-demographics. Worth noting is that in this model, elderly with medical insurance were twice as likely to seek care as those who were not medically covered (Table A4.2).

However, after further adjusting for dental hygiene practices and behaviors and lifestyle-related behaviors, aside from complete denture wearing retaining its prediction pattern of seeking treatment, DMFT score regained significance as a positive predictor of dental care utilization [suggesting that one of the added correlates may have been a negative confounder]: the odds of treatment seeking were 10% higher with every unit increase in the DMFT score, holding all other variables constant. In this model, awareness of affordable dental care, perception of oral health importance relative to general health and income, were also significantly related to treatment seeking (Table A4.2). In fact, those aware of affordable dental care had 183% higher odds of seeking care than their counterparts. Similarly, elders who perceive that oral health was less important than general health, had 65% less odds of utilizing dental care than others. Finally, when comparing seniors with an income between 500K LBP and 1 M LBP (versus seniors with an income lower than 500K LBP), the former had138% higher odds of seeking treatment

In the following section, the oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index) were modeled together to predict treatment seeking (models 7,8 and 9) (Table A4.3).

Oral health status was not related to treatment seeking pattern. When controlling for socio-demographics, only medical insurance was significantly related to oral health utilization, with those covered by an insurance scheme being twice as likely as those not having any insurance plan to seek dental care (Table A4.3).

However, after controlling for socio-demographics, dental hygiene practices and behaviors, and lifestyle-related behaviors, medical insurance lost its significance while frequency of tooth cleaning at home, perception of oral health, as well as awareness of affordable oral care services, were significantly related to treatment utilization (Table A4.3).

In summary, perceiving oral health as less important than general health was related to 64% less odds of seeking oral care. Additionally, those who cleaned their teeth once or twice a day were 3.32 times more likely to seek care than elders who cleaned their teeth less than once a day. Finally, knowing about affordable dental care services was related to 216% increase in the odds seeking oral care (Table A4.3).

2. Treatment seeking detailed exploration: preventive versus curative and no oral treatment utilization

a. Association between each oral health indicator and detailed treatment seeking

When trying to predict treatment seeking detailed patterns, compared to preventive treatment seeking, a higher RCI score corresponded to less curative treatment care seeking, regardless of the controlling factors (socio-demographics, dental hygiene practices and behaviors, as well as lifestyle-related behaviors). In fact,

unadjusted RRRs of RCI revealed 73% lower risks of seeking curative rather than preventive oral care services. This number reached 93% for each adjusted model (Table A4.4).

Besides, comparisons between seniors who did not seek oral care and those who did for preventive reasons yielded the following results: higher DMFT scores, along with complete denture wearing as opposed to partial denture wearing, were associated with higher risk ratios of no treatment seeking: every unit increase in the DMFT score yielded a 10% increase in the risk of not seeking treatment. As for complete denture wearing, the risk of not utilizing oral care, when compared to those wearing a partial denture, was 11 times higher (Table A4.4).

On the other hand, a higher number of upper and lower anterior and posterior teeth was significantly related to less negligence in terms of dental visits (around 25% decrease in the risk of not seeking oral care with every additional tooth present).These trends were similar, whether socio-demographic characteristics were included or not. However, when lifestyle-related behaviors as well as dental hygiene practices and behaviors were included in the model, only complete denture had the same significant prediction, and RCI gained significance in being negatively associated with avoiding dental visits (with a RRR of 0.16 and 95% CI of: 0.03,0.94) (Table A4.4).

b. Oral health indicators and detailed treatment seeking: examining independent effects controlling for significant correlates

Only complete denture wearing retained its association with the lack of treatment seeking when the following oral indicators were included together in the model (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and

denture status), with or without socio-demographic variables (models 4,5 and 6) (Table A4.5).

However, when dental hygiene practices and behaviors and lifestyle-related behaviors were added, no variables were significant predictors of avoiding dental care utilization except for awareness of affordable dental services and income (Table A4.5): seniors aware of affordable dental services had an 80% decrease in the risk of not visiting the dentist. As for seniors with an income between 500K LBP and 1M LBP, their risk of neglecting dental visits was 0.47 that of seniors with an income lower than 500K LBP. Although only borderline significant, those who had an income higher than 1M LBP were also more likely to seek preventive care (rather than not seeking care at all) than those who had an income lower than the minimum wage (Table A4.5).

When oral health indicators consisted of DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index placed together, with or without socio-demographics, treatment seeking differences between those who utilized preventive care and those who did not seek care at all were not related to any covariate in these models (models 7,8 and 9). Only RCI was close to being significant: with higher RCI, there were lower risk ratios of neglecting dental care utilization (Table A4.6).

When dental hygiene practices and behaviors and lifestyle-related behaviors were added, the above-mentioned relationship between RCI and treatment seeking became significant, with those who had a higher RCI score associated with a ten-fold increase in the relative risk of seeking preventive care compared to not seeking care within the past year. Moreover, awareness of affordable centers was related to a

significant decrease in avoiding the dentist during the past year rather than seeking him/her for preventive care (RRR=0.25 and 95%CI [0.07,0.96]) (Table A4.6).

In instances where curative care was sought compared to preventive services, the only significant predictor was RCI with a lower risk of seeking curative care for those with higher RCI (Table A4.6). The unadjusted risk of seeking curative care rather than preventive care was 84% lower with every unit increase in RCI score. When adjusting for socio-demographics with or without dental hygiene practices and behaviors as well as lifestyle-related behaviors, this risk was 96% lower with every unit increase in RCI score.

Controlling for the following oral indicators together (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and denture status), no indicator was related to care utilization (neither curative nor preventive) (Table A4.5).

However, when socio-demographics were incorporated in the model, with or without dental hygiene practices and behaviors as well as lifestyle-related behaviors, only income was significantly associated to this pattern difference in seeking oral care. In fact, those with an income of 1M LBP or more (versus less than 500K LBP) had a 93% lower RRR of seeking curative oral care rather than preventive services (Table A4.5).

CHAPTER VI

DISCUSSION

Prior to discussing the findings, we present the study limitations and offsetting strengths so that the results are interpreted with the latter in mind.

A. Strengths and Limitations

1. Strengths

Oral health of Lebanese community-dwelling urban elders is not extensively documented. In fact, studies pertaining to Lebanese seniors have focused either on the institutionalized elderly (Doumit et al., 2014) or on rural seniors (Boulos et al., 2013; Boulos et al., 2014). As for the researchers who have studied community-dwelling seniors, they have gathered their samples from a general health care seeking population (hospital or dispensary-based studies) (El Hélou et al., 2014; El Osta et al., 2014; El Osta, Tubert-Jeannin, et al., 2012). The only study that has focused on community-dwelling urban non-care seeker elders was a pilot study with a sample of only 51 older adults (Farhat-Mechayleh et al., 2011) and the latter focused mainly on denture-related measures.

The present study has gathered extensive data with a primary objective of describing, in detail, the status of oral health in the urban Lebanese geriatric population. The indices used encompass the DMFT score, the plaque index, the RCI, a periodontal assessment of the mouth, as well as a detailed schematic view of the mouth. These indices were not looked upon in the previously mentioned study. The wealth of data

available from this study makes it the first detailed investigation of oral health among a large diverse sample of community-dwelling urban elderly in Lebanon.

This study is also the first to assess the oral treatment seeking behavior of Lebanese seniors. A major strength of this study is the fact that it distinguishes between regular dental patients (preventive, check-up) and curative dental patients, especially in the Greater Beirut and Mount Lebanon areas where the sample was recruited.

Although the sampling was not a probability-sample technique, the large sample size and the heterogeneity of the sample in terms of geographic location within Beirut and Mount Lebanon, make it possible to carefully generate some conclusions about urban Lebanese seniors. The seniors were recruited from non-discriminating social organizations and can therefore represent the population of community-dwelling elders.

The Decision Making Competency test that was performed prior to the consent process, along with the face-to-face interview, ensured that all older adults included in the study had healthy cognitive capabilities. The vulnerability of our population was handled by using very short questions and a process of no longer than 15 minutes, encompassing both the dental examination and the questionnaire.

As for the data collection process, the oral health assessment was calibrated by a professional dentist before going to the field. This reinforces the validity of the results obtained.

2. Limitations

Despite diversity, the sample was recruited from a region extending to a radius of 25km around Administrative Beirut. Centers that had a dentist on staff and that

refused to be part of this study might include seniors with a different oral health status if the dentist is available and affordable to all the organization attendants. The generalization of the results to all the Lebanese seniors requires a national approach that would extend to all the Lebanese territory.

Also, after analysis of the sample characteristics, it can be confirmed that this population consists of urban seniors who have a low-income and somewhat low-educational level, mainly depending on their children or on charity, and who consider that their income is insufficient. However, compared to national estimates, our sample had a higher educational and financial status than Lebanese seniors aged 65 years and above (Central Administration of Statistics - Lebanon, 2005, 2009). Therefore, generalization of the results to all community-dwelling urban Lebanese seniors should be done with caution. The strategy of sampling from social organizations would not allow the capturing of higher income elderly individuals. An alternative strategy would have been to recruit a population-based sample via a household survey. However, this is not to say that seniors with a higher economic status have better oral health than the seniors included in this study: in fact, the difference might reside in the treatment seeking and affordability of the problem rather than its presence. Wealthier elders might replace their teeth more frequently when they lose them and/or use more expensive treatment options such as implants rather than dentures, but this does not mean that the number of missing teeth and the DMFT score are not similar. The only variable indicator might be the functional unit count, hinting to a possible better functionality and esthetics of the mouth among richer seniors.

Moreover, around one third of the sample live alone, higher than the 12% such fraction in 2009 (Abdulrahim et al., 2012). Even if we take into account the time gap

between that study and ours, as well as the increasing youth emigration in the last years, our results are still slightly high. This might be related to the sampling: people who are surrounded by family and live with their children/sibling do not usually go to social organizations unless they need the offered food and other provided services.

Some of the collected data might be subjected to the recall bias such as the time since cigarette smoking cessation and the number of visits to the dentist within the past year.

The social desirability bias is also a potential risk: for example, a senior with diabetes may have a hard time acknowledging his/her high consumption of sweets. Another example of this bias is related to the importance attached to oral health: knowing that the research team consisted of two dentists, the seniors may be more prone to answering that they perceive oral health to be at least as important as general health, when in reality they might not.

The household monthly income figure may not be accurate, especially in instances where the senior is financially dependent on a different source (children, siblings, companion…). As for the cases where the elders claim financial independence, this information should be interpreted with caution, especially when the seniors are widowed or retired: their expenses might be covered by inheritance from their late husband/wife or from their retirement fund. These elderly are different than those who are independent while still working to cover their expenses, or those who own some real estate properties that bring regular income and have done so for a long time.

Despite the vast list of oral health indicators, other prevalent conditions such as xerostomia and oral cancer were not assessed to avoid burdening the seniors with a longer examination process. Also, no measures related to the oral treatment status and to

the quality of the dental work performed in the mouth of these seniors were gathered, since it was not the objective of our study.

B. Summary of the Findings

The findings can be summarized as such:

1. Oral health of elderly

The study found that the elderly had a high number of missing teeth with a low functional unit count, yielding a non-functional occlusion. As for the remaining teeth, they were mostly in the mandible, more specifically anterior teeth. In addition to that, the wearers of complete dentures outnumbered those using partial dentures and those not using any denture. Finally, the periodontal status of the elderly in the sample was rather acceptable (low score of PSR and low plaque index).

2. Correlates of oral health

The study noted the following: a better oral health status is related to a higher educational level, a higher income level, a positive perception of oral health (as equally or more important than general health), more frequent dental cleaning, and a lower soda consumption rate. Finally, seniors with a predominant physical function problem had a worse oral health status than those with a predominant psychosocial function problem, who themselves had a poorer oral health status than the rest of the sample.

3. Treatment seeking: status and correlates

It can be deduced that only a quarter of the sample sought dental care (either because they didn't perceive a need to do so, or because the treatment was deemed

expensive). Among those who sought care, around three-quarters did so for curative purposes. Finally, more treatment seeking was related to awareness of dental care centers, a higher income (between 500K and 1M LBP per month), more frequent dental cleaning, medical insurance coverage, and a positive perception of oral health (as equally or more important than general health). However, less treatment seeking was related to wearing a complete denture.

C. Our study findings vis-à-vis published literature: how do we compare?

1. The status of oral health among the elderly

After assessment of the oral health status of this population, it seems that the major burden of oral health problems lies within the missing teeth. This finding is in line with the national and global literature that focuses mainly on missing teeth as the burden of oral conditions (Arrivé et al., 2012; Behbehani & Scheutz, 2004; Polzer et al., 2010). Our results yield an edentulism rate of 54%, which is close to the 41.2% found by Farhat-Mechayleh et al. (Farhat-Mechayleh et al., 2011). This rate is in between that of Petersen et al. and El Helot et al. (El Hélou et al., 2014; Petersen, 2004). The former does not mention the methodology in his study, while investigation of the design of the latter points out its hospital-based setting as a probable reason for the differences in results. When exploring in detail the number of remaining teeth, it is found that 21.59% of the seniors in our sample have at least 20 teeth present. This is way lower than the millennium goals set by the World Dental Federation (FDI), who recommended that by the year 2000, at least 50% of older adults aged 65 years and above should have no less than 20 teeth remaining (Gaio et al., 2012). To be below this goal by the year 2015 speaks volumes about the poor oral health status of this Lebanese low-income

population of community-dwelling seniors. In addition to this, the rate of unrestored edentulism among those with less than 20 remaining teeth is quite high (25.72%). This fraction is close to the corresponding numbers found by El Helou et al. and El Osta et al. (21% and 22%, respectively) but still lower than the 33% reported by Fahat Mechayleh et al. (El Hélou et al., 2014; El Osta, Tubert-Jeannin, et al., 2012; Farhat-Mechayleh et al., 2011).

As for the decayed and filled teeth, the numbers (3.75) are close to the international numbers, namely those from France (4), Madagascar (5.7) and China (2.5) (Arrivé et al., 2012; Hong-Ying et al., 2002; Petersen et al., 2004). They are also in line with the numbers from the region: in Saudi Arabia, a sample of institutionalized seniors had a mean DFT score of 2.5 (Al-Shehri, 2012), while in Lebanon, the number of decayed and missing teeth was collected by El Osta et al., with a mean number of 3.32 decayed teeth and 17.8 missing teeth (El Osta, Tubert-Jeannin, et al., 2012). When comparing our results to theirs, the sample in our study has less decayed teeth (1.51) but more missing teeth (19.6). Therefore, the difference in decayed teeth might be due to the higher numbers of missing teeth in our sample. We can assume that in our sample, teeth severely decayed were lost or extracted while in theirs, they might have been kept and were still present at the time of their examination (El Osta, Tubert-Jeannin, et al., 2012). The level of decay is quite acceptable among elders, especially when considering the high number of missing teeth.

In all the performed analyses, the number of mandibular anterior teeth seems higher than all other teeth. From a clinical point of view, this might be due to the lower anterior teeth being shielded from most oral problems in view of their position.

Finally, the lack of statistical significance in terms of RCI between elders who reached college education and those illiterate warrants more investigation.

2. ***Determinants of oral health problems***

No differences were noted in our results between males and females in terms of oral health problems except for the higher FUs in females. This is at odds with the international and regional literature that describes gender differences in oral status (Al-Shehri, 2012; Boulos et al., 2013; Gaio et al., 2012). This difference warrants further investigation.

As for age, its relationship with oral health problems has been extensively reported and it mainly involves tooth loss, periodontal diseases and root caries (Gaio et al., 2012; McQuistan et al., 2015; Polzer et al., 2010). This difference with our results might be due to the low number of older seniors in our sample.

Additionally, we found an important relationship between oral health and education of the seniors: the more educated elders experience a better oral health. This is in line with the international studies that established this link (Palmqvist, Söderfeldt, Vigild, & Kihl, 2000; Shah & Sundaram, 2004). Besides, the association with income is also present in our sample, and is in line with other articles that describe poorer oral health status for lower economic status populations (Palmqvist et al., 2000; Shah & Sundaram, 2004).

As for dental hygiene practices, when pertaining to dentures, they do not affect the oral health status as they do when involving natural teeth: more frequent cleaning of natural teeth leads to better oral health. The latter result is logical and well known among clinicians and lay people. However, the lack of significance related to denture cleaning frequency highlights the need for more studies with a higher sample size,

focusing mainly on the denture cleansing behavior among seniors, especially that a Cochrane review revealed a lack of consensus when it comes to denture care and hygiene practices (de Souza et al., 2009).

In terms of smoking behavior, oral health indicators reveal a poor status among current cigarette smokers when compared to past smokers and never smokers. These results are supported by the literature, more so when countries with tobacco control policies are assessed (Gaio et al., 2012; Petersen, 2004).

When it comes to dietary behavior, the major predictor of oral health issues in our sample is soda consumption: it is well known among clinicians that oral health problems are related to the consumption of free sugars and acidic beverages (Moukarzel, 2012). However, this information is not well spread among the general population. As for the lack of significance associated with sweets, it might be due to the very small sample size of seniors who never consume sweets (n=32).

As for general health, no differences were found between those with at least one comorbidity and those who were completely healthy, except for the number of decayed teeth, which is lower among healthy seniors. This is not corroborated by the literature, while most of the articles pertaining to oral health and general health inter-relationship identify associations between those two aspects. This difference with our results might be due to very few seniors being completely free of comorbidities (n=35) (Bricker et al., 2001; Castrejón-Pérez et al., 2012; Furuta et al., 2013; Weening-Verbree et al., 2013).

Finally, the GOHAI highest burden is related to oral health problems. To our knowledge, no study has related the highest burden of GOHAI to oral health in the elderly.

3. ***Oral care seeking behavior***

When asked about oral health services utilization, only 23.86% of the sample sought care within the past year. This is lower than most numbers in the world, mainly those from the US (Ahluwalia, Cheng, Josephs, Lalla, & Lamster, 2010; Wall et al., 2012). Our number is close to the Polish number, which is the lowest in Europe, although in Poland, unlike Lebanon, oral care is covered by social insurance contributions (Listl, 2011). It should be noted that the European numbers pertain to seniors aged more than 50 years and maybe of a wider representation of socio-economic groups. Taking into account that dental care seeking decreases when age increases, our seniors should be close to the Greek elders, who share our out-of-pocket mode of payment for dental care services.

Among elders who sought care, 26% did so for a regular check-up and/or a cleaning session. Although lower than the Danish and Swedish numbers and higher than the Polish, Greek and Spanish rates, our results are in line with those of numerous European countries such as Ireland, Austria and Belgium (Listl, 2011). Our numbers are also much higher than those in China, where 0.8% of treatment seekers do so for preventive reasons (Wu et al., 2005).

When taking into account the objective for the year 2000 in the United States, 60% of elders aged 65 years and above should receive dental care on a yearly basis. This is way higher than the 23.86% found in our study. Along with the established relationships in the literature between oral health and general health(Bricker et al., 2001; Kandelman et al., 2008; Polzer et al., 2010), and between oral health and malnutrition (Adiatman et al., 2013; Boulos et al., 2014; El Osta et al., 2014; Furuta et al., 2013; Kikutani et al., 2013), this issue is alarming and should be addressed as soon as

possible. In fact, neglecting oral health does not only affect the mouth, it also has repercussions on the entire health status of the individual.

Determinants of oral care seeking that surface from our study are education and income, as well as medical insurance. The first two determinants have been extensively described in the literature (Holm-Pedersen et al., 2005; Wu et al., 2005). As for medical insurance, it can be a proxy for awareness (those more aware in terms of medical treatments tend to be more aware in terms of oral treatments too). The same can be assumed when it comes to the frequency of dental cleaning..

Additionally, oral health indicators reveal a better status among those who sought oral treatment within the past year, when compared to those who did not utilize oral services. Moreover, awareness of affordable dental services and perception of oral health as at least as important as general health, are more common among seniors who utilized dental care within the past year. Finally, those with pain and discomfort visited the dentist more frequently than their counterparts. Subsequently, when checking the final regression models pertaining to treatment seeking during the previous year, income, medical insurance, perception of oral health, awareness of affordable dental services, denture status, as well as frequency of dental cleaning, are related to treatment seeking behavior. These factors have been previously mentioned in this section and are in line with the literature.

CHAPTER VII

CONCLUSION AND RECOMMENDATIONS

Looking at the big picture, community-dwelling urban Lebanese seniors, particularly those with a low-income as showcased by our sample, have a high number of missing teeth (including around 40% who experience complete edentulism), as well as low functional unit counts. However, decay levels, along with periodontal status (reflected by plaque index and PSR scores) are quite acceptable.

In terms of dental care utilization, less than a quarter of the sample sought oral care within the past year, the majority of which visited the dentist for curative reasons. When assessed in detail, this treatment seeking behavior is related to income, medical insurance, awareness of affordable oral care services, and perception of oral health relatively to general health, dental cleaning frequency and the pattern of denture wearing.

Subsequently, an increase in awareness about the importance of oral health and about available affordable dental care services might incite the seniors to seek oral treatment more frequently. In addition, the importance of regular dental brushing and the need to seek regular professional oral services, even among elders with complete dentures, should be stressed.

The high burden of oral health problems, as well as the oral care-seeking patterns and determinants in the elderly, call for an urgent intervention from policy makers and governmental parties.

First, in order to overcome the financial burden of dental care, and in view of the Lebanese medical coverage system, providing dental insurance seems the main step

towards improving the oral health status of the population. However, this plan will most likely take time before it is fully adopted, and even then, is not very probable to include seniors, mostly those with a low income. Indeed, the several law projects addressing medical coverage and pension/social protection which have already been submitted (but not adopted) do not even tackle dental coverage: for example, on December 19, 2004, a legislation by then-President Emile Lahoud was proposed to Parliament but did not receive much support(Collective for Research on Training and Development- Action, 2013). As for other drafts, they mainly include a project by the Lebanese Economic Association (Rached, 2012) and another by the International Labor Organization(Collective for Research on Training and Development- Action, 2013). The former entails that the Government would pay a monthly pension to seniors who are not supported by any other means (i.e. excluding all Government and military pensioners, as well as those covered by syndicates). This is the only such proposal which does not require the seniors to contribute a certain share; it costs the Lebanese Republic an average of 542 million USD per year (which corresponds to 3.6% of our national budget)(Rached, 2012). As for the draft from the ILO, it proposes a contribution shared by the employer and the employee, and a minimum pension amounting to 75% of the minimal wage. However, this draft does not include any health coverage to seniors (because the Ministry of Public Health was supposed to be working on a similar project), neither does it benefit seniors who were not previously working (mainly females)(Collective for Research on Training and Development- Action, 2013).

Additionally, more action is needed: for example, as shown by Arrivé et al., French seniors had at least one health insurance plan but did not always regularly seek care (Arrivé et al., 2012). Therefore, it is important to also act on other fronts, in order

to solve this public health issue. Actions can aim at treating or preventing oral health problems, or both.

A. Actions with a mixed goal: prevention and treatment

1. At the organization/community level

- One action would be to include a dentist on staff in social organizations, even in dispensaries, with specific days allocated for geriatric dentistry.
- Seniors are not the only ones involved: dentists should be motivated to treat the elderly. Increasing the focus on the geriatric dental problems in all dental schools, and creating a geriatric dentistry specialty, would improve the clinical competencies of those practitioners and prepare them to treat problems specific to older populations, such as missing teeth, unstable dentures, xerostomia and oral cancer, among others.
- Moreover, integrating oral health in the medical care instructions through physicians and geriatric specialists would be beneficial to the elders. Highlighting the importance of regular dental visits and appropriate care of the mouth would increase the seniors' awareness and remind them to seek care at least every year. Additionally, physicians can be asked to perform a basic examination of their patients' mouth and refer them according to their observations and/or their patient's complaints.

2. At the national level

- The Lebanese Dental Association can also help by requiring dentists to deliver dental instructions and oral care services to seniors in social organizations and/or nursing homes as part of a continuing education requirement.

- In addition, delivering dental services for free, as well as dental screenings at least on a yearly basis, could be part of a national campaign established by the Ministry of Public Health. If this option is not financially possible, the delivery of dental services, as well as dental instructions on hygiene and care seeking behavior, should be incorporated in all the campaigns pertaining to general health conditions (such as diabetes, osteoporosis, cardio-vascular diseases…) targeting older individuals aged 65 years and above. Oral health and general health are indeed intertwined, and there is no reason why they should be separated.

- The oral health status of the community-dwelling elderly being alarming, we can assume that the homebound and non-ambulatory seniors, whether institutionalized or not, have at least the same burden of oral diseases. Therefore, delivering ambulatory dental services is also a tool worth exploring, either freely by means of regular visits, or through establishing a hot number for those seniors to call in case of any emergency problem.

- Furthermore, the primary healthcare centers established by the Ministry of Public Health and Social Affairs, as well as university-based centers that offer oral care, should be promoted through the media. Information about these centers, as well as fees and appointment times, should be widely disseminated to GP practices, pharmacies, day centers, libraries and community groups of older people (Borreani et al., 2008).The packages offered for people who attend the above-mentioned Ministerial Primary Healthcare Centers could include dental care products such as toothbrushes, toothpastes and denture cleansers. The same could be established for other dispensaries and university-based center that offer dental care services at more affordable rates.

B. Action that aims at treating oral health problems

- Establish awareness campaign that would force the senior to react to his/her oral problems: these campaigns should address the resignation of the elders in terms of dental problems, and reinforce the idea that oral problems are not part of the natural ageing process (Gaio et al., 2012), and that oral health care utilization is essential to maintain a healthy mouth.

C. Actions that aim at preventing oral health problems

1. At the organization/community level

- Incorporating oral health-related instructions in workplaces, as well as establishing retirement plans in the workforce, would help prevent further oral health problems for the next generation of seniors. However, it should be noted that the majority of younger cohorts of women entering in the old age have never worked (85.7%) (Sibai et al., 2004). Therefore, they would not benefit from this recommendation except indirectly, in case they are dependent upon the income and benefits of a male breadwinner. This is why NGOs should have to focus more on non-working women in their approaches to promote dental care in seniors.

- Additionally, when seniors know that oral health problems can be prevented, they might be more motivated to seek dental care (McQuistan et al., 2015). Awareness campaigns can also target the families of these seniors (children and/or nephews…), as well as these elderlies' caregivers, in order to improve daily oral care and dental hygiene practices, whether through encouraging them to use the right equipment (toothbrush/toothpaste) or through reminding them of the ideal frequency and methods of cleaning teeth and dentures. Finally, it should be clarified that a pain-

free mouth is not necessarily a healthy mouth. Therefore, waiting for pain and discomfort is not the ideal way to handle oral health problems. This emphasizes the importance of seeking care by means of regular check-ups and access to preventive services.

2. At the national level

- Besides, incorporating smoking-related oral health issues in the anti-tobacco campaign might be a good idea to disseminate the fact that smoking also affects the mouth. Dentists can even be involved in the campaign aiming at reducing cigarette smoking.

- Using the media to lobby the restaurants and the food industry so that they place cautionary dental labels on their products, might help in increasing awareness in terms of dietary habits detrimental to oral health. Reducing the taxation on fluoride-based toothpastes (exempting them from the taxation related to cosmetic products) and increasing it on acidic beverages and foods rich with sweets, would also help in controlling the dietary aspect of the problem.

- Finally, the best way to solve a problem is to prevent it in the first place by establishing national guidelines that consist of giving the necessary information for individuals at an earlier age and emphasizing the need to seek professional care on a regular basis would greatly help the future generations of elderly in Lebanon in avoiding the issues that were addressed in this study (Kiyak & Reichmuth, 2005).

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APPENDICES

Appendix 1: Literature review of oral health status among Lebanese elderly				
Survey year	**Sample age groups**	**Place of sampling**	**Findings**	**Reference**
2014	70 years and above	Hospital in Beirut	70% of the sample had complete edentulism. 21% of those who need a denture did not wear any. 25% of those wearing dentures reported a poor fit. 55.6% of the sample needed dental care. No relationship between oral health and nutritional status. Only poor GOHAI scores were associated to nutritional deficit.	(El Hélou et al., 2014)
2014	60 years and above	Nursing homes in Lebanon	Seniors were asked whether they had an oral problem: 55.7% reported that they did.	(Doumit et al., 2014)
2013	65 years and above	National rural sample	Seniors were asked about: chewing problems, total or partial loss of dentition and wearing dental prosthesis: 28.4% had chewing problems; 66.1% were partially or totally edentulous; 47.2% wore dentures. Differences with gender: more females were edentulous and more females wore dentures. Differences with cognitive function: Chewing problems, edentulousness and wearing dentures were more common in cognitively	(Boulos et al., 2013)

2014	years and above	National rural sample	edentulousness and denture wearing) was significantly associated with poor nutritional status.	(Boulos et al., 2014)
2011	60 years and above	Social organization in Beirut	41.2% had complete edentulism and 43.1% had poor oral hygiene. No differences were noted among those with or without dentures. 92.1% had prosthetic and dental needs. 33% of those with total edentulism did not have any restoration. Only 30 seniors had natural teeth: 20% had periodontal problems and 60% had severe decays.	(Farhat-Mechayleh et al., 2011)
2012	65 years and above	Dispensaries in Beirut	The majority of the sample was dentate (63%) with at least 21 teeth present. Among the edentulous, 22% had no denture. Mean number of missing teeth: 17.8; decayed: 3.32; Functional Unit: 4.7. 31.6% reported having fair/poor oral health; 34.5% were dissatisfied or very dissatisfied with their oral health; 68.4% had xerostomia and 16.5% felt TMJ pain during the last 3 months.	(El Osta, Tubert-Jeannin, et al., 2012)
2014	65 years and above	Dispensaries in Beirut	Malnutrition was related to : -Fewer FU - Unrestored edentulism/ less than 21 teeth without denture; -Higher xerostomia perception; -Poorer OHRQoL (GOHAI).	(El Osta et al., 2014)

Appendix 2: Decision Making Competency Test

تاريخ المقابلة

الموافقة بعد ما استمارة	الجواب الصحيح	العلامة
ما هو الموضوع قيد الدراسة؟	صحة الفم والأسنان	
ما هو هدف الدراسة؟	تقييم صحة فم وأسنان اللبنانيين البالغين من العمر 65 عام وما فوق	
ما المطلوب منك كمشترك؟	اجراء مقابلة مع طبيب أسنان والخضوع لفحص أسنان قصير مع طبيب أسنان	
هو ما الوقت الاجمالي المطلوب للمشاركة؟	نصف ساعة تقريباً	
هل المشاركة تسبب اي خطر عاطفيا ومادي يتخطى مخاطر الحياة اليومية؟	كلا	
هل المشاركة طوعية؟	نعم	
اذا اردت، متى تستطيع ان تنسحب من الدراسة؟	في اي وقت	
هل تحتاج لسبب للانسحاب من الدراسة؟	كلا	
هل الانسحاب من الدراسة يؤثر على علاقتك بالجامعة الاميريكية في بيروت باي شكل من الاشكال؟	كلا	
هل الانسحاب من الدراسة يؤثر على رعايتك الطبية في المستقبل بأي شكل من الأشكال؟	كلا	

هل يمكن ربط المعلومات الشخصية الخاصة بك بالنتيجة باي شكل من الاشكال؟	كلا. المنشورات وعرض البيانات تكون مجهولة المصدر.	
كيف يمكن المحافظة على السرية؟	البيانات التي تعرف عن الشخص سوف تحفظ في مكان امن	
اين يمكن ان تجد رقم للاتصال في حال كان لديك اي سؤال؟	في استمارة الموافقة المسبقة	
اين يمكن ان تجد رقم للاتصال في حال كان لديك اي شكاوى عن حقك كمشارك؟	في استمارة الموافقة المسبقة	
مجموع العلامات المحاولة الاولى المحاولة الثانية المحاولة الثالثة		

العلامة 1 لكل جواب صحيح (المجموع 14)

في حال الفشل في تحقيق النتيجة المرجوة بعد كل محاولة، الشخص الذي يجري المقابلة سوف ينفذ الاجراءت التعليمية (يتم أعادة شرح المواد بالتفصيل للمشارك الذي يعاني صعوبة في فهم مضمون الاستمارة) لتحقيق النتيجة المرجوة. كل مشارك يحق له ثلاث محاولات. العلامة الكلية يجب أن تكون 100% صحيحة.

Appendix 3: List of centers used for the recruitment of the elderly sample (N=352)				
Organiza-tion	**Location**	**Mission/Services offered**	**Number approached**	**Number recruited**
Restaurants du Coeur	Nabaa	NGO with a mission to feed and distribute food to the elderly and the poor	15	9
Ayadina	Nabaa	NGO that works on improving life standards at many levels by engaging in multiple projects such as social projects aiming at occupying the elderly (playing cards or backgammon) as well as providing some services including lunches, animations and other activities.	47	40
Ajyalouna	Tallet El Khayyat	NGO with a program for the elderly that provides free of charge medical treatment to its participants.	44	37
Al Omr Al Madid	Corniche Al Mazraa	Center from the "Dar Al Aytam", NGO, created to help the elderly overcome loneliness and boredom by keeping an active social and cultural life through conferences or cultural and touristic activities	20	19

Primary Healthcare Center affiliated with the Ministry of Public Health and Ministry of Social Affairs	Bourj Hammoud	The Ministry of Social Affairs in coordination with the Ministry of Public Health launched dispensaries and dental clinics to improve the health status of the Lebanese population	21	20
Archbisho-pric of Christians following the Roman Orthodox rite	Ashrafieh	Religious center that provides free lunch for elderly individuals twice a week	12	12
Baytouna	Mar Mkhayel	NGO that offers food and activities to its attending older individuals	23	19
Women of Charity	Achrafieh (Karm El Zeitoun)	NGO that organizes some activities for senior participants as well as medical care at very low rates.	21	20
St Francis Center	Hamra	NGO that presents some social and intellectual activities for the attending elderly, ranging from bridge to scrabble	13	11

Caritas Darouna	Badaro	NGO that offers healthcare services, free lunch and breakfast to help neighboring senior individuals	24	19
St Antonios church	Furn El Chebbak	Offers food and care for the elderly individuals who attend this church.	23	21
Restaurant of Mar Mkhayel	Mar Mkhayel	NGO that delivers free lunches to geriatric people who are not able to afford food	8	6
Caritas Oasis	Sahel Alma	NGO offering healthcare services along with free lunch to seniors.	30	21
Kibarouna	Haret sakher	Offers lunch, snacks and social activities for seniors.	21	16
Basma	Badaro	NGO that takes care of elderly by offering social services and food and by having less expensive healthcare treatments	7	6
St Phoca church	Ghadir	Provides seniors with lunch and social activities	26	23
St Joseph Dispensary	Damour	Dispensary that offers healthcare services less expensive than private practitioners.	11	11

Cannes et Coeur	Jounieh	NGO that helps elderly overcome their boredom with social activities and have a twice-a-year campaign of medicine, clothes and food distribution to the nearby seniors	29	20
House of Hospitality	Jounieh	NGO that offers weekly lunch to elderly individuals	25	22

Appendix 4: Consent form

تقييم صحة الفم والأسنان لدى المسنين اللبنانيين البالغين من العمر ٦٥ عام أو أكثر في منطقة مدنية لبنانية

موافقة للمشاركة في بحث علمي:

الباحث الأساسي: الدكتورة ليليا نغندور، الجامعة الأميركيّة في بيروت

مرحبا"؛ اسمي ساندره العنداري. أنا طبيبة أسنان مقيمة في قسم تقويم الأسنان و الفكّين في المركز الطّبّي في الجامعة الأميركيّة في بيروت. أنا أيضاً طالبة دراسات عليا في علم الأوبئة والصحة العامة في الجامعة الأميركيّة في بيروت. أود طرح دراسة نقوم بها من الممكن أن تختار(ي) المشاركة بها. هذا البحث يهدف الى تقييم صحة الفم والأسنان لدى الأفراد البتالغين من العمر٦٥عام أو أكثر.

قبل أن أبدأ، أود شرح كيف سيتم التعامل مع المعلومات المحصلة من هذه الدراسة. في حال تود (ين) أن تشارك(ي) في الدراسة سيتم فحص فمك وطرح بعض الأسئلة عليك.

ان هذا البحث هو جزء من أطروحتي في الجامعة الأمريكية في بيروت وقد يقدم أطباء الدراسة هذه المعلومات أو ينشرونها ولكن من دون ذكر أية أسماء فيها.

سوف نقوم بكل ما هو ممكن من أجل الحفاظ على سرية المعلومات التي نحصل عليها. سوف يتم تدوين وتخزين هذه المعلومات في مكان لا يصل إليه أحد سوانا. الأشخاص الآخرون الذين قد يرون هذه المعلومات هم المسؤولون عن كافة الدراسات في الجامعة الأميركية في بيروت الذين يدققون فيما إذا كانت الدراسة تتم بشكل صحيح. في حال تم التدقيق في المعلومات من قبل جمعية الأخلاقيات، سنحرص على الحفاظ على سرية تامة لهذه المعلومات..

ان المشاركة في هذا البحث قد تستغرق 25 دقيقة تقريباً. سوف يشارك في البحث حوالي الـ350 شخص من جمعيات/مؤسسات في بيروت الكبرى وهم: أيادينا، العمرالمديد، أجيالنا، مستوصف وزارة الشؤون الاجتماعية في برج حمود وفي البوشرية مطرانية الروم الأرثودكس، نادي مارفرنسيس، سيدات المحبة، رابطة أبناء الكنيسة، مطعم مار مخايل، بيتنا، المركز

الاجتماعي للرعاية بالطفل والأمومة، رعية مار انطونيوس، كاريتاس- دارنا، كاريتاس-اوازيس، بيت الضيافة، رعية مار فوقا، كبارنا، مستوصف حارة صخر وغدير والدامور ، جمعية مار منصور، جمعية بسمة، جمعية قلب يسوع، رعية مار جاورجيس، جمعية "Canne et Coeur" و"مطاعم القلب" أو بالفرنسية "Les restaurants du Coeur".

لا خطر اطلاقاً في هذا البحث، وفي حال شاركت فيه سيتم فحص وتقييم صحة فمك وأسنانك مجاناً. عند الحاجة، سيتم احالتك الى أحد المراكز المجاورة لطب الأسنان. سوف يوزّع لك معجون أسنان مجاناً ونشرة اعلانية تشرح لك كل المعلومات المتعلقة بالمحافظة على أسنانك وصحّة فمك. لن يتم دفع أي أجر لك بالمقابل عن مشاركتك في البحث.

في حال عدم ارادة الاجابة على بعض الأسئلة في أي وقت خلال البحث، يمكنك تخطي هذه الأسئلة. في حال قررت التوقف عن المشاركة، فضلا أعلم(ي)ني بهذا الأمر. ان أردت أخذ استراحة في أي وقت خلال البحث، يمكننا التوقف لبعض الوقت لتأمين راحتك أو يمكننا اكمال الخطوات المتبقية في وقت آخر، أو يمكننا توقيف المشاركة نهائياً اذا أردت.

إن مشاركتك في هذه الدراسة هي طوعية. لا يتوجب عليك المشاركة في هذه الدراسة إذا كنت لا تريد(ين) ذلك. كما يمكنك أن تتوقف(ي) عن المشاركة ساعة تشاء/تشائين. وقرار كهذا لن يؤدي إلى أية مضاعفات أو عقاب كما أنه لن يؤدي إلى فقدان الحسنات التي تتمتع(ين) بها الآن. إذا كانت لديك أية أسئلة عن البحث يمكنك أن تسأل(ي)ها الآن. في حال أردت الاستفهام لاحقاً عن الدراسة، يمكنك الاتصال بالدكتورة ليليان غندور، قسم علم الأوبئة والصحة العامة في الجامعة الأميركية في بيروت، على الرقم التالي:

961 1 350000+ مقسم 4643 أو ارسال بريد الكتروني على عنوانها التالي: lg01@aub.edu.lb

يمكنك أيضاً الاتصال بي على رقمي الخاص:03-768167 أو من خلال البريد الالكتروني على عنواني الخاص:sa172@aub.edu.lb ان كان لديك أي أسئلة حول حقوقك في البحث هذا، يمكنك الإتصال بـ: لجنة الأخلاقيات 01-350000 (مقسم5454) السيدة لينا الأنسي .

الإتفاقية للمشاركة في الدراسة:

إن توقيعك في الأسفل يعني أنك قرأت المعلومات السابقة حول البحث وتسنى لك أن تطرح(ي) الأسئلة للتوضيح لك ما يجب القيام به من أجل المشاركة في هذه الدراسة. كما أن توقيعك يعني أنه تم إبلاغك أنه بإمكانك تغيير رأيك لاحقا إن شئت. سوف يتم إعطاءك نسخة من هذه الإتفاقية/الموافقة. بتوقيعك على هذه الموافقة لن تتنازل(ي) عن أي حق من حقوقك القانونية.

_____ _____

توقيع المشارك(ة) التاريخ والوقت

بيان الباحث:

لقد اطلعت على الموافقة للبحث هذه وعلى مخاطر وفوائد هذا البحث مع المشترك(ة)

وقد أجبت على كل الأسئلة التي طرحت علي كما أني أتعهد باعلام المشترك(ة) عن أي تغيير قد يحصل في هذا البحث.

اسم الباحث والامضاء

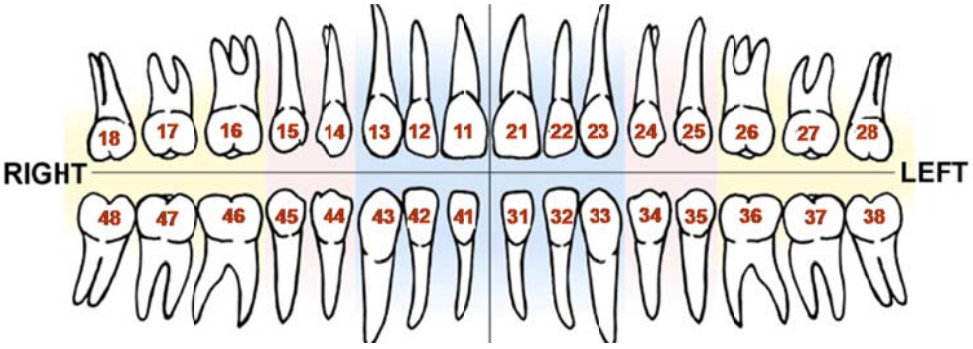
التاريخ

(إسم الشاهد) إذا كان المشترك أمياً توقيع الشاهد

التاريخ والساعة

Appendix 5: Clinical examination sheet

Participant ID:



DMFT:

D:

M:

F:

RCI:

Number of exposed teeth (sound, decayed or filled):

Number of roots decayed or filled:

Plaque Index:

16:

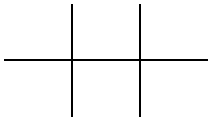
12:

24:

36:

32:

44:

PSR: 

FU:

Appendix 6: Arabic version of the questionnaire administered to the seniors					
تاريخ الولادة		العمر:			D1
الجنس	1.ذكر	2. انثى			D2
الوضع العائلي	1. متزوج	2. مطلق	3. أرمل	.4أعزب	D3
مستوى اعلى شهادة علمية	1. لا يجيد القراءة والكتابة	2. يجيد القراءة والكتابة	3. ابتدائي	4.متوسطي	D4
	5. ثانوي	6. جامعي			
هل تعيش (في غالب الأحيان)	1.لوحدك	2. مع شريك(ت)ك	3. مع (أحد) أولادك	4. مع (أحد) اخوتك\أخواتك	D5
اقتصاديا، هل تعتبر نفسك	A. مستقل	1. نعم	2. لا		D6
	B. معتمد على (أحد) أولادك	1. نعم	2. لا		
	C. معتمد على شريك(ت)ك	1. نعم	2. لا		
	D. معتمد على (أحد) اخوتك\أخواتك	1. نعم	2. لا		
	E. معتمد على مصدر آخر				
اجمالي الدخل العائلي الشهري	500,000 ل.ل. (1)	من 500,000 ل.ل الى ٩٩٩,٩٩٩ ل.ل(2)	من 1,000,000 ل.ل الى 3,000,000 ل.ل.(3)	أكثر من 3,000,000 ل.ل. (4)	D7

هل تعتقد دخل العائلة يكفي لسد احتياجاتكم الأساسية من مأكل، مشرب أو طبابة؟	1. لا يكفي	2. بالكاد يكفي	3. يكفي	4. يكفي ويزيد	D8
هل تعمل حاليًا؟	1. نعم، دوام كامل	2. نعم، دوام جزئي	3.ابحث عن عمل (D11 (الانتقال الى	4. لا اعمل حاليًا (الانتقال D11) الى	D9
	5. D11) متقاعد(الانتقال الى	6. ربة منزل (الانتقال D11) الى			
هل تؤمن لك وظيفتك دخلاً ثابتاً	1. نعم	2. لا			D10
هل لدى العائلة أي ضمان صحي	1. نعم	2.لا O1) (الانتقال الى			D11
ما هو نوع الضمان او مصدره	A. صندوق الضمان الوطني الاجتماعي	1. نعم	2. لا		D12
	B. تاونية موظفي الدولة	1. نعم	2. لا		
	C. ضمان الجيش	1. نعم	2. لا		

	D. ضمان قوى الامن الداخلي	1. نعم	2. لا		
	E. ضمان وزارة الصحة	1. نعم	2. لا		
	F. ضمان خاص	1. نعم	2. لا		
هل يغطي ضمانك الصحي علاج الاسنان	1. نعم	2. لا			D13

كيف تقيم مشاكل الأسنان مقارنةً مع غيرها من المشاكل الصحية؟	1. تزيد أهميتها عن أهمية المشاكل الصحية الأخرى	2. تقل أهميتها عن أهمية المشاكل الصحية الأخرى	3. تعادل أهميتها أهمية المشاكل الصحية الأخرى		O1
هل لديك طقم أسنان؟	1. كامل 6(تخطيO8-O)	2. غير كامل	3. كلا (O) الانتقال الى6		O2
كم مرة تنظف طقم أسنانك؟	1.لا أنظف طقم أسناني	2. نا.درا ما أنظف طقم أسناني (مرة أو أقل في الأسبوع)	3. فيمراتبضعة الاسبوع	4. أنظف طقم أسناني يوميا لكن ليس بعد كل وجبة طعام	O3
	5. أنظف طقم أسناني يوميا بعد كل وجبة طعام				
عندما تنظف طقم أسنانك، تستخدم:	A.المياه	1. نعم	2. لا		O4
	B.فرشاة الأسنان	1. نعم	2. لا		
	C.معجون الأسنان	1. نعم	2. لا		
	D.معقم الطقم	1. نعم	2. لا		
	E.غسول الأسنان	1. نعم	2. لا		
هل تنام مع طقم أسنانك	1. نعم	2. لا	3. أحياناً		O5
كم مرة تنظف أسنانك؟	1.أقل من مرة يوميا	2.مرة أو مرتين يوميا	3.ثلاث مرات يوميا		O6
في أي وقت من النهار، تنظف أسنانك؟	A.في الصباح	1. نعم	2. لا		O7
	B.في المساء	1. نعم	2. لا		
	C.بعد الطعام	1. نعم	2. لا		
	D.غير ذلك، حدد	1. نعم	2. لا		

عندما تنظف أسنانك، تستخدم:	A.فرشاة الأسنان	1. نعم	2. لا		O8
	B.المياه	1. نعم	2. لا		
	C.معجون الأسنان	1. نعم	2. لا		
	D.مسواك\سواك	1. نعم	2. لا		
	E.غسول الأسنان	1. نعم	2. لا		
	F. الخيط	1. نعم	2. لا		
	G.غير ذلك، حدد	1. نعم	2. لا		
متى زرت طبيب الأسنان لآخر مرة؟	1. لم أزر أي طبيب أسنان في حيا تي	2. منذ أكثر من سنة	خلال السنة الماضية 1(الانتقال O1) الى		O9
ما هي الأسباب التي منعتك عن زيارة طبيب الأسنان؟	A.لم أكن بحاجة إلى طبيب أسنان	1. نعم	2. لا		O10
	B.غلاء تكاليف علاج الأسنان	1. نعم	2. لا		
	C.عدم معرفتي بوجود عيادة لطبيب أسنان أو مركزاً لمعالجة الأسنان في منطقة سكنك	1. نعم	2. لا		
	D.صعوبة وصولك إلى عيادة طبيب الأسنان أو إلى مركز معالجة الأسنان	1. نعم	2. لا		
	E.أسباب أخرى: حدد(ي)				

خلال العام الماضي كم مرة زرت طبيب الأسنان؟	[ ]مرة	(O11a لا 99. أذكر(استطلاع	فقطO11a1. مرة واحدة	2. أكثر من مرةO11a	O11
أين زرت طبيب الأسنان خلال العام الما ضي؟	1.مستوصف	2. مركز طب أسنان في احدى الجامعا ت	3. مركز اجتماعي لطب الأسنان	4.عيادة خاصة	O12
الرجاء إختيار الخدمات التي قدمت لك في زيارتك الأخيرة لطبيب الأسنان	A.فحص مراجعة	1. نعم	2. لا		O13
	B.تنظيف الأسنان الوقائي\علاج أمراض اللثة دون جراحة	1. نعم	2. لا		
	C.علاج يقتصر على سن واحد: قلع سن	1. نعم	2. لا		
	D.علاج يقتصر على سن واحد: حشوة سن	1. نعم	2. لا		
	E.علاج يقتصر على سن واحد: علاج اللب	1. نعم	2. لا		

		F.علاج يقتصر على سن واحد: علاج تلبيس سن	1. نعم	2. لا	
		G.علاج لا يقتصر على سن واحد: تلبيس جسر	1. نعم	2. لا	
		H.علاج نقص في الأسنان: طقم أسنان جزئي جديد	1. نعم	2. لا	
		I.علاج نقص في الأسنان: طقم أسنان كامل جديد	1. نعم	2. لا	
		J.علاج نقص في الأسنان: تصحيح طقم أسنان جزئي	1. نعم	2. لا	
		K.علاج نقص في الأسنان: تصحيح طقم أسنان كامل	1. نعم	2. لا	
		L.علاج تقويم الأسنان	1. نعم	2. لا	

	M.علاج المفصل الصدغي	1. نعم	2. لا		
	N.زرع سن\أسنان	1. نعم	2. لا		
	O.جراحة فم: ازالة كيس في الفم\الأسنان	1. نعم	2. لا		
	P.جراحة فم: ازالة سرطان في الفم	1. نعم	2. لا		
	Q.جراحة فم: خزعة	1. نعم	2. لا		
	R.جراحة فم: زراعة لثة\عظم	1. نعم	2. لا		
	S.أسباب أخرى: حدد (ي)	1. نعم	2. لا		

من تحمل تكاليف العلاج خلال زيارتك الأخيرة لدى طبيب الأسنان؟	1.انا شخصياً	2.أحد أولادي	3.أحد الأقارب	4.غيره حدد	O14
ما كانت كلفة العلاج خلال زيارتك الأخيرة لدى طبيب الأسنان؟	[ ] USD\ ل.ل.	99.لا أذكر (استطلاع)	1. مجاناً	< 10,000 LL(2)	O15
	10,000-50,000 LL(3)	50,000-100,000 LL(4)	>100,000 LL(5)		
لأي حد كنت راض(ية) من زيارتك لدى طبيب الأسنان \ من العلاج الذي تلقيته؟	1. راض(ية) جدا 8(O1) الانتقال الى	2.راض(ية) 8(الانتقال O1) الى	3.راض(ية) الى حد ما	4.غير راض(ية)	O16
ما الأسباب التي أدت الى استيائك؟					O17
هل تعلم أن هناك مراكز/عيادات أسنان تقدم خدمات اقل كلفة من عيادات الأسنان الخاصة؟	1.نعم حدد(ي) أسماء المراكز التى تعرف(ين)ها: ---------- ---------- ---------- ---------- -------	2. لا H1) (الانتقال الى			O18

هل قمت بزيارة أحدى هذه المراكز؟	1. نعم (H1) الانتقال الى	2.لا			O19
ما هو سبب عدم زيارتك لهذه المراكز؟	A.تكاليف العلاج مرتفعة بالنسبة لي (لا استطيع تحمل الكلفة)	1. نعم	2. لا		O20
	B.عدم تصنيف صحة الفم كأولوية	1. نعم	2. لا		
	C.لا تؤمن هذه المراكز نوعية علاج جيدة	1. نعم	2. لا		
	D.بعد مسافة هذه المراكز عن منزلك	1. نعم	2. لا		
	E.تجربة سيئة سابقة في أحد هذه المراكز	1. نعم	2. لا		
	F.أسباب أخرى: حدد(ي)				

هل تم تشخيصك بأحد هذه الأمراض المزمنة؟	A.الغدد الصماء: حدد(ي)	1. نعم	2. لا		H1
	B.القلب\الأوعية الدموية: حدد(ي)	1. نعم	2. لا		
	C.الجهاز التنفسي:حدد(ي)	1. نعم	2. لا		
	D.الجهاز الهضمي:حدد(ي)	1. نعم	2. لا		
	E.سرطان: حدد(ي)	1. نعم	2. لا		
	F.الجهازالنفسي \المعرفي \العقلي: حدد(ي)	1. نعم	2. لا		
	G.العضلات والعظام: حدد(ي)	1. نعم	2. لا		
	H.غيرها من الأمراض: حدد(ي)	1. نعم	2. لا		
هل تدخن السيجارة؟	1.كنت أدخن السجائر لكني أبطلت هذه العادة	2.أدخن السجائر حالياً (الانتقال الى H4)	3. لم أدخن السجائر في حياتي (الانتقال الى H5)		H2
منذ متى توقفت عن تدخين السجائر؟	سنة[ ] (الانتقال الى H5)				H3
تقريبا كم عدد السجائر التي تدخن(ين)ها يومياً؟	١-١٠سجائر(1)	١١-٢٠سجائر(2)	أكثرمن٢٠سجائر(3)		H4

هل تدخن(ين) الأرغيلة؟	1.نعم	2.لا(H7) الانتقال الى			H5
ما هو نمط تدخين الأرغيلة الاسبوعيف	١-٧أراغيل(1)	٨- ١٤أراغيل(2)	أكثرمن١٤أراغيل (3)		H6
كم مرة	1.أبداً	2.نادراً ما	3.أحياناً (أقل من مرة في الأسبوع)	4.تكرارا (أكثرمن مرة في الأسبوع)	5.يومياً (عدد المرات يومياً)	H7
تأكل(ين) السكاكر\ الحلويات	□	□	□	□	□	A
تتناول(ين) المشربات الغازية	□	□	□	□	□	B
تتناول(ين) القهوة	□	□	□	□	□	C
تتناول(ين) الكحول	□	□	□	□	□	D

مقاس إبيورث: مافرصه حدوث إغفاءه في اي من الحالات التاليه:					***Epworth Sleepiness Scale*** Chance of dozing in any of the following situations
عدد مرات الحدوث				الوضعية	Situation
دائما	غالبا	نادرا	ابدا		
3	2	1	0	خلال الجلوس والقراءة	Sitting and reading
3	2	1	0	خلال مشاهدة التلفاز	Watching TV
3	2	1	0	الجلوس هادئا في الاماكن العامة (مثلا: في مسرح او غرف الانتظار او اثناء الاجتماعات)	Sitting inactive in a public place ((e.g. a theater or a meeting)
3	2	1	0	الجلوس كراكب في سفر لمده ساعه من غير توقف	As a passenger in a car for an hour without a break
3	2	1	0	خلال التمدد للراحه بعد الظهر اذا سمحت الضروف	Lying down to rest in the afternoon when circumstances permit
3	2	1	0	خلال الجلوس والتحدث مع شخص اخر	Sitting and talking to someone
3	2	1	0	خلال الجلوس هادئا بعد الغداء	Sitting quietly after a lunch without alcohol
3	2	1	0	في السيارة اثناء التوقف نتيجه الزحام لعده دقائق	In a car, while stopped for a few minutes in traffic
				المجموع	

مؤشر تقييم صحة الفم في الأشهر الثلاثة الماضية GOHAI

الرجاء الإجابة على الأسئلة التالية عبر وضع علامة في المربع المناسب

١ـ هل شعرت *خلال الأشهر الثلاثة الماضية* أنّ مشاكل أسنانك أو طقم أسنانك تحدّ من تناولك الطعام من حيث النوعيّة أو الكميّة ؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

٢ـ هل عانيت *خلال الأشهر الثلاثة الماضية* من صعوبة في مضغ بعض أنواع الطعام القاسي كاللحوم، التفاح أو الجنارك؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

٣ـ هل شعرت *خلال الأشهر الثلاثة الماضية* بعدم الارتياح في البلع ؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

٤ـ هل شعرت *خلال الأشهر الثلاثة الماضية* أن أسنانك أو طقم أسنانك منعتك من التحدث كما تريد؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

٥ـ هل شعرت *خلال الأشهر الثلاثة الماضية* بانزعاج عند تناولك أي نوع من الطعام ؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

٦ـ هل شعرت *خلال الأشهر الثلاثة الماضية* أن مشاكل الأسنان، اللثة أو طقم أسنانك تحدّ من علاقاتك مع الناس؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

٧ـ هل شعرت خلال الأشهر الثلاثة الماضية بعدم الرضى من مظهر فمك، أسنانك أو طقم أسنانك؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

٨ـ هل استعملت خلال الأشهر الثلاثة الماضية دواء" لمعالجة أوجاع الفم ؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

٩ـ هل شعرت خلال الأشهر الثلاثة الماضية بالإضطراب وانشغل فكرك بسبب مشاكل الأسنان، اللثة أو طقم أسنانك ؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

١٠ـ هل شعرت خلال الأشهر الثلاثة الماضية بالإنزعاج أو بالخجل بسبب مشاكل الأسنان، اللثة أو طقم أسنانك ؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

١١ـ هل شعرت خلال الأشهر الثلاثة الماضية بعدم الإرتياح عند تناولك الطعام أمام الأخرين؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

١٢ـ هل عانيت خلال الأشهر الثلاثة الماضية من حساسية الأسنان أو اللثّة للساخن والبارد والحلى؟

☐أبداً ☐نادراً ☐أحياناً ☐غالباً ☐دائماً

Appendix 7: List of centers offering affordable dental services in Beirut

لائحة باسماء المراكز التي تقدم خدمات طب الاسنان في بيروت

الجامعة اللبنانية, كلية طب الاسنان, فرع الحدث	٠٥-٤٦٣٥٣٩
جامعة القديس يوسف, كلية طب الاسنان,طريق الشام	01-421290/ 01-421298
الجامعة العربية في بيروت, طريق الجديدة	٠١- ٣٠٠١١٠ Extension: ٢٥٣٠ _ ٢٧٣٠ - ٢٥٢٣
مستوصف مار يوحنا الأشرفية	01-337860
مستوصف مطرانية بيروت	01-329843
مركز الخدمات كرم الزيتون	01-327248
مستوصف كرم الزيتون مخزومي	01-326802
مركز بيار الجميل	01-583835
المجلس العام الماروني	01-574157

CHAPTER X

TABLES

Table D1: Socio-demographic characteristics of elderly surveyed in social organizations in Beirut and Mount Lebanon (N=352)

		n	%
Age[§]	65-70	121	34.38
	71-80	140	39.77
	>80	91	25.85
Gender	Male	106	30.11
	Female	246	69.89
Marital Status	Married	114	32.3
	Divorced	11	3.13
	Widowed	151	42.90
	Single	76	21.59
Highest Education	Illiterate	73	20.74
	Basic Literate	30	8.52
	Primary	129	36.65
	Complementary	57	16.19
	Secondary	36	10.23
	College	27	7.67
Living arrangement	Alone	104	29.55
	With partner	69	19.60
	With child(ren)	123	34.94
	With sibling(s)	49	13.92
	Other	7	1.99
Financial Dependence	Independent	66	18.75
	Dependent on child(ren)	99	28.13
	Dependent on partner	15	4.26
	Dependent on sibling(s)	28	7.95

	Dependent on an organization	113	32.1
	Dependent on > 1 source	31	8.81
Monthly Income	<500K LBP	207	58.81
	500K to 1M LBP	96	27.27
	>1M LBP *	49	13.92
Perceived Income Sufficiency	Not sufficient	174	49.43
	Barely sufficient	96	27.27
	Sufficient	69	19.60
	More than sufficient	13	3.69
Employment Status	Employed **	29	8.24
	Unemployed	323	91.76
Income stability among employed	Stable	15	51.72
	Unstable	14	48.28
		n	**%**
Medical Insurance	Yes	103	29.26
	No	249	70.74
Insurance Types (among "yes")	Social Security	40	38.83
	Civil Servant Coop	7	6.80
	Army insurance	14	13.59
	Internal Security Forces	6	5.83
	Ministry of Health	2	1.94
	Private Insurance	35	33.98

* Only 2% (n=8) responded > 3M LBP

**1.99% (n=7) work full-time and 6.25% (n=22) work part-time

*** Only 0.28% (n=1) is looking for work and 3% (n=10) are retired and still receiving a retirement pension from their previous job.

[§] The mean age is 73.45 with a SD of 7.03 and median age of 72

Table D2: Prevalence of selected general health indicators and lifestyle-related behaviors among elderly surveyed in social organizations in Beirut and Mount Lebanon (N=352)

		n	%
Diagnosis with Chronic Diseases	Endocrine	125	35.51
	Cardio-vascular	229	65.06
	Respiratory	60	17.05
	Gastro-intestinal	87	24.72
	Cancer	28	7.95
	Neuro-psychiatric problem	23	6.53
	Musculo-skeletal	187	53.13
	Other	17	4.83
Cigarette Smoking	Past smoker	64	18.18
	Current smoker	106	30.11
	Never smoked	182	51.70
Years since smoking cessation (Among past smokers)	1 to 5 years	10	15.63
	6 to 10 years	15	23.44
	11 to 15 years	12	18.75
	16 to 20 years	9	14.06
	> 20 years	18	28.13
Number of Cigarettes per Day (Among current smokers)	1 to 10 (half a pack or less)	57	53.77
	11 to 20 (< a pack but > $^{1/2}$ a pack)	31	29.25
	> 20 (more than a pack)	18	16.98
Current Waterpipe Smoking	Yes	15	4.26
	No	337	95.74

Number of Waterpipes per Week	1 to 7	13	86.67
	>7	2	13.33
Frequency of Sweets Consumption	Never	32	9.09
	Rarely	88	25.00
	Occasionally	58	16.48
	Frequently	97	27.56
	Daily	77	21.88
Frequency of Soda Consumption	Never	77	21.88
	Rarely	103	29.26
	Occasionally	70	19.89
	Frequently	69	19.60
	Daily	33	9.38
Frequency of Coffee Consumption	Never	41	11.65
	Rarely	21	5.97
	Occasionally	9	2.56
	Frequently	24	6.82
	Daily	257	73.01
		n	**%**
Frequency of Alcohol Consumption	Never	245	69.60
	Rarely	72	20.45
	Occasionally	13	3.69
	Frequently	10	2.84
	Daily	12	3.41
ESS	Normal range	282	80.11
	Mild Sleepiness	31	8.81
	Moderate Sleepiness	22	6.25
	Severe Sleepiness	17	4.83

GOHAI highest burden	All components equal	61	17.63
	Physical function	162	46.82
	Psychosocial function	58	16.76
	Pain/discomfort	65	18.79

Table A1.1: Oral health status indicators among elderly surveyed in social organizations in Beirut and Mount Lebanon (N=352)

	Mean (SD)	Median
PSR	1.01 (1.25)	0.5
RCI	0.3 (0.38)	0
Roots exposed	4.49 (4.08)	4
Roots decayed/filled	1.77 (2.91)	0
FU	7.48 (5.17)	8
D	1.51 (2.95)	0
M	19.6 (9.89)	26
F	2.24 (4.08)	0
DMFT	23.35 (6.57)	28
Total plaque index*	1.96 (0.81)	2
Upper anterior	2.05 (2.66)	0
Upper posterior	2.05 (2.93)	0
Lower anterior	2.39 (2.77)	0
Lower posterior	2.32 (3.17)	0
D and F	3.75 (5.09)	0

*: 71.5% of the sites have a plaque index ≤ 2

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A1.2: Oral hygiene practices and behaviors among elderly surveyed in social organizations - Beirut and Mount Lebanon (N=352)

		n	%
Perception of Dental health importance	More important than general health	29	8.24
	Less important than general health	143	40.63
	As important as general health	180	51.14
Denture	Complete	140	39.77
	Partial	53	15.06
	No	159	45.17
Frequency of Denture Cleaning (Among those with partial/complete denture)	Few times a week or less*	26	13.47
	Daily	102	52.85
	After each meal	65	33.68
Denture Cleaning Tools	Water	183	94.82
	Toothbrush	159	82.38
	Toothpaste	122	63.21
	Denture cleanser	21	10.88
	Mouthwash	2	1.04
	Detergent	35	18.13
	Salt	7	3.63
Sleeping with Denture	Yes	105	54.40
	Sometimes	17	8.81
	No	71	36.79
Frequency of Teeth Cleaning**	< once a day	84	39.62
	Once or twice a day	102	48.11
	3 times a day	26	12.26
Time of Teeth Cleaning	Morning	114	53.77
	Evening	100	47.17
	After each meal	28	13.21
	Variable	12	5.66

Teeth Cleaning Tools	Toothbrush	155	73.11
	Water	153	72.17
	Toothpaste	147	69.34
	Miswak	2	0.94
	Mouthwash	14	6.60
	Floss	4	1.89
	Salt	10	4.72
	Other	3	1.42
Time of Last Dentist Visit	Never	6	1.70
	> 1 year	262	74.43
	< 1 year	84	23.86

		n	**%**
Reason For Not Visiting Dentist within last year/ever	No need	147	54.85
	Expensive treatment	97	36.19
	No info on clinic	1	0.37
	Difficulty of reaching	8	2.99
	Other	22	8.21
Number of Visits to Dentist in Last Year	Once	51	60.71
	More than once	33	39.29
Location of Dentist Visit in Last Year	Dispensary	22	26.19
	Univ-based facility/social organization	12	14.29
	Private dentist	50	59.52
Services Provided in Last Dental Visit	Regular check-up	45	53.57
	Cleaning/Root planning	12	14.29
	Extraction	23	27.38
	Filling	11	13.10
	Crown restoration	10	11.90

	Several-teeth bridge	5	5.95
	New partial denture	6	7.14
	New complete denture	8	9.52
	Repair of partial denture	4	4.76
	Repair of complete denture	7	8.33
	Other	5	5.95
Payer of Last Dental Visit Cost	Self	35	41.67
	Child(ren)	11	13.10
	Relative(s)	1	1.19
	Organizations	4	4.76
	Free of charge	33	39.29
Cost of Last Dental Visit	Free	33	39.29
	< 10K LBP	3	3.57
	10K to 50K LBP	11	13.10
	50K to 100K LBP	18	21.43
	> 100K LBP	16	19.05
	Do not remember	3	3.57
Satisfaction with Last Dental Visit	Very satisfied	46	54.76
	Satisfied	17	20.24
	Somewhat satisfied	7	8.33
	Not satisfied	14	16.67
Reasons for Lack of Full Satisfaction	Unsatisfied with procedure outcome	13	61.90
	Lack of quality	2	9.52
	Other	3	14.29
	No reason given	3	14.29

		n	%
Awareness of affordable Dentistry services	Not Aware	192	54.55
	Aware but never visited	73	20.74
	Aware and visited	87	24.72
Reasons for Not Visiting Any of the Above	Still expensive treatment	23	31.51
	Don't consider teeth a priority	2	2.74
	Lack of good quality	4	5.48
	Location is too far	3	4.11
	Bad previous experience	1	1.37
	No need	25	34.25
	Other	15	20.55

* 1.04% (n=2) do not clean their dentures at all; 1.04% (n=2) clean their dentures rarely

** Among partial/no denture

Table A2.1: Estimates of selected oral health status indicators by gender in an elderly sample (N=352)

	Male (n=106)				Female (n=246)				Mann-Whitney p-value *
	n	**Mean (SD)**	**Median**	**Sum of ranks**	**n**	**Mean (SD)**	**Median**	**Sum of ranks**	
PSR	41	0.96 (0.94)	0.75	2683.5	87	1.06 (1.28)	0.67	5572.5	0.84
RCI	41	0.33(0.39)	0.17	2791	88	0.3(0.38)	0.07	5594	0.5
Roots exposed	41	5.56(4.33)	5	2945.5	88	4.56(4.23)	3.5	5439.5	0.15
Roots decayed/filled	41	2.05(2.72)	1	2867	88	1.86(3.31)	0.5	5518	0.28
FU	106	6.53 (5.2)	7	16720	146	7.89 (5.11)	8	45408	**0.02**
D	54	2.52(2.7)	2	4351	105	2.96(4.09)	1	8369	0.91
M	54	13.94(10.17)	9	4541.5	105	12.3(9.41)	10	8178.5	0.42
F	54	2.69(4.22)	0	3733.5	105	4.6(5.3)	3	8986.5	**0.03**
DMFT	54	19.15(7.82)	20.5	4201	105	19.86(6.83)	20	8519	0.66
Total plaque index	51	2.14 (0.81)	2.2	4971	121	1.89 (0.8)	1.75	9907	0.056
Upper anterior	54	3.67(2.58)	5	4122.5	105	4.05(2.49)	5	8597.5	0.44
Upper posterior	54	3.61(3.16)	3.5	4021	105	4.14(3.05)	5	8699	0.27
Lower anterior	54	3.65(2.7)	5	4050.5	105	4.11(2.49)	6	8669.5	0.29
Lower posterior	54	3.91(3.35)	4	4130	105	4.27(3.27)	5	8590	0.48

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.2: Estimates of selected oral health status indicators by age groups in an elderly sample (N=352)

	Age = 65 to 69 (n=121)				Age = 70 to 79 (n=140)				Age >= 80 (n=91)				K Wallis p-value *
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	54	1.27 (1.31)	0.82	3867.5	51	0.9 (1.07)	0.67	3154.5	23	0.71 (1.04)	0	1234	0.11
RCI	55	0.38 (0.41)	0.25	3947.5	51	0.24 (0.33)	0	3049.5	23	0.27 (0.4)	0	1388	0.17
Roots exposed	55	4.31 (4.17)	4	3267	51	5.67 (4.5)	5	3695	23	4.48 (3.86)	3	1423	0.18
Roots decayed /filled	55	2.11 (3.24)	1	3762	51	2.04 (3.34)	0	3290	23	1.22 (2.24)	0	1333	0.49
FU	121	7.38 (4.94)	8	21139.5	140	7.66 (5.34)	8	25127	91	7.35 (5.24)	8	15861.5	0.9
D	62	2.89 (3.31)	2	5198.5	66	2.86 (4.18)	1	5084	31	2.55 (3.29)	1	2437.5	0.68
M	62	11.63 (8.61)	9	4703	66	13.27 (10.03)	10	5392	31	14.42 (10.86)	10	2625	0.63

F	62	4.4 (5.2)	2	5284.5	66	3.35 (4.91)	1	4917	31	4.32 (4.94)	3	2518	0.38
DMFT	62	18.92 (6.99)	21	4619.5	66	19.48 (7.45)	20	5279	31	21.29 (6.88)	23	2821.5	0.26
Total plaque index	68	2.11 (0.83)	2.33	6518	67	1.9 (0.8)	2	5520.5	37	1.79 (0.75)	1.67	2839.5	0.11
Upper anterior	62	4.18 (2.37)	6	5201	66	3.82 (2.59)	5	5142.5	31	3.62 (2.68)	5	2376.5	0.66
Upper posterior	62	4.21(2.86)	4	5168	66	3.85(3.32)	4	5173	31	3.71(3.07)	5	2379	0.75
Lower anterior	62	4.52(2.37)	6	5614.5	66	3.91(2.52)	5	5119.5	31	2.94(2.79)	3	1986	**0.015**
Lower posterior	62	4.34(3.18)	4.5	5117	66	4.06(3.34)	5	5191	31	3.94(3.48)	5	2412	0.85

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.3: Estimates of selected oral health status indicators by education in an elderly sample Beirut and Mount Lebanon (N=352)

	Illiterate (n= 73)				Basic Literate (n=30)				Primary (n=129)				Complementary (n=57)			
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks
PSR	19	0.75 (1.03)	0.5	1082	11	1.33 (1.55)	1	772	39	1 (0.95)	0.75	2634	22	1.16 (1.29)	0.67	1501
RCI	19	0.4 (0.45)	0.25	1335.5	11	0.53 (0.44)	0.5	914	39	0.33 (0.34)	0.25	2770	23	0.49 (0.44)	0.43	1831.5
Roots exposed	19	4 (4.68)	3	1030	11	5.82 (5.69)	3	746	39	5.08 (3.33)	4	2766.5	23	5.83 (4.12)	6	1749
Roots decayed/ filled	19	2.42 (3.44)	1	1298	11	3.64 (5.24)	2	891.5	39	2.23 (3.06)	1	2862.5	23	2.65 (3.32)	1	1746.5
FU	73	6.75 (4.86)	7	11823.5	30	6.4 (5.21)	6.5	4669.5	129	7.5 (5.13)	8	22766	57	7.16 (5.67)	7	9715
D	25	3.52 (4.61)	3	2227	13	2.85 (2.7)	2	1127	54	2.96 (3.49)	1.5	4424	28	3.5 (4.93)	1	2267.5
M	25	14.92 (9.83)	16	2237	13	16.08 (9.15)	12	1266.5	54	15.28 (9.43)	12.5	5062	28	12.64 (9.67)	10.5	2236.5
F	25	3.28 (4.61)	1	1927	13	3.08 (3.93)	1	972.5	54	3.2 (5.44)	0	3749	28	2.61 (3.92)	0.5	1956

DMFT	25	21.72 (6.3)	23	2321.5	13	22 (5.63)	23	1213.5	54	21.44 (6.56)	22.5	4950.5	28	18.75 (8.36)	20.5	2121
Total plaque index	25	2.09 (0.84)	2	2383	14	2.18 (0.76)	2.1	1433	57	1.99 (0.79)	2	5014.5	28	2.1 (0.85)	2.27	2602.5
Upper anterior	25	3.36 (2.63)	4	1786	13	3.38 (2.5)	4	892	54	3.43 (2.59)	4.5	3734	28	3.93 (2.64)	6	2306.5
Upper posterior	25	3.12 (2.68)	3	1695.5	13	3.31 (3.57)	3	927.5	54	3.09 (2.9)	2	3641.5	28	4.11 (3.02)	4.5	2267.5
Lower anterior	25	3.44 (2.62)	3	1810.5	13	3.38 (2.4)	4	833.5	54	3.54 (2.73)	4.5	3966.5	28	4.11 (2.75)	6	2417
Lower posterior	25	3.52 (3.1)	4	1795.5	13	3 (2.94)	4	823	54	3.39 (3.06)	3	3755.5	28	4.07 (3.3)	4.5	2213.5

	Secondary (n=36)				College (n=27)				Kruskal Wallis p-value *
	n	**Mean (SD)**	**Median**	**Sum of ranks**	**n**	**Mean (SD)**	**Median**	**Sum of ranks**	
PSR	15	0.57 (0.97)	0	741.5	22	1.31 (1.45)	0.92	1525.5	0.46
RCI	15	0.03 (0.1)	0	518	22	0.09 (0.15)	0.14	1016	**0.0001**
Roots exposed	15	3.67 (4.84)	2	715.5	22	4.64 (4.45)	4.5	1378	0.16
Roots decayed/filled	15	0.13 (0.52)	0	517.5	22	0.55 (0.91)	0	1069	**0.0004**
FU	36	7.89 (4.89)	8.5	6665.5	27	10.7 (4.47)	12	6488.5	**0.016**
D	16	1.75 (2.27)	1	1129	23	1.57 (1.9)	1	1545.5	0.54
M	16	8.25 (9.15)	4	852	23	6.57 (7.24)	4	1066	**0.0001**
F	16	5.75 (4.12)	7	1632	23	7.3 (5.42)	8	2483.5	**0.0029**
DMFT	16	15.75 (7.13)	14.5	893.5	23	15.43 (6.14)	16	1220	**0.0016**
Total plaque index	23	1.7 (0.68)	1.5	1674.5	25	1.73 (0.87)	1.17	1770.5	0.21
Upper anterior	16	4.56 (2.39)	6	1473.5	23	5.52 (1.38)	6	2528	**0.0033**
Upper posterior	16	5.38 (2.94)	5.5	1615.5	23	6.13 (2.62)	7	2572.5	**0.0008**
Lower anterior	16	5.19 (1.64)	6	1575.5	23	4.78 (2.17)	6	2117	0.092
Lower posterior	16	5.94 (3.77)	7	1680.5	23	6.09 (2.86)	7	2452	**0.003**

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.4: Estimates of selected oral health status indicators by employment status in an elderly sample (N=352)

	Not working (n=323)				Working (n=29)				Mann Whitney p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	118	0.99 (1.17)	0.67	7514	10	1.39 (1.36)	1.13	742	0.38
RCI	119	0.31 (0.38)	0.14	7721	10	0.31 (0.4)	0.13	664	0.9
Roots exposed	119	4.85 (4.24)	4	7717	10	5.2 (4.87)	4.5	668	0.87
Roots decayed/filled	119	1.89 (3.12)	1	7692	10	2.3 (3.37)	1	693	0.69
FU	323	7.56 (5.17)	8	57460.5	29	6.62 (5.14)	7	4667.5	0.39
D	146	2.92 (3.74)	1	11903	13	1.62 (2.69)	0	817	0.15
M	146	12.79 (9.69)	9.5	11624	13	13.54 (9.83)	9	1096	0.72
F	146	3.9 (4.99)	1	11618	13	4.54 (5.59)	2	1102	0.68
DMFT	146	19.61 (7.15)	20	11681.5	13	19.69 (7.67)	21	1038.5	0.99
Total plaque index	157	1.95 (0.8)	2	13501	15	2.06 (0.93)	2.2	1377	0.66
Upper anterior	146	3.92 (2.52)	5	11659	13	3.85 (2.64)	6	1061	0.89
Upper posterior	146	4.03 (3.11)	4	11810	13	3.23 (2.74)	3	910	0.41
Lower anterior	146	3.98 (2.55)	6	11738.5	13	3.69 (2.78)	5	981.5	0.69
Lower posterior	146	4.13 (3.28)	5	11664.5	13	4.31 (3.59)	5	1055.5	0.92

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.5: Estimates of selected oral health status indicators by household monthly income (LBP) in an elderly sample (N=352)

	Income < 500K (n=207)				Income: 500K to 999K (n=96)				Income >= 1M (n=49)				Kruskal Wallis p-value *
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	68	1.1 (1.12)	0.82	4679	35	0.94 (1.06)	0.66	2236.5	25	0.92 (1.5)	0	1340.5	0.2
RCI	69	0.36 (0.38)	0.25	4881	35	0.32 (0.4)	0.13	2268	25	0.16 (0.33)	0	1236	**0.036**
Roots exposed	69	5.26 (4.46)	4	4709	35	5.06 (4.3)	4	2344.5	25	3.56 (3.5)	3	1331.5	0.21
Roots decayed/filled	69	2.38 (3.55)	1	4923.5	35	1.89 (2.92)	1	2246	25	0.72 (1.46)	0	1215.5	**0.02**
FU	207	7.12 (5.1)	8	35049.5	96	7.27 (5.14)	7	16539	49	9.45 (5.2)	11	10539.5	**0.016**
D	89	3.49 (4.25)	2	7784	44	2.27 (2.77)	2	3351.5	26	1.38 (2.12)	0	1584.5	**0.02**

M	89	14.30 (9.66)	11	7799.5	44	12.77 (9.58)	9.5	3536	26	8.04 (8.55)	5.5	1384.5	**0.0035**
F	89	2.99 (4.65)	0	6296	44	3.84 (4.96)	1	3552	26	7.42 (5.02)	8	2872	**0.0003**
DMFT	89	20.79 (6.96)	22	7783.5	44	18.89 (7.56)	19.5	3333.5	26	16.85 (6.49)	16	1603	**0.03**
Total plaque index	96	2.18 (0.74)	2.23	9570	46	1.83 (0.85)	1.45	3608	30	1.48 (0.72)	1	1700	**0.0001**
Upper anterior	89	3.55 (2.62)	5	6569.5	44	3.95 (2.43)	5	3500	26	5.12 (1.95)	6	2650.5	**0.014**
Upper posterior	89	3.7 (3.03)	4	6746	44	3.82 (3.13)	4.5	3452	26	5.12 (3.04)	6	2532	0.09
Lower anterior	89	3.74 (2.62)	5	6810	44	3.80 (2.66)	5.5	3440.5	26	4.96 (1.97)	6	2469.5	0.14
Lower posterior	89	3.64 (3.2)	4	6515	44	4.32 (3.15)	4.5	3564.5	26	5.58 (3.48)	7	2640.5	**0.02**

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.6: Estimates of selected oral health status indicators by oral health perception in an elderly sample (N=352)

	More important than general health				Less important than general health				As important as general health				K Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	15	0.58 (0.96)	0	1033	57	1.17 (1.37)	0.66	5368.5	107	0.99 (1.21)	0.6	9708.5	0.21
RCI	16	0.3 (0.34)	0.2	1599.5	57	0.32 (0.39)	0.17	5397	108	0.29 (0.39)	0	9474.5	0.51
Roots exposed	16	4.13 (4.18)	4	1378	57	5.09 (4.08)	4	5686.5	108	4.23 (4.07)	3	9406.5	0.31
Roots decayed/filled	16	1.25 (1.24)	1	1566	57	2.35 (3.72)	1	5574	108	1.55 (2.54)	0	9331	0.3
FU	29	5.69 (4.97)	6	4072.5	143	7.19 (5.47)	7	24500	180	8 (4.89)	8.5	33555.5	0.055
D	29	1.28 (1.89)	0	5407	143	1.3 (2.74)	0	23493.5	180	1.72 (3.23)	0	33227.5	0.095
M	29	19.38 (9.98)	22	4918	143	22.29 (2.54)	28	28936.5	180	17.49 (10.39)	19	28273.5	**0.0001**

F	29	2.79 (4.78)	0	5329	143	1.69 (3.84)	0	22995.5	180	2.58 (4.13)	0	33803.5	**0.019**
DMFT	29	23.45 (6.53)	28	5156.5	143	25.29 (4.99)	28	28868.5	180	21.79 (7.27)	25.5	28103	**0.0001**
Total plaque index	15	1.88 (0.71)	2	1249	55	2.12 (0.82)	2.17	5295	102	1.89 (0.81)	1.79	8334	0.2
Upper anterior	29	1.83 (2.66)	0	4978	143	1.46 (2.36)	0	22460	180	2.56 (2.79)	0	34690	**0.0017**
Upper posterior	29	2.21 (2.87)	0	5233	143	1.38 (2.49)	0	22448	180	2.57 (3.16)	0	34447	**0.003**
Lower anterior	29	2.62 (2.8)	2	5386	143	1.66 (2.52)	0	21894	180	2.93 (2.83)	4	34848	**0.0004**
Lower posterior	29	2.31 (2.95)	0	5263	143	1.64 (2.88)	0	22076.5	180	2.87 (3.33)	1	34788.5	**0.0007**

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.7: Estimates of selected oral health status indicators by frequency of denture cleaning in an elderly sample (N=352)

	Few times a week or less				Daily				After each meal				K Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	7	0.81 (1.49)	0	169	27	1.1 (1.44)	0.2	727	17	0.92 (1.42)	0	430	0.86
RCI	8	0.3 (0.35)	0.21	223.5	27	0.26 (0.41)	0	691.5	17	0.29 (0.42)	0	463	0.87
Roots exposed	8	4.13 (3.52)	5.5	234	27	2.89 (3.1)	2	649	17	4.29 (3.85)	4	495	0.47
Roots decayed/filled	8	2 (2.51)	1.5	243.5	27	1.04 (2.05)	2	660	17	1.71 (2.49)	0	474.5	0.46
FU	26	7.42 (5.39)	6.5	2163.5	102	8.58 (4.23)	9	9789	65	9.12 (4.88)	10	6768.5	0.26
D	26	0.65 (2.08)	0	2578	102	0.34 (0.97)	0	9983.5	65	0.52 (1.84)	0	6159.5	0.79
M	26	24.88 (5.65)	28	2442.5	102	25.14 (5.85)	28	9885	65	25.28 (5.72)	28	6393.5	0.91

F	26	0.38 (0.8)	0	2528	102	1.04 (2.71)	0	10008.5	65	0.66 (1.95)	0	6184.5	0.88
DMFT	26	25.92 (3.77)	28	2357.5	102	26.52 (4)	28	9912.5	65	26.46 (3.99)	28	6451	0.65
Total plaque index	6	2 (0.65)	2	152	25	1.81 (0.84)	1.4	557.5	16	2.1 (0.93)	2.27	418.5	0.64
Upper anterior	26	0.5 (1.63)	0	2528	102	0.53 (1.61)	0	9848	65	0.49 (1.46)	0	6345	0.98
Upper posterior	26	0.42 (1.27)	0	2510.5	102	0.53 (1.6)	0	9982.5	65	0.43 (1.56)	0	6228	0.92
Lower anterior	26	1.38 (2.32)	0	2710	102	1 (2.12)	0	9708.5	65	1.15 (2.31)	0	6302.5	0.6
Lower posterior	26	0.73 (1.59)	0	2532	102	1 (2.42)	0	10034.5	65	0.58 (1.71)	0	6154.5	0.83

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.8: Estimates of selected oral health status indicators by sleeping with denture pattern in an elderly sample (N=352)

	Yes				Sometimes				No				K Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	29	0.84 (1.2)	0.2	746.5	17	0.72 (1.34)	0	379.5	5	2.9 (1.67)	3.5	200	**0.04**
RCI	30	0.32 (0.42)	0	841.5	17	0.12 (0.25)	0	367.5	5	0.53 (0.49)	0.8	169	0.12
Roots exposed	30	3.4 (3.39)	2	778.5	17	3.24 (3.65)	2	420	5	5.4 (2.88)	5	179.5	0.32
Roots decayed/filled	30	1.63 (2.59)	0	825	17	0.71 (1.36)	0	383	5	2.4 (2.3)	3	170	0.19
FU	105	8.94 (4.55)	9	10541.5	71	8.31 (4.75)	8	6693	17	7.76 (4.66)	8	1486.5	0.59
D	105	0.5 (1.69)	0	10180.5	71	0.24 (0.96)	0	6619	17	1 (1.8)	0	1921.5	0.09
M	105	25.2 (5.31)	28	10079.5	71	25.08 (6.46)	28	7014	17	25.12 (5.59)	28	1627.5	0.91
F	105	0.84 (2.25)	0	10358.5	71	0.93 (2.55)	0	6893.5	17	0.29 (1.21)	0	1469	0.44

DMFT	105	26.53 (3.23)	28	10047	71	26.25 (4.88)	28	7056.5	17	26.41 (3.84)	28	1617.5	0.82
Total plaque index	26	2.03 (0.82)	2	664	16	1.59 (0.79)	1.2	302	5	2.5 (0.87)	3	162	0.09
Upper anterior	105	0.43 (1.44)	0	9997	71	0.63 (1.77)	0	6989	17	0.53 (1.37)	0	1735	0.62
Upper posterior	105	0.39 (1.28)	0	10031	71	0.62 (1.92)	0	6960	17	0.47 (1.18)	0	1730	0.71
Lower anterior	105	1.25 (2.3)	0	10524	71	0.97 (2.12)	0	6628	17	0.76 (1.99)	0	1569	0.48
Lower posterior	105	0.87 (2.09)	0	10319.5	71	0.7 (2.09)	0	6671.5	17	1.06 (2.38)	0	1730	0.66

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.9: Estimates of selected oral health status indicators by frequency of natural teeth cleaning in an elderly sample (N=352)

	< once per day				Once or twice/day				3 times/day				K Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	45	1.33 (1.24)	1.17	3344	70	0.8 (1.11)	0.33	3996.5	13	1.18 (1.21)	0.83	915.5	**0.04**
RCI	46	0.42 (0.41)	0.29	3511.5	70	0.28 (0.37)	0	4338.5	13	0.04 (0.07)	0	535	**0.004**
Roots exposed	46	5.8 (4.21)	5.5	3445	70	4.24 (4.08)	3	4116	13	5 (5.13)	5	824	**0.07**
Roots decayed/filled	46	3.04 (3.79)	1	3578	70	1.49 (2.67)	0	4238.5	13	0.31 (0.48)	0	568.5	**0.003**
FU	85	3.56 (4.54)	2	6163.5	102	8.18 (4.72)	9	12853	26	9.88 (5)	11.5	3774.5	**0.0001**
D	69	2.81 (3.83)	1	5307	74	2.93 (3.53)	2	6293.5	16	2.25 (3.84)	1	1119.5	0.36
M	69	17.77 (9,23)	19	7156.5	74	8.84 (7.92)	7	4507	16	10.25 (9.8)	6.5	1056.5	**0.0001**
F	69	1.86 (3.67)	0	4140	74	5.51 (5.51)	4	6997.5	16	5.75 (4.67)	7	1582.5	**0.0001**

DMFT	69	22.43 (6.71)	25	6792	74	17.28 (6.61)	17	4791	16	18.25 (7.7)	16.5	1137	**0.0001**
Total plaque index	52	2.26 (0.77)	2.42	5376.5	96	1.88 (0.77)	1.67	7832.5	22	1.58 (0.86)	1	1326	**0.001**
Upper anterior	69	2.81 (2.62)	3	4276.5	74	4.8 (2.02)	6	6923	16	4.63 (2.42)	6	1520.5	**0.0001**
Upper posterior	69	2.55 (2.91)	1	4109.5	74	5.05 (2.79)	5	7092	16	5 (2.76)	6	1518.5	**0.0001**
Lower anterior	69	2.87 (2.71)	3	4339	74	4.99 (1.95)	6	7154.5	16	3.88 (2.63)	5	1226.5	**0.0001**
Lower posterior	69	2.57 (2.87)	1	4063.5	74	5.38 (3.02)	6	7134	16	5.25 (3.47)	6.5	1522.5	**0.0001**

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.10: Estimates of selected oral health status indicators by awareness of affordable dental services in an elderly sample (N=352)

	Not Aware				Aware but never visited				Aware and visited				K Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	88	1.07 (1.27)	0.67	8103	54	0.91 (1.22)	0.42	4648.5	37	1.03 (1.27)	0.67	3358.5	0.78
RCI	90	0.33 (0.39)	0.17	8687.5	54	0.31 (0.4)	0	4885	37	0.2 (0.32)	0	2898.5	0.16
Roots exposed	90	4.54 (4.03)	3.5	8288	54	4.5 (4.49)	4	4792	37	4.35 (3.65)	4	3391	0.93
Roots decayed/filled	90	1.78 (2.55)	1	8566.5	54	2.11 (3.4)	0	5000.5	37	1.27 (2.95)	0	2904	0.21
FU	192	7.52 (5.31)	8	33931	87	6.97 (4.8)	8	14465.5	73	8.04 (5.23)	9	13731.5	0.4
D	192	1.52 (3.09)	0	33461.5	87	2.03 (3.34)	0	16793	73	0.89 (1.72)	0	11873.5	0.08
M	192	20.4 (9.81)	28	35381	87	18.69 (9.39)	21	14290.5	73	18.58 (10.58)	22	12456.5	0.23
F	192	1.89 (3.79)	0	32304.5	87	2.37 (3.89)	0	16154.5	73	3 (4.92)	0	13669	0.15

DMFT	192	23.8 (6.51)	28	35426.5	87	23.09 (6.28)	27	14598.5	73	22.47 (7.04)	28	12103	0.21
Total plaque index	85	2.05 (0.84)	2	7778.5	50	1.92 (0.76)	2	4202	37	1.81 (0.79)	1.5	2897.5	0.36
Upper anterior	192	1.82 (2.57)	0	323570	87	2.43 (2.72)	0	16377.5	73	2.21 (2.77)	0	13180.5	0.25
Upper posterior	192	1.81 (2.81)	0	32566	87	2.18 (2.87)	0	15952	73	2.53 (3.27)	0	13610	0.28
Lower anterior	192	2.18 (2.7)	0	32509	87	2.61 (2.78)	1	16062	73	2.7 (2.9)	0	13557	0.27
Lower posterior	192	2.03 (3.05)	0	31913	87	2.62 (3.17)	1	16445.5	73	2.75 (3.43)	0	13769.5	0.07

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.11: Estimates of selected oral health status indicators by cigarette smoking in an elderly sample (N=352)

	Never Smoker (n=182)				Past Smoker (n=64)				Current Smoker (n=106)				Kruskal Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	73	0.91 (1.18)	0.33	1942	30	1.03 (1.21)	0.67	1930.5	25	1.33 (1.15)	0.67	4383.5	0.12
RCI	74	0.27 (0.35)	0.13	1771	30	0.25 (0.35)	0	2018	25	0.51 (0.45)	0.38	4596	**0.04**
Roots exposed	74	4.41 (4.08)	3	1933	30	5.07 (4.86)	4	1950.5	25	6.04 (3.96)	5	4501.5	0.14
Roots decayed/filled	74	1.59 (3.12)	1	1877	30	1.67 (2.58)	0	2005.5	25	3.2 (3.5)	2	4522.5	0.055
FU	182	7.65 (5.11)	8	12107.5	64	8.19 (4.99)	8.5	17366.5	106	6.77 (5.33)	7	32654	0.24
D	88	2.82 (3.74)	2	2481	31	2.84 (3.62)	1	3054	40	2.78 (3.66)	1	7185	0.82
M	88	12.34 (9.63)	9	1853.5	31	8.39 (7.14)	7	4095	40	17.45 (9.74)	16.5	6771.5	**0.0003**
F	88	4.22 (5.16)	2	2924.5	31	5.23 (5.1)	4	2488.5	40	2.38 (4.34)	0	7307	**0.006**

DMFT	88	19.38 (7.19)	19.5	1817	31	16.45 (6.12)	16	3999	40	22.6 (6.85)	25	6904	**0.0007**
Total plaque index	101	1.91 (0.74)	1.83	2620	35	1.8 (0.91)	1.2	3659.5	36	2.28 (0.82)	2.88	8398.5	**0.012**
Upper anterior	88	4.13 (2.45)	6	2968	31	4.84 (2.07)	6	2376.5	40	2.75 (2.62)	3	7375.5	**0.0009**
Upper posterior	88	4.19 (3.07)	5	3044.5	31	5.19 (2.79)	6	2345.5	40	2.5 (2.83)	1.5	7330	**0.0008**
Lower anterior	88	4.01 (2.56)	6	2948	31	5.13 (1.61)	6	2589.5	40	2.93 (2.8)	2.5	7182.5	**0.009**
Lower posterior	88	4.24 (3.33)	5	3037.5	31	5.58 (3.04)	6	2475.5	40	2.83 (2.93)	2	7207	**0.003**

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.12: Estimates of selected oral health status indicators by waterpipe smoking in an elderly sample (N=352)

	Waterpipe Non-smoker (n=337)				Waterpipe Smoker (n=15)				Mann-Whitney p-value *
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	124	1.01 (1.19)	0.67	7948.5	4	1.35 (1.21)	1.46	307.5	0.49
RCI	125	0.3 (0.38)	0.13	8041.5	4	0.56 (0.52)	0.63	343.5	0.23
Roots exposed	125	4.82 (4.31)	4	8028	4	6.5 (2.38)	6.5	357	0.19
Roots decayed/filled	125	1.84 (3.05)	1	8038	4	4.5 (4.65)	4.5	347	0.21
FU	337	7.48 (5.18)	8	59487	15	7.6 (5.05)	8	2641	0.99
D	154	2.82 (3.68)	1	12377.5	5	2.4 (3.91)	0	342.5	0.56
M	154	12.79 (9.69)	9	12272	5	14.8 (9.96)	16	448	0.63
F	154	3.95 (5.04)	1	12351.5	5	3.8 (5.22)	0	368.5	0.75
DMFT	154	19.57 (7.23)	20.5	12284	5	21 (5.43)	20	436	0.72
Total plaque index	165	1.94 (0.8)	2	14039	7	2.49 (0.89)	3	839	0.066
Upper anterior	154	3.94 (2.52)	5	12365.5	5	3.2 (2.68)	2	354.5	0.63
Upper posterior	154	4 (3.1)	4	12398.5	5	2.8 (2.59)	2	321.5	0.43
Lower anterior	154	3.95 (2.57)	6	12298	5	4 (2.83)	6	422	0.81
Lower posterior	154	4.14 (3.31)	5	12316	5	4.2 (3.11)	5	404	0.97

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.13: Estimates of selected oral health status indicators by soda consumption in an elderly sample (N=352)

	Never (n=77)				Rarely/Occ. (n=173)				Frequently/Daily (n=102)				K-Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	41	0.91 (1.13)	0.67	2503.5	57	1.23 (1.3)	0.83	3993.5	30	0.77 (0.98)	0.42	1759	0.28
RCI	41	0.3 (0.37)	0.14	2645.5	58	0.31 (0.38)	0.15	3794.5	30	0.32 (0.41)	0.06	1943	0.99
Roots exposed	41	5.93 (4.65)	4	3019	58	4.29 (4.07)	4	3469.5	30	4.57 (3.95)	4	1896.5	0.18
Roots decayed/filled	41	2.34 (3.71)	1	2758.5	58	1.52 (2.32)	1	3685.5	30	2.13 (3.59)	0.5	1941	0.87
FU	77	8.05 (5.35)	10	14540.5	173	7.79 (4.97)	8	31535	102	6.54 (5.29)	7	16052	0.069
D	48	2.48 (3.37)	1	3613.5	70	2.77 (3.83)	1.5	5632	41	3.27 (3.8)	1	3474.5	0.61
M	48	10.77 (9.59)	8	3294.5	70	12.36 (9.71)	9	5417.5	41	16.15 (9.05)	15	4008	**0.0095**

F	48	5.21 (5.13)	4	4371.5	70	4.33 (5.5)	1	5779	41	1.83 (3.15)	0	2569.5	**0.0084**
DMFT	48	18.46 (7.32)	17	3490	70	19.46 (7.12)	19.5	5520	41	21.24 (6.94)	23	3710	0.18
Total plaque index	52	1.96 (0.81)	1.92	4511	81	1.83 (0.81)	1.5	6328	39	2.24 (0.76)	2.33	4039	**0.029**
Upper anterior	48	4.23 (2.35)	5.5	4060	70	4.24 (2.48)	6	6097	41	3 (2.61)	3	2563	**0.01**
Upper posterior	48	4.9 (3.1)	5	4495.5	70	4.06 (3.07)	5	5703.5	41	2.71 (2.71)	2	2521	**0.0037**
Lower anterior	48	4.38 (2.51)	6	4195	70	3.97 (2.55)	6	5597	41	3.44 (2.62)	4	2928	0.21
Lower posterior	48	4.83 (3.16)	6	4293.5	70	4.03 (3.38)	4	5496.5	41	3.54 (3.23)	3	2930	0.16

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.14: Estimates of selected oral health status indicators by sweets consumption in an elderly sample (N=352)

	Never (n=32)				Rarely/Occasionally (n=146)				Frequently/Daily (n=174)				Kwallis p-value*
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	14	0.85 (1.17)	0.17	805.5	60	1.09 (1.21)	0.67	3984.5	54	0.99 (1.18)	0.67	3464	0.71
RCI	14	0.29 (0.34)	0.29	922	61	0.36 (0.4)	0.18	4289	54	0.25 (0.36)	0	3174	0.22
Roots exposed	14	5.14 (5.2)	3	888.5	61	5.08 (4.38)	4	4066.5	54	4.57 (3.94)	4	3430	0.89
Roots decayed /filled	14	2.14 (4.42)	1	914.5	61	2.08 (2.97)	1	4204.5	54	1.69 (2.95)	0	3266	0.44
FU	32	7.69 (5.06)	8	5782.5	146	7 (5.03)	7.5	24311.5	174	7.85 (5.3)	8	32034	0.29
D	15	3.6 (2.69)	3	1512	72	2.9 (3.94)	2	5865.5	72	2.56 (3.6)	1	5342.5	0.1
M	15	10.4 (8)	8	1066	72	13.1 (9.4)	10	5890.5	72	13.13 (10.28)	9	5763.5	0.7
F	15	4 (5.08)	2	1222.5	72	4 (5.1)	1.5	5837.5	72	3.89 (5.01)	1	5660	0.94

DMFT	15	18 (6.26)	16	1028	72	20 (7.1)	21.5	5897.5	72	19.57 (7.45)	19.5	5794.5	0.58
Total plaque index	18	2.26 (0.71)	2.45	1882	79	1.96 (0.81)	2	6879	75	1.89 (0.83)	1.75	6116.5	0.2
Upper anterior	15	4.8 (2.04)	6	1369	72	3.78 (2.51)	5	5589	72	3.88 (2.61)	5.5	5762	0.54
Upper posterior	15	4.47 (3.14)	5	1313	72	4 (3.07)	4	5765	72	3.82 (3.12)	4	5642	0.78
Lower anterior	15	4.67 (2.13)	6	1348	72	3.97 (2.51)	5.5	5735.5	72	3.79 (2.7)	6	5636.5	0.63
Lower posterior	15	4.8 (2.86)	5	1334.5	72	3.99 (3.43)	4	5609.5	72	4.17 (3.25)	5	5776	0.69

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.15: Estimates of selected oral health status indicators by coffee consumption in an elderly sample (N=352)

	Never (n=41)				Rarely/Occasionally (n=30)				Frequently/Daily (n=281)				Kruskal Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	21	0.98 (0.87)	1	1448	14	1.06 (1.15)	0.88	941.5	93	1.02 (1.26)	0.67	5866.5	0.76
RCI	22	0.25 (0.32)	0.17	1401	14	0.17 (0.32)	0	687	93	0.34 (0.4)	0.14	6297	0.18
Roots exposed	22	4.5 (3.4)	4	1417.5	14	5.07 (4.92)	3	895	93	4.94 (4.39)	4	6072.5	0.99
Roots decayed/filled	22	1.45 (2.24)	1	1422.5	14	0.86 (1.75)	0	687.5	93	2.19 (3.42)	1	6275	0.19
FU	41	7.29 (5.13)	7	7096	30	7.3 (5.32)	7	5158.5	281	7.53 (5.18)	8	49873.5	0.94
D	23	3.48 (3.8)	2	2121	14	2.5 (2.53)	2	1189.5	122	2.72 (3.77)	1	9409.5	0.3
M	23	10.65 (7.77)	8	1656.5	14	9.64 (7.83)	9	925	122	13.64 (10.1)	10	10138.5	0.28

F	23	4.74 (5.4)	2	2014	14	4.5 (3.88)	3.5	1310	122	3.74 (5.09)	1	9396	0.28
DMFT	23	18.87 (7.18)	21	1702	14	16.64 (6.5)	15	817	122	20.1 (7.2)	21	10201	0.12
Total plaque index	25	1.96 (0.73)	2	2184.5	16	1.8 (0.66)	1.75	1262.5	131	1.98 (0.84)	2	11431	0.81
Upper anterior	23	4.52 (1.93)	5	1950	14	5 (1.66)	5.5	1293.5	122	3.68 (2.65)	5	9476	0.41
Upper posterior	23	4.7 (2.84)	5	2062.5	14	5.5 (2.95)	7	1449.5	122	3.65 (3.09)	4	9208	**0.049**
Lower anterior	23	4.3 (2.16)	6	1923	14	4.29 (2.4)	5	1115	122	3.85 (2.66)	6	9682	0.91
Lower posterior	23	4.91 (2.86)	5	2065	14	4.79 (3.53)	4.5	1246	122	3.93 (3.33)	4	9409	0.35

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.16: Estimates of selected oral health status indicators by alcohol consumption in an elderly sample (N=352)

	Never (n=245)				Rarely/Occasionally (n=85)				Frequently/Daily (n=22)				K Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	91	1.03 (1.25)	0.5	5749	30	1.04 (1.04)	0.78	2078.5	7	0.86 (0.96)	0.67	428.5	0.7
RCI	92	0.32 (0.38)	0.15	6107.5	30	0.26 (0.4)	0	1770	7	0.32 (0.33)	0.33	507.5	0.52
Roots exposed	92	5.37 (4.4)	4	6396.5	30	3.4 (3.94)	2.5	1499.5	7	4.71 (2.43)	4	489	0.4
Roots decayed/filled	92	2.05 (3.28)	1	6138.5	30	1.5 (2.65)	0	1752	7	2 (3.16)	1	494.5	0.48
FU	245	7.58 (5.08)	8	43605.5	85	7.21 (5.14)	8	14580	22	7.41 (6.37)	6.5	3942	0.87
D	109	3.1 (3.97)	2	9091	39	2.44 (3.11)	1	2937.5	11	1.27 (1.68)	1	691	0.26
M	109	12.41 (9.27)	9	8568.5	39	13.13 (10.36)	9	3126.5	11	16.27 (11.24)	20	1025	0.6
F	109	4.39 (5.23)	2	9140	39	2.97 (4.53)	1	2800	11	3 (4.31)	0	780	0.27

DMFT	109	19.91 (6.92)	21	8876	39	18.54 (7.86)	18	2890.5	11	20.55 (7.38)	20	953.5	0.61
Total plaque index	121	1.95 (0.78)	2	10482	42	1.99 (0.86)	2	3618	9	1.98 (1)	1.83	778	0.99
Upper anterior	109	4.09 (2.41)	5	8950	39	3.74 (2.68)	5	3066	11	2.82 (2.93)	2	704	0.4
Upper posterior	109	3.99 (2.97)	4	8760	39	4.23 (3.36)	4	3271	11	2.73 (3.17)	2	689	0.39
Lower anterior	109	4.06 (2.53)	6	8937.5	39	3.85 (2.64)	5	3036	11	3.36 (2.77)	4	746.5	0.54
Lower posterior	109	4.23 (3.14)	5	8809.5	39	4.08 (3.68)	5	3125.5	11	3.55 (3.56)	2	785	0.8

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.17: Estimates of selected oral health status indicators by presence of any general health problem in an elderly sample (N=352)

	No (n= 35)				Yes (n=317)				Mann-Whitney p-value *
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	13	1.16 (1.32)	0.67	908.5	115	1.01 (1.17)	0.67	7347.5	0.57
RCI	14	0.28 (0.42)	0	837.5	115	0.31 (0.38)	0.17	7547.5	0.56
Roots exposed	14	4.14 (2.66)	4.5	889.5	115	4.97 (4.42)	4	7495.5	0.88
Roots decayed/filled	14	1.43 (2.53)	0	803.5	115	1.98 (3.2)	1	7581.5	0.39
FU	35	7.54 (5.49)	9	6327.5	317	7.48 (5.14)	8	55800.5	0.79
D	17	1.35 (2.45)	0	1010	142	2.99 (3.77)	2	11710	**0.045**
M	17	12.76 (10.13)	9	1334.5	142	12.87 (9.65)	9.5	11385.5	0.89
F	17	6.94 (6.7)	8	1674	142	3.59 (4.69)	1	11046	0.07
DMFT	17	21.06 (6.05)	21	1492.5	142	19.44 (7.29)	20	11227.5	0.46
Total plaque index	18	1.89 (0.85)	1.67	1498.5	154	1.97 (0.81)	2	13379.5	0.77
Upper anterior	17	4 (2.5)	6	1416	142	3.91 (2.53)	5	11304	0.74
Upper posterior	17	4.12 (3.02)	5	1407.5	142	3.94 (3.1)	4	11312.5	0.79
Lower anterior	17	3.59 (2.9)	6	1308.5	142	4 (2.53)	6	11411.5	0.75
Lower posterior	17	4 (2.96)	5	1325	142	4.16 (3.34)	5	11395	0.84

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.18: Estimates of selected oral health status indicators by number of comorbidities in an elderly sample (N=352)

	# of co-morbidities															
	0 (n= 35)				1 (n= 86)				2 (n=94)				3 and higher (n=137)				K-Wallis p-value
	n	Mean (SD)	Medi-an	Sum of ranks	n	Mean (SD)	Medi-an	Sum of ranks	n	Mean (SD)	Medi-an	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	13	1.16 (1.32)	0.67	908.5	28	1.09 (1.11)	1	1892.5	36	0.82 (1.19)	0.25	2043.5	51	1.08 (1.2)	0.67	3411.5	0.5
RCI	14	0.28 (0.42)	0	837.5	28	0.36 (0.41)	0.21	1934.5	36	0.32 (0.38)	0.2	2411.5	51	0.28 (0.36)	0.14	3201.5	0.8
Roots exposed	14	4.14 (2.66)	4.5	889.5	28	5.11 (4.85)	4	1826.5	36	5.28 (4.34)	4	2476	51	4.67 (4.31)	4	3193	0.9
Roots decayed/filled	14	1.43 (2.53)	0	803.5	28	2.54 (4.1)	1	1922.5	36	1.94 (2.56)	1	2483.5	51	1.71 (3.05)	1	3175.5	0.63
FU	35	7.54 (5.49)	9	6327.5	86	7.64 (5.3)	8	15428.5	94	7.8 (5.1)	8	17037	137	7.15 (5.09)	7	23335	0.84
D	17	1.35 (2.45)	0	1010	37	2.68 (2.93)	2	3070	45	3.11 (3.43)	2	3845.5	60	3.08 (4.45)	1	4798.5	0.22
M	17	12.76 (10.13)	9	1334.5	37	13.27 (10.1)	9	3012.5	45	12.47 (9.51)	10	3582	60	12.92 (9.63)	9	4791	0.99

F	17	6.94 (6.7)	8	1674	37	2.7 (4)	1	2621	45	3.91 (4.66)	2	3602.5	60	3.9 (5.09)	1	4822.5	0.21
DMFT	17	21.06 (6.05)	21	1492.5	37	18.65 (3.39)	20	2772.5	45	19.49 (6.69)	19	3553	60	19.9 (7.08)	20	4902	0.79
Total plaque index	18	1.9 (0.85)	1.67	1498.5	41	1.97 (0.76)	2	3521	48	1.9 (0.86)	1.45	4013.5	65	2.02 (0.81)	2	5845	0.9
Upper anterior	17	4 (2.5)	6	1416	37	3.84 (2.54)	5	2903.5	45	4.11 (2.48)	5	3685.5	60	3.8 (2.59)	5	4715	0.96
Upper posterior	17	4.12 (3.02)	5	1407.5	37	4.27 (3.31)	5	3131	45	3.62 (2.98)	4	3389.5	60	3.98 (3.09)	4	4792	0.82
Lower anterior	17	3.59 (2.9)	6	1308.5	37	3.65 (2.74)	6	2839.5	45	4.29 (2.53)	6	3841.5	60	4 (2.41)	5	4730.5	0.78
Lower posterior	17	4 (2.96)	5	1325	37	4.05 (3.44)	5	2903	45	4.24 (3.34)	5	3665.5	60	4.17 (3.33)	5	4826.5	0.99

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.19: Estimates of selected oral health status indicators by ESS in an elderly sample (N=352)

	Normal Range				Mild ESS				Moderate ESS				Severe ESS				K Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	100	0.98 (1.19)	0.67	6292.5	9	1 (1)	1.17	606.5	9	1.05 (1.22)	0.67	594	10	1.42 (1.29)	1.33	763	0.72
RCI	101	0.3 (0.37)	0.14	6598.5	9	0.47 (0.45)	0.33	705	9	0.37 (0.46)	0	589.5	10	0.16 (0.32)	0	492	0.35
Roots exposed	101	5.06 (4.37)	4	6709	9	3.78 (2.99)	5	524.5	9	3.89 (3.59)	3	513.5	10	4.9 (5.02)	5.5	638	0.83
Roots decayed/ filled	101	1.82 (2.96)	1	6553.5	9	2.22 (2.11)	2	694.5	9	2.44 (3.57)	0	595.5	10	2.2 (5.03)	0	541.5	0.57
FU	282	7.51 (5.09)	8	49934.5	31	7.74 (5.4)	8	5637.5	22	6.91 (5.7)	7.5	3659	17	7.24 (5.68)	5	2897	0.94
D	123	2.71 (3.48)	1	9765	12	4.33 (6.41)	1.5	1019.5	13	1.85 (2.58)	0	843	11	3.45 (2.91)	2	1092.5	0.29
M	123	12.11 (9.73)	9	9331.5	12	17.58 (9.82)	20.5	1211	13	16.15 (9.31)	14	1287.5	**11**	12.18 (8.04)	12	890	0.13
F	123	4.04 (5.09)	2	9962	12	2.42 (4.64)	0	739.5	13	5.08 (5.3)	4	1159.5	**11**	3.27 (4.56)	1	859	0.44

DMFT	123	18.85 (7.23)	18	9261	12	24.33 (5.07)	27.5	1323.5	13	23.08 (5.36)	24	1309	**11**	18.91 (7.84)	22	826.5	**0.024**
Total plaque index	140	1.99 (0.82)	2	12363	9	1.63 (0.68)	1.5	613	11	2.09 (0.76)	2	1061.5	**12**	1.73 (0.78)	1.62	840.5	0.35
Upper anterior	123	4.05 (2.54)	6	10220.5	12	3 (2.34)	3.5	709	13	3.15 (2.48)	3	837	**11**	4.36 (2.38)	6	953.5	0.14
Upper posterior	123	4.17 (3.02)	4	10203	12	2.33 (2.87)	1	677	13	2.92 (2.78)	3	849	**11**	4.64 (3.35)	6	991	0.13
Lower anterior	123	4.15 (2.47)	6	10180.5	12	2.92 (3.06)	2.5	789	13	3.54 (2.96)	6	993.5	11	3.45 (2.5)	4	757	0.43
Lower posterior	123	4.37 (3.3)	5	10214	12	2.75 (3.05)	2	737	13	2.69 (2.69)	3	768.5	**11**	4.91 (3.56)	5	1000.5	0.11

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.20: Estimates of selected oral health status indicators by GOHAI highest component in an elderly sample (N=352)

	Physical Function				Psychosocial function				Discomfort				Equal components				Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	46	1.08 (1.24)	0.67	3062	27	1.08 (1.25)	0.67	1776	38	1.11 (1.17)	0.83	2514.5	15	0.43 (0.85)	0	648.5	0.13
RCI	46	0.30 (0.38)	0.11	2926	28	0.36 (0.40)	0.21	1914	38	0.27 (0.37)	0.13	2333	15	0.30 (0.36)	0.13	955	0.88
Roots exposed	46	4.67 (4.17)	3	2839.5	28	4.46 (4.39)	3.5	1643.5	38	5.05 (3.76)	5	2594.5	15	6.13 (5.68)	4	1050.5	0.64
Roots decayed/filled	46	1.65 (2.41)	1	2901	28	2.25 (3.72)	1	1858	38	1.68 (2.53)	1	2411.5	15	2.67 (4.98)	1	957.5	0.98
FU	162	6.78 (5.36)	7	25903	58	7.12 (4.98)	7.5	9555	65	8 (5.02)	8	11774	61	9.46 (4.50)	10	12799	**0.007**
D	68	2.03 (2.66)	1	4722	31	3.94 (4.55)	2	2756.5	40	3.6 (4.58)	2	3553	17	1.94 (2.30)	1	1214.5	0.06
M	68	16.63 (10.25)	18.5	6462.5	31	11.55 (7.95)	9	2372	40	9.65 (7.61)	7.5	2629.5	17	6.76 (8.36)	5	782	**0.0001**
F	68	2.49 (4.70)	0	4194	31	4.45 (4.74)	2	2720.5	40	5.23 (5.18)	4	3638	17	6.24 (5.31)	5	1693.5	**0.0003**

DMFT	68	21.15 (7.34)	23	6110	31	19.94 (6.87)	21	2465.5	40	18.48 (6.45)	17.5	2812	17	14.94 (6.68)	14	858.5	**0.006**
Total plaque index	65	2.06 (0.84)	2.17	5849.5	38	2.01 (0.84)	1.9	3403	47	1.92 (0.78)	2.67	3866	20	1.70 (0.71)	1.45	1416.5	0.41
Upper anterior	68	2.99 (2.70)	3.5	4262.5	31	4.32 (2.41)	6	2633	40	4.78 (1.89)	6	3649.5	17	5.06 (2.01)	6	1701	**0.0004**
Upper posterior	68	2.96 (3.29)	2	4331.5	31	4.19 (2.63)	4	2484	40	4.78 (2.44)	5	3571.5	17	6.12 (2.87)	7	1859	**0.0004**
Lower anterior	68	3.16 (2.70)	3.5	4445.5	31	4.42 (2.39)	6	2631.5	40	4.53 (2.20)	6	3389	17	5.29 (1.99)	6	1780	**0.002**
Lower posterior	68	3.06 (3.39)	1.5	4369	31	4.42 (2.87)	5	2525	40	5.03 (3.06)	5	3604	17	5.88 (2.62)	7	1748	**0.002**

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A2.21: Estimates of denture status by socio-demographics in an elderly sample (N=352)

		n	% No denture	% Partial denture	% Complete denture	Chi-square p-value
Age[§]	65-70	121	51.24	14.05	34.71	0.16
	71-80	140	47.14	14.29	38.57	
	>80	91	34.07	17.58	48.35	
Gender	Male	106	50.94	12.26	36.79	0.33
	Female	246	42.68	16.26	41.06	
Marital Status	Married	114	42.98	18.42	38.6	0.12
	Divorced	11	72.73	0	27.27	
	Widowed	151	39.74	15.23	45.03	
	Single	76	55.26	11.84	32.89	
Highest Education	Illiterate	73	34.25	8.22	57.53	**<0.0001**
	Basic Literate	30	43.33	13.33	43.33	
	Primary	129	41.86	18.6	39.53	
	Complementary	57	49.12	10.53	40.35	
	Secondary	36	44.44	27.78	27.78	
	College	27	85.19	11.11	3.7	
Living arrangement	Alone	104	45.19	17.31	37.5	0.49
	With partner	69	42.03	18.84	39.13	
	With child(ren)	123	42.28	13.82	43.9	
	With sibling(s)	49	59.18	8.16	32.65	
	Other	7	28.57	14.29	57.14	
Financial Dependence	Independent	66	53.03	15.15	31.82	0.078
	Dependent on child(ren)	99	32.32	18.18	49.49	
	Dependent on partner	15	33.33	26.67	40	
	Dependent on sibling(s)	28	57.14	7.14	35.71	

	Dependent on an organization	113	53.1	11.5	35.4	
	Dependent on > 1 source	31	35.48	19.35	45.16	
Monthly Income	<500K LBP	207	43	14.49	42.51	0.65
	500K to 1M LBP	96	45.83	15.63	38.54	
	>1M LBP *	49	53.06	16.33	30.61	
Perceived Income Sufficiency	Not sufficient	174	47.13	13.79	39.08	0.41
	Barely sufficient	96	43.75	13.54	42.71	
	Sufficient	69	44.93	21.74	33.33	
	More than sufficient	13	30.77	7.69	61.54	
Employment Status	Employed **	29	44.83	24.14	31.03	0.31
	Unemployed	323	45.2	14.24	40.56	
Income stability among employed	Stable	15	42.86	28.57	28.57	0.86
	Unstable	14	46.67	20	33.33	
Medical Insurance	Yes	103	41.75	18.45	39.81	0.48
	No	249	46.59	13.65	39.76	

Table A2.22: Estimates of denture status by general health and lifestyle-related behaviors in an elderly sample (N=352)

		n	% of no denture	% of partial denture	% of complete denture	chi-square p-value
Diagnosis with Chronic Diseases	Yes	317	44.79	14.83	40.38	0.78
	No	35	48.57	17.14	34.29	
Number of Comorbidities	0	35	48.57	17.14	34.29	0.93
	1	86	43.02	16.28	40.7	
	2	94	47.87	15.96	36.17	
	3+	137	43.8	13.14	43.07	
Cigarette Smoking	Past smoker	64	48.44	9.38	42.19	0.11
	Current smoker	106	37.74	14.15	48.11	
	Never smoked	182	48.35	17.58	34.07	
Waterpipe Smoking	Yes	15	33.33	20	46.67	0.63
	No	337	45.7	14.84	39.47	
Frequency of Soda Consumption	Never/Rarely	77	62.34	14.29	23.38	**0.005**
	Frequently/ Occasionally	173	40.46	17.34	42.2	
	Daily	102	40.2	11.76	48.04	
Frequency of Sweets Consumption	Never/Rarely	32	46.88	12.5	40.63	0.7
	Frequently/ Occasionally	146	49.32	14.38	36.3	
	Daily	174	41.38	16.09	42.53	
Frequency of Coffee Consumption	Never/Rarely	41	56.1	7.32	36.59	0.39
	Frequently/ Occasionally	30	46.67	10	43.33	
	Daily	281	43.42	16.73	39.86	
Frequency of Alcohol	Never/Rarely	245	44.49	15.51	40	0.95
	Frequently/	85	45.88	15.29	38.82	

Consumption	Occasionally					
	Daily	22	50	9.09	40.91	
Perception of Dental health importance	> important than general health	29	44.83	17.24	37.93	0.19
	< important than general health	143	43.36	10.49	46.15	
	As important as general health	180	46.67	18.33	35	
Awareness of affordable Dentistry services	Not Aware	192	42.71	14.06	43.23	0.5
	Aware but never visited	73	46.58	13.7	39.73	
	Aware and visited	87	49.43	18.39	32.18	
ESS	Normal range	282	43.62	16.67	39.72	0.19
	Mild sleepiness	31	38.71	6.45	54.84	
	Moderate sleepiness	22	59.09	9.09	31.82	
	Severe sleepiness	17	64.71	11.76	23.53	
GOHAI highest burden	All components equal	61	27.87	13.11	59.02	**<0.001**
	Physical function	162	41.98	13.58	44.44	
	Psychosocial function	58	53.45	20.69	25.86	
	Pain/ discomfort	65	61.54	15.38	23.08	

Table A3.1.0: Socio-demographic estimates by oral health care seeking among elderly from Beirut and Mount Lebanon (N=352)

		n	% of treatment seekers within the last year	chi-square p-value
Age[§]	65-69	121	24.79	0.93
	70-79	140	22.86	
	>=80	91	24.18	
Gender	Male	106	27.36	0.31
	Female	246	22.36	
Marital Status	Married	114	21.05	0.763
	Divorced	11	27.27	
	Widowed	151	23.84	
	Single	76	27.63	
Highest Education	Illiterate	73	19.18	**0.011**
	Basic Literate	30	26.67	
	Primary	129	18.6	
	Complementary	57	24.56	
	Secondary	36	27.78	
	College	27	51.85	
Living arrangement	Alone	104	29.81	0.454
	With partner	69	18.84	
	With child(ren)	123	23.58	
	With sibling(s)	49	20.41	
	Other	7	14.29	
Financial Dependence	Independent	66	30.3	0.315
	Dep on child(ren)	99	24.24	
	Dep on partner	15	20	
	Dep on sibling(s)	28	35.71	
	Dep on organization	113	19.47	
	Dep on > one source	31	16.13	

Monthly Income	<500K LBP	207	19.32	0.054
	500K to 1M LBP	96	31.25	
	>1M LBP	49	28.57	
Perceived Income Sufficiency	Not sufficient	174	20.11	0.12
	Barely sufficient	96	28.13	
	Sufficient	69	30.43	
	More than sufficient	13	7.69	
Employment Status	Employed	323	20.69	0.676
	Unemployed	29	24.15	
Income stability among employed	Stable	15	21.43	0.99
	Unstable	14	20	
Medical Insurance	Yes	103	32.04	**0.021**
	No	249	20.48	

Table A3.1.1: Socio-demographic estimates by oral health care seeking among elderly from Beirut and Mount Lebanon (N=352)

		n	% of non treatment seeker	% of curative seekers within the last year	% of preventive seekers within the last year	chi-square p-value
Age[§]	65-69	121	75.21	19.01	5.79	0.94
	70-79	140	77.14	15.71	7.14	
	>=80	91	75.82	18.68	5.49	
Gender	Male	106	72.64	21.7	5.66	0.41
	Female	246	77.64	15.85	6.5	
Marital Status	Married	114	78.95	15.79	5.26	0.89
	Divorced	11	72.73	18.18	9.09	
	Widowed	151	76.16	16.56	7.28	
	Single	76	72.37	22.37	5.26	
Highest Education	Illiterate	73	80.82	16.44	2.74	**0.037**
	Basic Literate	30	73.33	23.33	3.33	
	Primary	129	81.4	13.95	4.65	
	Complementary	57	75.44	17.54	7.02	
	Secondary	36	72.22	16.67	11.11	
	College	27	48.15	33.33	18.52	
Living arrangement	Alone	104	70.19	21.15	8.65	0.84
	With partner	69	81.16	14.49	4.35	
	With child(ren)	123	76.42	17.89	5.69	
	With sibling(s)	49	79.59	14.29	6.12	
	Other	7	85.71	14.29	0	
Financial Dependence	Independent	66	69.7	16.67	13.64	0.14
	Dependent on child(ren)	99	75.76	18.18	6.06	

	Dependent on partner	15	80	20	0	
	Dependent on sibling(s)	28	64.29	25	10.71	
	Dependent on an organization	113	80.53	17.7	1.77	
	Dependent on > 1 source	31	83.87	9.68	6.45	
Monthly Income	<500K LBP	207	80.68	15.46	3.86	**<0.0001**
	500K to 1M LBP	96	68.75	26.04	5.21	
	>1M LBP	49	71.43	10.2	18.37	
Perceived Income Sufficiency	Not sufficient	174	79.89	15.52	4.6	0.22
	Barely sufficient	96	71.88	21.88	6.25	
	Sufficient	69	69.57	18.84	11.59	
	More than sufficient	13	92.31	7.69	0	
Employment Status	Employed	323	75.85	18.58	5.57	0.08
	Unemployed	29	79.31	6.9	13.79	
Income stability among employed	Stable	15	80	6.67	13.33	0.999
	Unstable	14	78.57	7.14	14.29	
Medical Insurance	Yes	103	67.96	22.33	9.71	**0.052**
	No	249	79.52	15.66	4.82	

Table A3.2.0: Estimates of selected oral health status indicators by oral treatment seeking behavior in an elderly sample (N=352)

	No treatment seeking				Treatment seeking within a year				Mann-Whitney
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	p-value *
PSR	78	0.98 (1.2)	0.67	4899	50	1.09 (1.17)	0.67	3357	0.51
RCI	79	0.34 (0.38)	0.2	5428.5	50	0.27 (0.39)	0	2956.5	0.13
Roots exposed	79	4.84 (3.92)	4	5203.5	50	4.94 (4.8)	4	3181.5	0.74
Roots decayed/filled	79	2.04 (3.01)	1	5408	50	1.74 (3.31)	0	2977	0.16
FU	268	7.33 (5.23)	8	46501.5	84	7.96 (4.97)	9	15626.5	0.32
D	106	2.99 (4.01)	1	8437	53	2.45 (2.9)	1	4283	0.87
M	106	14.86 (9.98)	12.5	9457	53	8.85 (7.64)	7	3263	**0.0003**
F	106	2.66 (4.47)	0	7089	53	6.53 (5.13)	6	5631	**<0.001**
DMFT	106	20.51 (7.19)	22	9112.5	53	17.83 (6.85)	18	3607.5	**0.02**
Total plaque index	108	2.07 (0.82)	2	9987.5	64	1.79 (0.77)	1.5	4890.5	**0.037**
Upper anterior	106	3.43 (2.63)	4.5	7626.5	53	4.89 (1.97)	6	5093.5	**0.0009**
Upper posterior	106	3.36 (3.14)	3	7512	53	5.17 (2.61)	6	5208	**0.0003**
Lower anterior	106	3.64 (2.67)	5	8003	53	4.58 (2.23)	6	4717	0.058
Lower posterior	106	3.53 (3.33)	3.5	7577.5	53	5.38 (2.86)	6	5142.5	**0.0008**

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-28).

Table A3.2.1: Estimates of selected oral health status indicators by oral treatment seeking behavior in an elderly sample (N=352)

	No treatment seeking				Curative treatment seeking within a year				Preventive treatment seeking within a year				Kruska-Wallis p-value
	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	n	Mean (SD)	Median	Sum of ranks	
PSR	78	0.98 (1.2)	0.67	4899	36	1.08 (1.09)	0.75	2466.5	14	1.1 (1.4)	0.25	890.5	0.73
RCI	79	0.34 (0.38)	0.2	5428.5	36	0.22 (0.34)	0	2022.5	14	0.38 (0.48)	0.06	934	0.21
Roots exposed	79	4.84 (3.92)	4	5203.5	36	5.47 (5.3)	4	2393	14	3.57 (2.9)	4	788.5	0.65
Roots decayed/filled	79	2.04 (3.01)	1	5408	36	1.94 (3.74)	0	2140	14	1.21 (1.81)	0.5	837	0.38
FU	268	7.33 (5.23)	8	46501.5	62	7.66 (4.88)	8	11154	22	8.82 (5.23)	10.5	4472.5	0.4
D	106	2.99 (4.01)	1	8437	39	2.31 (2.3)	2	3191,5	14	2.86 (4.24)	1	1091.5	0.95
M	106	14.86 (9.98)	12.5	9457	39	9.56 (7.73)	8	2590.5	14	6.86 (7.28)	4	672.5	**0.0007**

F	106	2.66 (4.47)	0	7089	39	6.26 (5.38)	5	4019.5	14	7.29 (4.43)	8	1611.5	**0.0001**
DMFT	106	20.51 (7.19)	22	9112.5	39	18.13 (6.59)	19	2725.5	14	17 (7.75)	15	882	0.059
Total plaque index	108	2.07 (0.82)	2	9987,5	46	1.79 (0.75)	1.55	3529.5	18	1.8 (0.83)	1.37	1361	0.11
Upper anterior	106	3.43 (2.63)	4.5	7626.5	39	4,72 (2.06)	6	3603	14	5.36 (1.65)	6	1490.5	**0.002**
Upper posterior	106	3.36 (3.14)	3	7512	39	5.03 (2.78)	6	3760.5	14	5.57 (2.14)	6	1447.5	**0.001**
Lower anterior	106	3.64 (2.67)	5	8003	39	4.44 (2.27)	6	3349	14	5 (2.15)	6	1368	0.11
Lower posterior	106	3.53 (3.33)	3.5	7577.5	39	5.18 (2.8)	6	3668.5	14	5.93 (3.05)	7	1474	**0.0027**

PSR (Periodontal Screening and Recording; Range: 0-4); RCI (Root Caries Index; Range: 0-1); FU (Functional Units; Range: 0-22); D (Decayed; Range:0-28); M (Missing; Range: 0-28); F (Filled; Range: 0-28); DMFT (Decayed, Missing and Filled Teeth; Range: 0-2

Table A3.3.0: Oral health care seeking by dental hygiene practices and behaviors among elderly from Beirut and Mount Lebanon (N=352)

		n	% of treatment seekers within the last year	chi-square p-value
Perception of Dental health importance	More important than general health	29	31.03	**0.002**
	Less important than general health	143	13.99	
	As important as general health	180	30.55	
Frequency of Denture Cleaning	Few times a week or less	26	16.13	0.79
	Daily	102	54.84	
	After each meal	65	29.03	
Sleeping with Denture	Yes	105	13.33	0.072
	Sometimes	71	15.49	
	No	17	35.29	
Frequency of Teeth Cleaning	< once a day	85	21.18	**0.009**
	Once or twice a day	102	42.16	
	3 times a day	26	38.46	
Time of Teeth Cleaning	Never	52	38.46	0.21
	Morning	39	38.46	
	Evening	28	39.29	
	Morning and evening	12	25	
	After each meal	37	37.84	
	Variable	45	17.78	
Awareness of affordable Dentistry services	Not Aware	192	16.15	**<0.0001**
	Aware but never visited	73	20.55	
	Aware and visited	87	43.68	

Table A3.3.1: Estimates of dental hygiene practices and behaviors by oral health care seeking among elderly from Beirut and Mount Lebanon (N=352)

		n	% of non treatment seeker	% of non checkup seekers within the last year	% of checkup seekers within the last year	chi-square p-value
Perception of Dental health importance	More important than general health	29	68.97	27.59	3.45	**0.004**
	Less important than general health	143	86.01	11.19	2.8	
	As important as general health	180	69.44	21.11	9.44	
Frequency of Denture Cleaning	Few times a week or less	26	80.77	15.38	3.85	0.66
	Daily	102	83.33	10.78	5.88	
Sleeping with Denture	After each meal	65	86.15	12.31	1.54	0.13
	Yes	105	86.67	84.51	64.71	
	Sometimes	71	11.43	9.86	23.53	
	No	17	1.9	5.63	11.76	
Frequency of Teeth Cleaning	< once a day	85	78.82	57.84	61.54	**0.043**
	Once or twice a day	102	16.47	29.41	26.92	
	3 times a day	26	4.71	12.75	11.54	
Time of Teeth Cleaning	Never	52	61.54	26.92	11.54	0.55
	Morning	39	61.54	25.64	12.82	
	Evening	28	60.71	28.57	10.71	

	Morning and evening	12	75	25	0	
Awareness of affordable Dentistry services	After each meal	37	62.16	29.73	8.11	**<0.0001**
	Variable	45	82.22	11.11	6.67	
	Not Aware	192	83.85	11.98	4.17	
	Aware but never visited	73	79.45	13.7	6.85	
	Aware and visited	87	56.32	33.33	10.34	

Table A3.4.0: Oral health care seeking by general health and lifestyle-related behaviors among elderly from Beirut and Mount Lebanon (N=352)

		n	% of treatment seekers within the last year	chi-square p-value
Diagnosis with Chronic Diseases	Yes	317	23.66	0.79
	No	35	25.71	
Number of Comorbidities	0	35	25.71	0.608
	1	86	18.6	
	2	94	24.47	
	3+	137	26.28	
Cigarette Smoking	Past smoker	64	26.56	0.138
	Current smoker	106	16.98	
	Never smoked	182	26.92	
Waterpipe Smoking	Yes	15	13.33	0.33
	No	337	24.33	
Frequency of Soda Consumption	Never/Rarely	77	27.27	0.673
	Frequently/Occasionally	173	23.7	
	Daily	102	21.57	
Frequency of Sweets Consumption	Never/Rarely	32	21.88	0.29
	Frequently/Occasionally	146	28.08	
	Daily	174	20.69	
Frequency of Coffee Consumption	Never/Rarely	41	21.95	0.23
	Frequently/Occasionally	30	36.67	
	Daily	281	22.78	
Frequency of Alcohol Consumption	Never/Rarely	245	24.49	0.92
	Frequently/Occasionally	85	22.35	
	Daily	22	22.73	

ESS	Normal range	282	23.76	0.50
	Mild sleepiness	31	16.13	
	Moderate sleepiness	22	27.27	
	Severe sleepiness	17	35.29	
GOHAI highest burden	All components equal	61	16.39	**0.008**
	Physical function	162	20.99	
	Psychosocial function	58	22.41	
	Pain/discomfort	65	40.00	

Table A3.4.1: Oral health care seeking by general health and lifestyle-related behaviors among elderly from Beirut and Mount Lebanon (N=352)

		n	%of non treatment seeker	% of curative seekers within the last year	% of preventive seekers within the last year	chi-square p-value
Diagnosis with Chronic Diseases	Yes	317	76.34	17.03	6.62	0.51
	No	35	74.29	22.86	2.86	
Number of Comorbidities	0	35	74.29	22.86	2.86	0.78
	1	86	81.4	13.95	4.65	
	2	94	75.53	17.02	7.45	
	3+	137	73.72	18.98	7.3	
Cigarette Smoking	Past smoker	64	73.44	20.31	6.25	0.35
	Current smoker	106	83.02	11.32	20.33	
	Never smoked	182	73.08	5.66	6.25	
Water pipe Smoking	Yes	15	86.67	13.33	0	0.5
	No	337	75.67	17.8	6.53	
Frequency of Soda Consumption	Never/Rarely	77	72.73	22.08	5.19	0.7
	Frequently/ Occasionally	173	76.3	16.18	7.51	
	Daily	102	78.43	16.67	4.9	
Frequency of Sweets Consumption	Never/Rarely	32	78.13	18.75	3.13	0.11
	Frequently/ Occasionally	146	71.92	23.29	4.79	
	Daily	174	79.31	12.64	8.05	
Frequency of Coffee Consumption	Never/Rarely	41	78.05	17.07	4.88	0.45
	Frequently/ Occasionally	30	63.33	30	6.67	
	Daily	281	77.22	16.37	6.41	

Frequency of Alcohol Consumption	Never/Rarely	245	75.51	17.55	6.94	0.96
	Frequently/ Occasionally	85	77.65	17.65	4.71	
	Daily	22	77.27	18.18	4.55	
ESS	Normal range	282	76.24	17.02	6.74	0.44
	Mild sleepiness	31	83.88	9.68	6.45	
	Moderate sleepiness	22	72.73	22,73	4.55	
	Severe sleepiness	17	64.71	35.29	0	
GOHAI highest burden	All components equal	61	83.61	11.48	4.92	**0.01**
	Physical function	162	79.01	17.90	3.09	
	Psychosocial function	58	77.59	13.79	8.62	
	Pain/ discomfort	65	60.00	26.15	13.85	

Table A4.1: Unadjusted and adjusted ORs and 95% CI of the association between treatment seeking and oral health indicators, socio-demographics, dental hygiene practices and behaviors as well as lifestyle-related behaviors

	Model 1	Model 2	Model 3
Total plaque index	**0.65 (0.44,0.96)**	**0.60 (0.38,0.94)**	0.78 (0.46,1.30)
DMFT	**0.92 (0.89,0.95)**	**0.92 (0.89,0.96)**	0.98 (0.93,1.04)
Upper Anterior	**1.30 (1.19,1.43)**	**1.31 (1.19,1.45)**	**1.17 (1.01,1.34)**
Upper Posterior	**1.26 (1.16,1.36)**	**1.26 (1.15,1.38)**	**1.15 (1.02,1.30)**
Lower Posterior	**1.24 (1.15,1.34)**	**1.23(1.14,1.34)**	1.11 (0.98,1.25)
Lower Anterior	**1.26 (1.15,1.38)**	**1.27 (1.15,1.40)**	1.06 (0.90,1.25)
RCI	0.64 (0.28,1.43)	0.66 (0.27,1.65)	0.97 (0.34,2.77)
Denture:			
Partial	Ref.	Ref.	Ref.
No denture	0.97 (0.5,1.88)	0.99 (0.50,1.97)	0.97 (0.46,2.06)
Complete	**0.20 (0.09,0.45)**	**0.20 (0.09,0.47)**	**0.25 (0.10,0.61)**

Model 1 contains each oral health indicator alone.

Model 2 contains each oral health indicator alone with all socio-demographics

Model 3 contains each oral health indicator alone with socio-demographics, dental hygiene practices and behaviors, lifestyle-related behaviors and quality of life.

Bolded ORs and 95% CI are statistically significant at alpha 0.05.

Table A4.2: Unadjusted and adjusted ORs and 95% CI of the association between treatment seeking and socio-demographics, dental hygiene practices and behaviors as well as lifestyle-related behaviors

	Model 4	Model 5	Model 6
SOCIO-DEMOGRAPHICS			
Age	---	1.00 (0.95,1.04)	1.00 (0.95,1.05)
Gender			
Male	---	Ref	Ref
Female	---	0.65 (0.35,1.19)	0.62 (0.32,1.20)
Education			
Illiterate / Basic Literate	---	Ref	Ref
Primary / Complementary	---	0.67 (0.34,1.30)	0.73 (0.36,1.49)
Secondary / College	---	1.04 (0.44,2.46)	1.13 (0.45,2.86)
Income			
500K or less	---	Ref	Ref
>500K but <1M	---	1.70 (0.91,3.21)	**2.38 (1.15,4.92)**
1M or more	---	0.67(0.25,1.78)	0.96 (0.33,2.83)
Medical insurance			
No	---	Ref	Ref
Yes	---	**2.01 (1.04,3.91)**	1.96 (0.95,4.04)
ORAL HEALTH STATUS INDICATORS			
Total plaque index	---	---	---
DMFT	1.05 (0.98,1.13)	1.07 (0.99,1.16)	**1.09 (1.00,1.18)**
Upper Anterior	1.12 (0.92,1.36)	1.15 (0.94,1.41)	1.15 (0.92,1.43)
Upper Posterior	1.09 (0.91,1.29)	1.12 (0.93,1.34)	1.15 (0.93,1.41)
Lower Posterior	1.14 (0.98,1.32)	1.10(0.94,1.29)	1.11 (0.93,1.32)
Lower Anterior	0.99 (0.84,1.17)	1.05 (0.88,1.25)	0.99 (0.82,1.21)
RCI	---	---	---
Denture:			
Partial	Ref	Ref	Ref
No denture	0.59 (0.29,1.25)	0.57 (0.26,1.27)	0.51 (0.21,1.23)
Complete	**0.30 (0.12,0.78)**	**0.32 (0.12,0.86)**	**0.29 (0.10,0.83)**

DENTAL HYGIENE PRACTICES AND ORAL HEALTH BEHAVIORS			
Perception of Oral Health:			
As/more important than general Health	---	---	Ref
Less important than general Health	---	---	**0.35 (0.18,0.68)**
Frequency of Dental Cleaning:			
Less than once per day	---	---	---
Once or twice per day	---	---	---
Three times per day	---	---	---
Awareness of affordable dental services:			
Not aware	---	---	Ref
Aware	---	---	**2.83 (1.55,5.19)**
LIFESTYLE-RELATED BEHAVIORS			
Cigarette smoking:			
Never smoker	---	---	Ref
Past Smoker	---	---	0.89 (0.35,2.29)
Current Smoker	---	---	1.55 (0.68,3.50)
Soda:			
Never	---	---	Ref
Rarely/Occasionally	---	---	0.84 (0.39,1.81)
Frequently/Daily	---	---	1.38 (0.59,3.25)
GOHAI highest burden			
All burdens equal	---	---	Ref
Physical function	---	---	1.59 (0.65,3.87)
Psychosocial function	---	---	1.32 (0.46,3.82)
Pain/discomfort	---	---	2.35 (0.88,6.31)

Model 4 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and denture status)

Model 5 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and denture status) and socio-demographics.

Model 6 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and denture status) and socio-demographics as well as dental hygiene practices and behaviors and lifestyle-related behaviors and quality of life.

Bolded ORs and 95% CI are statistically significant at alpha 0.05.

Table A4.3: Unadjusted and adjusted ORs and 95% CI of the association between treatment seeking and socio-demographics, dental hygiene practices and behaviors as well as lifestyle-related behaviors

	Model 7	Model 8	Model 9
SOCIO-DEMOGRAPHICS			
Age	---	1.05 (0.99,1.11)	1.06 (0.99,1.14)
Gender			
Male	---	Ref	Ref
Female	---	0.63 (0.29,1.36)	0.59 (0.24,1.49)
Education			
Illiterate / Basic Literate	---	Ref	Ref
Primary / Complementary	---	0.44 (0.18,1.06)	0.52 (0.19,1.39)
Secondary / College	---	0.76 (0.25,2.27)	0.69 (0.19,2.56)
Income			
500K or less	---	Ref	Ref
>500K but <1M	---	1.35 (0.56,3.23)	2.14 (0.76,6.07)
1M or more	---	0.30 (0.08,1.13)	0.48 (0.10,2.24)
Medical insurance			
No	---	Ref	Ref
Yes	---	**2.65 (1.04,6.74)**	2.21 (0.74,6.07)
ORAL HEALTH STATUS INDICATORS			
Total plaque index	0.73 (0.47,1.14)	0.65 (0.39,1.09)	0.82 (0.46,1.47)
DMFT	1.03 (0.96,1.12)	1.05 (0.97,1.14)	1.07 (0.97,1.17)
Upper Anterior	1.00 (0.82,1.23)	1.07 (0.86,1.33)	1.09 (0.85,1.40)
Upper Posterior	1.10 (0.92,1.31)	1.13 (0.93,1.36)	1.18 (0.94,1.48)
Lower Posterior	1.10 (0.94,1.29)	1.05 (0.89,1.24)	1.02 (0.84,1.25)
Lower Anterior	0.96 (0.79,1.17)	1.11 (0.89,1.39)	1.09 (0.84,1.41)
RCI	0.88 (0.33,2.37)	0.99 (0.34,2.93)	1.34 (0.40,4.47)
Denture:			
Partial	---	---	---
No denture	---	---	---
Complete	---	---	---

DENTAL HYGIENE PRACTICES AND ORAL HEALTH BEHAVIORS			
Perception of Oral Health:			
As/more important than general Health	---	---	Ref
Less important than general Health	---	---	**0.36 (0.14,0.90)**
Frequency of Dental Cleaning:			
Less than once per day	---	---	Ref
Once or twice per day	---	---	**3.32 (1.16, 9.49)**
Three times per day	---	---	4.51 (0.94,21.61)
Awareness of affordable dental services:			
Not aware	---	---	Ref
Aware	---	---	**3.16 (1.41,7.10)**
LIFESTYLE-RELATED BEHAVIORS			
Cigarette smoking:			
Never smoker	---	---	Ref
Past Smoker	---	---	0.74 (0.20,2.73)
Current Smoker	---	---	1.56 (0.57,4.31)
Soda:			
Never	---	---	Ref
Rarely/Occasionally	---	---	1.19 (0.45,3.14)
Frequently/Daily	---	---	2.66 (0.78,9.06)
GOHAI highest burden			
All burdens equal	---	---	Ref
Physical function	---	---	1.90 (0.53,6.78)
Psychosocial function	---	---	2.32 (0.56,9.49)
Pain/discomfort	---	---	2.08 (0.55,7.96)

Model 7 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index).

Model 8 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index) and socio-demographics.

Model 9 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index) and socio-demographics as well as dental hygiene practices and behaviors and lifestyle-related behaviors and quality of life.

Bolded ORs and 95% CI are statistically significant at alpha 0.05.

Table A4.4: Unadjusted and adjusted RRRs and 95% CI of the association between preventive and no treatment seeking and socio-demographics, dental hygiene practices and behaviors as well as lifestyle-related behaviors

	No treatment versus preventive treatment			Curative versus preventive treatment		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Total plaque index	1.52 (0.81,2.87)	1.19 (0.58,2.42)	0.95 (0.43,2.11)	0.98 (0.49,1.97)	0.61 (0.27,1.36)	0.66 (0.28,1.56)
DMFT	**1.10 (1.04,1.17)**	**1.07 (1.00,1.14)**	1.01 (0.92,1.10)	1.01 (0.95,1.08)	0.99 (0.92,1.06)	1.00 (0.91,1.10)
Upper Anterior	**0.75 (0.63,0.88)**	**0.80 (0.67,0.95)**	0.90(0.72,1.14)	0.96 (0.80,1.15)	1.06 (0.87,1.30)	1.08 (0.84,1.40)
Upper Posterior	**0.78 (0.68,0.89)**	**0.81 (0.70,0.94)**	0.89 (0.73,1.08)	0.97 (0.84,1.12)	1.03 (0.88,1.22)	1.03 (0.84,1.27)
Lower Posterior	**0.77 (0.68,0.88)**	**0.82 (0.71,0.94)**	0.91 (0.75,1.10)	0.95 (0.83,1.09)	1.01 (0.87,1.18)	1.01 (0.82,1.25)
Lower Anterior	**0.76 (0.64,0.90)**	**0.81 (0.68,0.97)**	0.99 (0.76,1.28)	0.94 (0.78,1.13)	1.04 (0.85,1.28)	1.09 (0.82,1.46)
RCI	0.67 (0.20,2.18)	0.24 (0.05,1.16)	**0.16 (0.03,0.94)**	**0.27 (0.07,1.10)**	**0.08 (0.01,0.46)**	**0.09 (0.01,0.60)**
Denture:						
Partial	Ref	Ref	Ref	Ref	Ref	Ref
No denture	1.30 (0.46,3.64)	1.38 (0.46,4.11)	1.10 (0.34,3.51)	1.39 (0.44,4.42)	1.60 (0.46,5.49)	1.41 (0.39,5.14)
Complete	**10.89 (2.10,56.31)**	**8.81 (1.64,47,35)**	**7.97 (1.42,44.66)**	2.75 (0.46,16.59)	2.17 (0.34,13.89)	2.35 (0.35,15.63)

Model 1 contains each oral health indicator alone.

Model 2 contains each oral health indicator alone with all socio-demographics.

Model 3 contains each oral health indicator alone with socio-demographics, dental hygiene practices and behaviors and lifestyle-related behaviors.

Bolded RRRs and 95% CI are statistically significant at alpha 0.05.

Table A4.5: Unadjusted and adjusted RRRs and 95% CI of the association between preventive and no treatment seeking and socio-demographics, dental hygiene practices and behaviors as well as lifestyle-related behaviors

	No treatment versus preventive treatment			Curative versus preventive treatment		
	Model 4	**Model 5**	**Model 6**	**Model 4**	**Model 5**	**Model 6**
SOCIO-DEMOGRAPHICS						
Age	---	1.03 (0.95,1.11)	1.00 (0.91,1.09)	---	1.04 (0.95,1.13)	1.00 (0.91,1.10)
Gender						
Male	---	Ref	Ref	---	Ref	Ref
Female	---	1.07 (0.36,3.16)	1.10 (0.32,3.72)	---	0.61 (0.19,1.96)	0.59 (0.16,2.18)
Education						
Illiterate / Basic Literate	---	Ref	Ref	---	Ref	Ref
Primary / Complementary	---	0.72 (0.18,2.90)	0.62 (0.14,2.76)	---	0.40 (0.09,1.74)	0.38 (0.08,1.84)
Secondary / College	---	0.63 (0.13,3.06)	0.38 (0.07,2.18)	---	0.61 (0.11,3.37)	0.36 (0.06,2.32)
Income						
500K or less	---	Ref	Ref	---	Ref	Ref
>500K but <1M	---	0.65 (0.18,2.30)	**0.47 (0.11,1.92)**	---	1.13 (0.30,4.29)	1.22 (0.28,5.34)
1M or more	---	0.29 (0.07,1.28)	0.18 (0.03,1.04)	---	**0.07 (0.01,0.44)**	**0.07 (0.01,0.52)**
Medical insurance						
No	---	Ref	Ref	---	Ref	Ref
Yes	---	0.77 (0.24,2.50)	0.96 (0.25,3.66)	---	1.83 (0.51,6.58)	2.31 (0.55,9.70)

ORAL HEALTH STATUS INDICATORS						
Total plaque index	---	---	---	---	---	---
DMFT	0.95 (0.85,1.06)	0.94 (0.83,1.06)	0.94 (0.82,1.08)	0.99 (0.88,1.11)	1.01 (0.88,1.16)	1.03 (0.89,1.20)
Upper Anterior	0.91 (0.66,1.25)	0.95 (0.69,1.33)	0.89 (0.60,1.32)	1.02 (0.72,1.45)	1.14 (0.79,1.65)	1.07 (0.69,1.64)
Upper Posterior	0.92 (0.69,1.21)	0.87 (0.64,1.18)	0.89 (0.63,1.25)	1.00 (0.74,1.35)	0.96 (0.69,1.34)	1.01 (0.70,1.46)
Lower Posterior	0.84 (0.66,1.07)	0.86 (0.66,1.13)	0.85 (0.64,1.13)	0.94 (0.72,1.21)	0.94 (0.70,1.25)	0.93 (0.69,1.26)
Lower Anterior	1.02 (0.78,1.33)	1.05 (0.79,1.41)	1.11 (0.82,1.51)	1.01 (0.75,1.35)	1.14 (0.83,1.58)	1.15 (0.82,1.63)
RCI	---	---	---	---	---	---
Denture:						
Partial	Ref	Ref	Ref	Ref	Ref	Ref
No denture	2.22 (0.68,7.23)	2.28 (0.65,8.03)	2.40 (0.48,11,92)	1.45 (0.40,5.26)	1.50 (0.37,6.14)	1.40 (0.25,8.03)
Complete	**6.8 (1.08,42.83)**	**7.62 (1.14,50.83)**	7.00 (0.96,51.22)	2.56 (0.34,19.09)	3.34 (0.41,27.32)	2.61 (0.29,23.66)

DENTAL HYGIENE PRACTICES AND BEHAVIORS						
Perception of Oral Health:						
As/more important than general Health	---	---	Ref	---	---	Ref
Less important than general Health	---	---	3.63 (0.96,13.70)	---	---	1.31(0.32,5.56)
Frequency of Dental Cleaning:						
Less than once per day	---	---	---	---	---	---
Once or twice per day	---	---	---	---	---	---
Three times per day	---	---	---	---	---	---
Awareness of affordable dental services:						
Not aware	---	---	Ref	---	---	Ref
Aware	---	---	**0.21 (0.07,0.65)**	---	---	0.55 (0.16,1.81)
LIFESTYLE- RELATED BEHAVIORS						
Cigarette smoking:						
Never smoker	---	---	Ref	---	---	Ref
Past Smoker	---	---	0.36 (0.06,2.05)	---	---	0.22 (0.03,1.46)
Current Smoker	---	---	0.47 (0.10,2.13)	---	---	0.88 (0.14,3.34)

Soda:						
Never	---	---	Ref	---	---	Ref
Rarely/Occasionally	---	---	0.44 (0.11,1.84)	---	---	0.26 (0.06,1.06)
Frequently/Daily	---	---	0.29 (0.05,1.68)	---	---	0.32 (0.05,1.97)
GOHAI highest burden				---		
All burdens equal	---	---	Ref			Ref
Physical function	---	---	1.23 (0.23,6.66)	---		2.27 (0.36,14.25)
Psychosocial function	---	---	0.48 (0.08,2.73)	---		0.52 (0.07,3.82)
Pain/discomfort	---	---	0.26 (0.025,1.28)			0.48 (0.08,2.86)

Model 4 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and denture status).

Model 5 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and denture status) and socio-demographics.

Model 6 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior and denture status) and socio-demographics, dental hygiene practices and behaviors and lifestyle-related behaviors.

Bolded RRRs and 95% CI are statistically significant at alpha 0.05.

Table A4.6: Unadjusted and adjusted RRRs and 95% CI of the association between preventive and no treatment seeking and socio-demographics, dental hygiene practices and behaviors as well as lifestyle-related behaviors

	No treatment versus preventive treatment			Curative versus preventive treatment		
	Model 7	**Model 8**	**Model 9**	**Model 7**	**Model 8**	**Model 9**
SOCIO-DEMOGRAPHICS						
Age	---	0.96 (0.88,1.05)	0.93 (0.83,1.04)	---	1.00 (0.91,1.10)	0.98 (0.86,1.11)
Gender						
Male	---	Ref	Ref	---	Ref	Ref
Female	---	0.96 (0.28,3.38)	1.00 (0.19,5.21)	---	0.52 (0.13,2.07)	0.51(0.09,3.08)
Education						
Illiterate / Basic Literate	---	Ref	Ref	---	Ref	Ref
Primary / Complementary	---	0.94 (0.19,4.57)	0.99 (0.15,6.59)	---	0.30 (0.05,1.71)	0.39 (0.05,2.79)
Secondary / College	---	0.64 (0.08,4.95)	0.52 (0.04,6.90)	---	0.43 (0.05,3.78)	0.26 (0.02,3.77)
Income						
500K or less	---	Ref	Ref	---	Ref	Ref
>500K but <1M	---	0.56 (0.12,2.61)	0.32 (0.05,1.90)	---	0.71 (0.14,3.75)	0.67 (0.10,4.31)
1M or more	---	0.37 (0.05,2.81)	0.19 (0.01,2.64)	---	**0.03 (0.00,0.30)**	**0.02 (0.00,0.41)**

Medical insurance						
No	---	Ref	Ref	---	Ref	Ref
Yes	---	0.64 (0.15,2.77)	1.05 (0.16,6.68)	---	2.17 (0.42,11.24)	3.33 (0.45,23.37)
ORAL HEALTH STATUS INDICATORS						
Total plaque index	1.75 (0.82,3.77)	1.54 (0.66,3.59)	1.11 (0.43,2.86)	1.39 (0.61,3.19)	1.00 (0.38,2.59)	0.91 (0.33,2.54)
DMFT	0.97 (0.86,1.09)	0.95 (0.83,1.09)	0.97 (0.82,1.14)	1.00 (0.88,1.13)	1.01 (0.87,1.18)	1.06 (0.89,1.27)
Upper Anterior	1.12 (0.80,1.56)	1.09 (0.77,1.54)	1.04 (0.69,1.58)	1.17 (0.81,1.69)	1.25 (0.84,1.87)	1.25 (0.78,2.00)
Upper Posterior	0.88 (0.66,1.16)	0.85 (0.62,1.16)	0.82 (0.55,1.22)	0.95 (0.70,1.29)	0.94 (0.66,1.33)	0.93 (0.61,1.43)
Lower Posterior	0.83 (0.64,1.09)	0.89 (0.67,1.17)	0.96 (0.68,1.36)	0.89 (0.67,1.19)	0.91 (0.66,1.24)	0.99 (0.68,1.49)
Lower Anterior	0.98 (0.71,1.35)	0.95 (0.66,1.36)	0.93 (0.60,1.45)	0.93 (0.65,1.32)	1.09 (0.73,1.62)	1.02 (0.62,1.65)
RCI	0.31 (0.06,1.51)	0.53 (0.23,1.01)	**0.10 (0.01,0.95)**	**0.16 (0.03,0.95)**	**0.07 (0.01,0.61)**	**0.06 (0.01,0.69)**
Denture:						
Partial	---	---	---	---	---	---
No denture	---	---	---	---	---	---
Complete	---	---	---	---	---	---

DENTAL HYGIENE PRACTICES AND BEHAVIORS						
Perception of Oral Health:						
As/more important than general Health	---	---	Ref	---	---	Ref
Less important than general Health	---	---	2.16(0.45,10.37)	---	---	0.75 (0.14,4.09)
Frequency of Dental Cleaning:						
Less than once per day	---	---	Ref	---	---	Ref
Once or twice per day	---	---	0.18(0.02,1.49)	---	---	0.55 (0.06,5.06)
Three times per day	---	---	0.21(0.01,3.53)	---	---	0.98 (0.05,18.99)
Awareness of affordable dental services:						
Not aware	---	---	Ref	---	---	Ref
Aware	---	---	**0.25(0.07,0.96)**	---	---	0.70 (0.17,2.99)

LIFESTYLE-RELATED BEHAVIORS						
Cigarette smoking:						
Never smoker	---	---	Ref	---	---	Ref
Past Smoker	---	---	2.11(0.16,28.02)	---	---	1.34 (0.08,21.85)
Current Smoker	---	---	0.47(0.08,2.80)	---	---	0.58 (0.09,3.90)
Soda:						
Never	---	---	Ref	---	---	Ref
Rarely/Occasionally	---	---	0.30(0.06,1.56)	---	---	0.22 (0.04,1.38)
Frequently/Daily	---	---	0.17(0.02,1.75)	---	---	0.34 (0.03,3.93)
GOHAI highest burden						
All burdens equal	---	---	Ref	---	---	Ref
Physical function	---	---	0.83 (0.09,7.94)	---	---	1.66 (0.14,19.62)
Psychosocial function	---	---	0.21 (0.02,1.29)	---	---	0.30 (0.03,3.64)
Pain/discomfort	---	---	0.14 (0.02,1.21)	---	---	0.16 (0.01,1.80)

Model 7 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index).

Model 8 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index) and socio-demographics

Model 9 includes all oral health indicators (DMFT, Upper Anterior, Upper Posterior, Lower Anterior, Lower Posterior, RCI and plaque index) and socio-demographics, dental hygiene practices and behaviors and lifestyle-related behaviors.

Bolded RRRs and 95% CI are statistically significant at alpha 0.05.