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Study of the prevalence of Temporomandibular Disorders (TMD) and quality of life in an institutionalized elderly population

Estudo de prevalência de Desordens Temporomandibulares (TMD) e qualidade de vida em uma população de idosos institucionalizados

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ABSTRACT

PURPOSE: This multidisciplinary prevalence study had the objective of identifying the prevalence of TMD, chronic pain and quality of life in institutionalized elderly patients in Southern Brazil, including depression and somatization levels. METHODS: Forty subjects (55% women, mean age=75 years±S.D., 80% Caucasian) in need of dental treatment were selected from two long-term elderly institutions in the city of Porto Alegre. The World Health Organization Quality of Life (WHOQOL) questionnaire was used for assessing quality of life, the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) for TMD signs and symptoms as well as depression and somatization levels, and the North York Dental Health Survey (NYDHS) for the oral health status. RESULTS: Approximately 60% completed elementary school. It was also a low income population (85%, $75 to $500 American dollars per month). Most (56.4%) were born in the countryside. Ten percent had high intensity pain, with 2.5% accompanied by moderate limitation. These severe signs and symptoms of TMD were associated with significant disability in daily functions and had a negative impact in the level of psychological stress and quality of life in institutionalized patients. In addition, almost 97.5% of the elderly has shown some degree of depression, and 57.5% had moderate to strong somatization levels. CONCLUSIONS: The proportion of elderly with severe TMD signs and symptoms was low; however, the great frequency of depression and somatization, with a good number of them in actual treatment need, highlights the importance of evaluating the elderly in all aspects.

KEYWORDS: temporomandibular disorder; orofacial pain; depression; somatization; quality of life; elderly.

RESUMO

OBJETIVO: Esse estudo multidisciplinar de prevalência teve como objetivo identificar a prevalência de TMD, dor crônica e qualidade de vida de pacientes idosos institucionalizados no sul do Brasil, incluindo depressão e níveis de somatização. MÉTODOS: 40 sujeitos (55% mulheres, idade média de 75 anos, 80% Caucasiana com necessidade de tratamento dentário foram selecionados de duas instituições de longa permanência para idosos em Porto Alegre. O Questionário de Qualidade de Vida da Organização Mundial da Saúde (WHOQOL) foi utilizado para avaliar a qualidade de vida, o questionário para Critério Diagnóstico de Desordens Temporomandibulares (RDC/TMD) para sinais e sintomas de DTM bem como depressão e níveis de somatização e o Inventário de Saúde Dental de North York (NYDHS) para o estado de saúde oral. RESULTADOS: Aproximadamente 60% completou ensino fundamental. População de baixa renda (85% 75 a 500 dólares por mês). A maioria (56,4%) nasceram no campo. Dez por cento possuem alta intensidade de dor com 2,5% acompanhada de limitação moderada. Esses sinais e sintomas de DTM foram associados com deficiência significativa nas funções diárias e tiveram um impacto negativo no nível de estresse psicológico e qualidade de vida dos idosos institucionalizados. Além disso, quase 97,5% dos idosos demonstraram algum grau de depressão e 57,5% tiveram níveis de somatização moderados a altos. CONCLUSÕES: A proporção de idosos com sinais e sintomas de DTM foi baixa; entretanto, a grande frequência de depressão e somatização e um grande número em necessidade atual de tratamento destaca a importância de avaliar os idosos em todos os aspectos.

PALAVRAS-CHAVE: desordem temporomandibular; dor orofacial; depressão; somatização; qualidade de vida; idosos.

INTRODUCTION

The aging of the population is a major achievement followed by a great challenge, because it leads to an increase in social and economic policies to improve the quality of life of this group. It is notable how the group of people with 60 or more years old is growing faster than any other, and it is expected to reach a total of 1.2 billion by the year 2025.[1] Brazil, according to demographic data, will be the sixth largest elderly population in the world by the year 2025.[2]

One of the issues that arise with aging is chronic pain, which may affect the quality of life of the elderly. In the United States, it is considered a public health problem, affecting 100 million adults.[3] Around half of the people over the age of 60 report some kind of chronic pain,[4,5] which not only limits the movements and agility of patients, but also compromises their quality of life.[5]

Chronic pain may be generated by various diseases or alterations such as temporomandibular disorders (TMD). TMD is a collective term which involves some chronic pain related to the masticatory muscles, the temporomandibular joint or both. Also, orofacial pain in the majority of cases is associated with the muscles of mastication and/or the temporomandibular joint(s).[6]

Little has been studied about the elderly population regarding TMD, but there are few studies regarding its prevalence in community-dwelling elderly population.[4,5] On the other hand, there is a lack of studies in Brazilian institutionalized elderly population.[7]

Therefore, this study had the objective of identifying the prevalence of TMD, chronic pain and quality of life in institutionalized elderly patients in Southern Brazil, including depression and somatization levels.

MATERIALS AND METHODS

Institutionalized elderly patients from two institutions situated in the city of Porto Alegre, located in the south region of Brazil, were asked to participate in this study. Questionnaires were filled out by them under supervision, in case they needed help. Then, patients were clinically examined according to RDC/TMD, axis II. Details are described as follow.

Inclusion/Exclusion Criteria

Forty elderly patients, of both genders, with a minimum age of 62 years, were selected. These patients were drawn from two long-term staying institutions: a) Amparo Santa Cruz located in Belém Velho neighborhood, municipality of Porto Alegre, which houses 53 elders and develops projects towards the needy community by partnerships with public and private sectors, and b) Old Folks Home (Gustavo Nordlund), located in Rubem Berta neighborhood, municipality of Porto Alegre, which houses 100 elders and is a philanthropic institution.

All patients signed the informed consent agreeing to participate in the study, which was approved by the São Lucas Hospital Ethics Committee (CEP/HSL, Protocol #10/05138) at the Pontifical Catholic University of Rio Grande do Sul, State of Rio Grande do Sul, Brazil.

Questionnaires

For TMD diagnosis, the Research Diagnostic Criteria for Temporomandibular Disorders was employed. The RDC/TMD is a clinical questionnaire developed with the objective of creating a set of diagnostic criteria for the classification of TMD. It allows a multidimensional evaluation of TMD chronic pain, including not only clinical variables, but also social and economic factors which might influence the treatment result, such as: educational level, income, age, chronic pain impact, etc. It is often used in order to standardize data collection, the replication of studies, and the comparison of data from different studies.[8]

For assessment of oral health, the North York Dental Health Survey (NYDHS) was used. This questionnaire was developed in order to evaluate a global assessment of oral health conditions, including caries, periodontal disease and facial pain following the guidelines of the WHO.[9]

It is clear from basic research that pain might influence patient's quality of life, especially when dealing with the elderly. This particular group has to cope with limitations due to health issues. This way, the World Health Organization Quality of Life questionnaire was used (WHOQOL), which has been validated in Brazil.[10] It has questions regarding daily life activities, health care, family and social relations, so that how these different aspects of life may be compromised by the patient's illness can be analyzed.

The questionnaires were filled by the patient and supervised by an undergraduate student, who helped by repeating the question, when needed.

Clinical evaluation for presence of signs and symptoms of TMD

The diagnosis of TMD was only confirmed in those patients presenting with a Chronic Pain Grade (CPG) level II or greater on a four-level scale (from O to IV).[8] The RDC/TMD Axis II was administered by a single examiner, which has been shown to have a good reproducibility in the literature (Kappa=0.7).[8] The

examiner was blinded to the patient's chief complaint to prevent examiner bias (i.e., systematic error).

Sample size calculation and data analysis

The population proportion was estimated with specified absolute precision according to the following formula ($n=z^2_{1-a/2}\,P(1-P)/d^2$),[11] in which: the margin of error was ±2%, at a 95% confidence level, and the anticipated proportion was 40% based on the populational study by Locker & Slade examining the TMD signs and symptoms in the elderly population (at least one sign or symptom.[12] The final sample reached *40* individuals, and the database and data analysis were created using the SPSS software version 11.5.

Protocol

The questionnaires were used in the following order: a) reading and signature of the consent form by the elderly, and fulfilling of b) the RDC/TMD axis II, c) the North York Dental Health Survey (NYDHS), and d) the World Health Organization Quality of Life Index (WHOQOL).

RESULTS

The social and demographic characteristics have shown that 60% of the interviewed elderly had incomplete primary school education and 84.8% of them received from $150 to $1,000 Brazilian *Reais* as their monthly income (approximately US$300). In addition, 56.4% were born in cities around the state, and 80% of them have an European dominant ethnicity. Also, the mean age was 75±9.12 years, and 55% were female.

Table 1 shows the oral health aspects of the elderly from the study. The mean presence of teeth in the mouth is 4.43, and all have at least 10 missing teeth. Fifty percent wear some type of removable prosthodontics or complete dentures, and 30% has never been to a dentist before. Besides, 67.5% has not visited a dentist for more than 3 years.

Table 2 displays the results of the RDC/TMD axis II self-assessment questionnaire. Chronic orofacial pain was present at levels II and III in 10% of the elderly. Depression was present as a strong, severe condition in 27.5% of the interviewed elderly. In addition, somatization, either with or without pain, was present as a moderate to strong condition in most of the study population (>50%). According to the results of RDC axis II, among the situations in which the elderly would feel distressed, headache and loss of appetite were not an issue in 62.5% and 80% of them, respectively.

Table 1. Self-assessment of oral health survey (North York Dental Health Survery – NYDHS) and quality of life indicators (World Health Organization Quality of Life – WHOQOL) in an institutionalized elderly population.

Independent variables	Percentage (%) N=40
Perceived oral health:	
Good to excelent	60
Reasonable to bad	40
Presence of natural teeth:	
Greater or equal 1 tooth	52.5
No teeth	47.5
Use of a removable partial or complete denture:	
Yes	50
No	50
Frequency of dentist consultation:	
Regularly	20
Only when presents pain or another problem	50
Never	30
Time of last consultation:	
In the last 6 months	12.5
1 to 2 years ago	17.5
3 years ago	2.5
More than 3 years ago	67.5
Number of natural teeth:	
Mean (standard deviation)	4.43 (6.36)
Range	0-22
In the last year, at anytime...	
– you did not feel the same pleasure to eat like you used to:	
Yes	37.5
No	62.5
– you avoided to smile due to the appearance of your teeth:	
Yes	30
No	70
– you avoided to talk to others:	
Yes	20
No	80
– you avoided to eat among other people due to problems in chewing:	
Yes	20
No	80
– you can eat beef and\or an apple:	
Yes	52.5
No	47.5
– pain or discomfort in the denture or your own teeth made you avoid leisure activities:	
Yes	15
No	85
Over the last weeks, did you have any of the problems below:	
– Wounds in your mouth (ulcers):	
Yes	12.5
No	87.5
– Bleeding gums:	
Yes	10
No	90
– Bad halitosis:	
Yes	22.5
No	77.5
– Dry mouth:	
Yes	60
No	40
– Clicking or noises in front of the ear:	
Yes	40
No	60
– Difficulties in opening your mouth:	
Yes	10
No	90

Table 2. Self-assessment of Temporomandibular Disorders and Orofacial Pain using the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) – Axis II in an institutionalized elderly population.

Independent variables	Percentage (%) N=40
Chronic Pain Grade – CPG:	
No pain = 0	75
Low disability, low intensity = I	15
Low disability, high intensity = II	7.5
High disability, moderately limiting = III	2.5
High disability, severely limiting = IV	0
Disability Points – DP:	
No or low disability (less than 3 points)	97.5
High disability (equal or more than 3 points)	2.5
Characteristic Pain Intensity:	
– CPI (100 mm VAS):	
Mean (Standard Deviation)	11.3 (28.1)
– Depression:	
Mean (Standard Deviation)	0.5 (0.7)
– Somatization with pain:	
Mean (Standard Deviation)	0.14 (0.37)
– Somatization without pain:	
Mean (Standard Deviation)	0.43 (0.62)
Depression (%):	
Absent	2.5
Mild Depression (<0.6)	40
Moderate Depression (<1.5)	30
Strong Depression (<2.4)	22.5
Severe Depression (>2.4)	5
Somatization with pain (%):	
Mild Somatization (<0.500)	47.5
Moderate Somatization (<1.000)	17.5
Strong Somatization (1.000+)	35
Somatization without pain (%):	
Mild Somatization (<0.428)	42.5
Moderate Somatization (<0.857)	12.5
Strong Somatization (0.857+)	45

Table 3. Comparative results of the quality of life of institutionalized elders using WHOQOL.

Independent variables Dependent variables	Elders, TMD (N=40)
Evaluation of present quality of life (%):	
Good	50
Average	37.5
Bad	12.5
Acceptance of physical appearance (%):	
Completely	77.5
Average	20
Nothing	2.5
How satisfied do you feel about...	
– health (%):	
Satisfied	42.5
Partially satisfied	27.5
Unsatisfied	30
– sleep (%):	
Satisfied	65
Partially satisfied	17.5
Unsatisfied	17.5
– yourself (%):	
Satisfied	67.5
Partially satisfied	25
Unsatisfied	7.5
– personal relations (friends, relatives...) (%):	
Satisfied	67.5
Partially satisfied	25
Unsatisfied	7.5
– the conditions of your home (%):	
Satisfied	65
Partially satisfied	17.5
Unsatisfied	17.5
– access to healthcare (%):	
Satisfied	80
Partially satisfied	7.5
Unsatisfied	12.5

Nonetheless, 46.9% reported loss of sexual interest or pleasure, 42.5% felt weakness or dizziness, and 55% felt lower back pain, with 50% of these patients reporting muscle soreness. In relation to the quality of sleep, 62.5% has not reported agitated or disturbed sleep, but 50% had difficulty in falling asleep.

The results of the WHOQOL questionnaire regarding the elders' feelings towards many aspects of their lives; such as: health and sleep are shown in **Table 3**. The patients have not complained about sleep and were satisfied about their home at the institution. When asked about how they felt about their health, 57.5% were partially satisfied or unsatisfied, even though access to healthcare was not an issue to 80%.

DISCUSSION AND CONCLUSION

There is little information about the prevalence of TMD in the institutionalized elderly population in the literature.[6,13,14] In Brazil, one of the few existing studies was done in 36 institutionalized elderly patients from the *Padre Cacique*, a Long Term Care Institution for the elderly, and from the *Porto Alegre* Society for Support of the Needy (SPAAN).[7] According to the authors, the prevalence of muscular and/or articular palpation sensitivity was 16.7%, a relatively low percentage. However, the presence of joint sounds was 61.1%; and 50% and 46% of patients have shown limited maximum mouth opening and maximum lateral movement, respectively. These results have shown that when elders are clinically examined, a high prevalence of classic signs of TMD is found (i.e., tenderness to palpation in the TMJ(s) and/or masticatory muscles, and joint sounds); however, studies have shown that the proportion of patients with symptoms of TMD (i.e., spontaneous pain in the TMJ(s) and masticatory muscles) tends to reduce sharply after the age of fifty.[4,5,15]

The possible increase in signs of TMD might be due to: a) degenerative alterations in the joints (osteoarthritis), b) reduction in the sensory perception in the oral structures, c) oral manifestations of systemic problems, d) reduction in the motor activity in the oral and facial musculature, e) reduction in the size and number of muscle fibers, which are replaced by fat and conjunctive tissue, f) reduction in the transverse section of the musculature and in the neurological function, and g) changes in the functioning of the oral cavity related to the loss of teeth, among others.[16,17] Another explanation might be also due to the fact that after the age of 50; systemic problems (e.g., diabetes, cancer and cardiovascular problems) draw all the attention and the patient's resources. Therefore, since TMD is not a life-threatening disease, it might play a secondary role in the patient's life.[16] Other explanations have suggested a reduction in the emotional stress of this group in relation to younger ones; because, in this age group, the major life challenges have already passed.[18]

Despite a good proportion of the elderly has mentioned difficulty in chewing a piece of barbecue, meat or an apple; and feeling less pleasure in eating like before, the perceived oral health was satisfactory. However, the fact that the great majority of the elderly from these two institutions has not consulted a dentist in the past three or more years is astonishing, and it highlights the urge of proper policies for what should be considered a healthcare issue. On the other hand, general health was an issue, since 57.5% was partially or not satisfied, regardless of the presence or absence of pain. A recent study with 890 people (385 elderly) in a non-institutionalized Brazilian community has shown that 40.9% of the pain group versus 68.7% in the non-pain group felt having good to excellent general health. However, the authors did not displayed separate values for the elderly, which make it impossible the comparison among these studies.

Moreover, the presence of chronic pain seems to be more relevant since it may affect the elderly, especially in association with depression.[19] It has been shown that chronic pain has impact on the psychosocial aspects,[20] and chronic (non-respondant) pain patients have higher levels of depression.[21] The relationship between pain and depression severity was the target of a paper that found an influence of personality characteristics.[22] On the other hand, despite having a high rate of depression, the interviewed elderly in our study has shown a low chronic pain grade, agreeing with a previous study.[7] In two community-dwelling studies, depression level were associated with poorer quality of life.[23,24] Depression symptoms, according to RDC/TMD, are prevalent in this group; disagreeing with another study that showed a prevalence of 6.3% of people with depression, anxiety and emotional problems; however, that percentage included young adults, not only elderly population.[5] On the other hand, one study has shown that depression was present in 100% of the institutionalized elderly, among which 96% were serious or severely depressed.[14]

Another factor related to the presence of chronic pain is insomnia and unrefreshing sleep, which tend to worsen as the level of pain increases.[19,25] Since the elders of our study have shown a low pain level, it was expected to observe a better sleep quality, and in fact they did not complain of sleep problems.

The institutionalized elderly has shown satisfaction over their lives, home conditions, and physical appearance. Conversely, their approval towards health and quality of life was negative. And even though only 12.5% were unsatisfied with access to healthcare, an impressive 30% has never consulted with a dentist. And as they were institutionalized, this should be part of the institution policy. This information highlights the lack of access to a proper health care and is in accordance to another study that emphasizes the need to improve access to health professionals and services for the elderly in Hong Kong.[17]

According to estimates of IBGE (Brazilian Institute of Geography and Statistics), the number elderly population should more than double by the year 2050, representing 26.7% of the Brazilian population.[26] In 2008, the elderly corresponded 17.7% of the European population; and according to a projection of the European population (EU-15), by the year 2032, it is expected to increase 7.5%.[27] In this way, care should be given towards the maintenance of functional and cognitive abilities, social independence and mobility of this share of the population. Many institutions have established independence and autonomy as acceptance criteria for the elderly, which highlights a contradiction of the reasons to seek such places. The moment when the elderly most need care is when he/she becomes dependent and, most of the time, the family is not capable of taking care of him/her because of work, lack of preparation, among other factors.[18]

Institutionalized elderly receive proper care from the institution's employees, in terms of medication, feeding and adequate hygiene; but they have shown some deficiencies in some services within the unities, such as lack of dental care. Nonetheless, the latter did not seem to be relevant to the overall satisfaction. It is rather contradictory; but, despite of being satisfied with their oral health, the interviewed elderly have shown desire of improving their oral status, including rehabilitation with prosthesis. This is in accordance with a previous study which found that institutionalized

elderly has shown greater self-perception of oral health, regardless of their teeth status.[13] And a large number of missing teeth and inadequate oral health were observed in our study group, highlighting their poor dental conditions and care. A proper oral rehabilitation would promote function and aesthetics, and thus improve their quality of life.

Self-assessment of oral health was carried out according to the North York Dental Health Survey,[9] which has not yet been validated to a Portuguese version. However, the questions used in this study were not related to culture differences, and so the elderly were able to understand and answer accordingly. On the other hand, care should be taken when analyzing data and the authors suggest that developing a Portuguese version is interesting to future studies on this matter.

The social and demographic characteristics showed that 60% of the interviewed elders had an incomplete primary school education, which represents a low school level. Also. their monthly income varied from 150 to 1,000 Brazilian Reais, a limited value that was, in some cases, designated to the institution or was under parental responsibility.

Consequently, it seems that the increase of life expectancy has not being followed by an improvement in quality of life. Demographic aging has a direct effect in all areas. The individual's, family's, and community's psychological, biological, economical, and social levels are the most affected by the aging process. There is also the need for public education along with research development towards an improvement of public policies involving the elderly.[17] In this way, in order to have a more favorable prognosis, evaluating biopsychosocial features should be regarded as well.[28]

There are many studies on the prevalence of TMD in different age groups.[29-31] However, studies evaluating prevalence of TMD in the elderly are scares; and most of them are not about institutionalized, but about community-dwelling ones.[5,6,32-34] One study has shown an interesting prevalence of TMD symptoms when comparing institutionalized and community-dwelling elders.[13] The authors have found that severe TMD symptoms were present in 7% and 16.3% of institutionalized and community-dwelling elders, respectively. However, the groups were not matched by age, since the institutionalized group was significantly older than the other; and another study has shown that there is a difference when comparing elders in their sixties with the elders in their seventies. It seems that the higher the age, the better the protective behavior against the chronic orofacial pain onset.[6]

According to our study, symptoms of TMD are not relevant to the overall quality of life of the elderly population analyzed. Since the presence of TMD symptoms was low, they could not be associated to these patients's social and economic conditions. This way, factors like income status, educational level and oral health condition had no direct influence on TMD symptoms and chronic pain.[4,18] One study has shown that institutionalized elderly has lower educational level and higher number of absent teeth as compared to non-institutionalized ones.[35]

Within the limits of this study, one may conclude that, even though TMD symptoms were low in the study group, there are many aspects to be concerned in the elderly population, especially in the institutionalized ones. Studies comparing institutionalized and community-dwelling elderly are needed in order to better understand the differences in quality of life perception.

REFERENCES

1. World Health Organization (WHO). [cited 2016 Apr 25]; Available from: http://www.who.int/ageing/primary_health_care/en/
2. World Health Organization (WHO). Envelhecimento Ativo: Uma Política de Saúde / World Health Organization. Tradução Suzana Gontijo. Brasília: Organização Pan-Americana; 2005.
3. Committee on Advancing Pain Research, Care, and Education, Institute of Medicine. Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research. Washington, DC: The National Academies Press; 2011.
4. Dellaroza MSG, Pimenta CAM, Matsuo T. Prevalência e caracterização da dor crônica em idosos não institucionalizados. Cad Saúde Pública. 2007;23(5):1151-60.
5. Siqueira SR, Vilela TT, Florindo AA. Prevalence of headache and orofacial pain in adults and elders in a Brazilian community: an epidemiological study. Gerodontology. 2015 June;32(2):123-31.
6. Aggarwal VR, Macfarlane GJ, Farragher TM, McBeth J. Risk Factors for Onset of Chronic Oro-Facial Pain – Results of the North Cheshire Oro-Facial Pain Prospective Population Study. Pain. 2010 May;149(2):354-9.
7. Canterji MB, Amenábar JM, Lima LKD, Padilha DMP, Sousa ACAD. Frequência de Sinais Clínicos e Sintomas de Disfunções Temporomandibulares em Pacientes Idosos Institucionalizados. Rev. Fac. Odontol. Porto Alegre. 2004; 5(1):48-51.
8. Dworkin SF, LeResche L. Research Diagnostic Criteria for Temporomandibular Disorders. J Craniomandib Disord. 1992 Fall;6(4):301-55.
9. Payne BJ, Locker D. Preventive oral health behaviors in a multi-cultural population: the North York Oral Health Promotion Survey. J Can Dent Assoc. 1994 Feb;60(2): 129-30, 133-9.
10. Fleck MP, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L, Pinzon V. Application of the Portuguese version of the instrument for the assessment of quality of life of the World Health Organization (WHOQOL-100). Rev Saude Publica. 1999 Apr;33(2):198-205.

11. Lwanga SK, Lemeshow S. Sample size determination in health studies. A practical manual. World Health Organization; 1991.
12. Locker D, Slade G. Association of symptoms and signs of TM disorders in an adult population. Community Dent Oral Epidemiol. 1989 June;17(3):150-3.
13. Abud MC, dos Santos JF, da Cunha V de P, Marchini L. TMD and GOHAI indices of Brazilian institutionalised and community-dwelling elderly. Gerodontology. 2009 Mar;26(1):34-9.
14. Runcan PL. Elderly institutionalization and depression. Procedia – Social and Behavioral Sciences. 2012;33: 109-13.
15. Osterberg T, Carlsson GE, Wedel A, Johansson U. A cross-sectional and longitudinal study of craniomandibular dysfunction in an elderly population. J Craniomandib Disord. 1992 Fall;6(4):237-45.
16. Guarda-Nardini L, Piccotti F, Mogno G, Favero L, Manfredini D. Age-Related Differences In Temporomandibular Disorder Diagnoses. Cranio. 2012 Apr;30(2):103-9.
17. Wan KY, McMillan AS, Wong MC. Orofacial Pain Symptoms and Associated Disability and Psychosocial Impact in Community-Dwelling and Institutionalized Elderly in Hong Kong. Community Dent Health. 2012 Mar;29(1):110-6.
18. Almagro Céspedes I, Castro Sánchez AM, Matarán Peñarocha GA, Quesada Rubio JM, Guisado Barrilao R, Moreno Lorenzo C. Temporomandibular Joint Dysfunction, Disability and Oral Health in a Community-Dwelling Elderly Population. Nutr Hosp. 2011 Sept-Oct;26(5):1045-51.
19. Meeks TW, Dunn LB, Kim DS, Golshan S, Sewell DD, Atkinson JH, Lebowitz BD. Chronic pain and depression among geriatric psychiatry inpatients. Int J Geriatr Psychiatry. 2008 June;23(6):637-42.
20. Von Korff M, Dworkin SF, Le Resche L, Kruger A. An epidemiologic comparison of pain complaints. Pain. 1988 Feb;32(2):173-83.
21. Grossi ML, Goldberg MB, Locker D, Tenenbaum HC. Irritable Bowel Syndrome Patients Versus Responding and Nonresponding Temporomandibular Disorder Patients: A Neuropsychologic Profile Comparative Study. Int J Prosthodont. 2008 May-June;21(3):201-9.
22. Calabrese SK, Lyness JM, Sörensen S, Duberstein PR. Personality and the association of pain and depression. Am J Geriatr Psychiatry. 2006 June;14(6):546-9.
23. Baernholdt M, Hinton I, Yan G, Rose K, Mattos M. Factors associated with quality of life in older adults in the United States. Qual Life Res. 2012 Apr;21(3):527-34.
24. Bielderman A, Greef MH, Krijnen WP, van der Schans CP. Relationship between socioeconomic status and quality of life in older adults: a path analysis. Qual Life Res. 2015 July;24(7):1697-705.
25. Power JD, Perruccio AV, Badley EM. Pain as a mediator of sleep problems in arthritis and other chronic conditions. Arthritis Rheum. 2005 Dec 15;53(6):911-9.
26. IBGE. [Cited 2016 Apr 25]. Available from: www.ibge.gov.br
27. Böckerman P, Johansson E, Saarni S. Institutionalisation and quality of life for elderly people in Finland; 2011.
28. Ohrbach R, Turner JA, Sherman JJ, Mancl LA, Truelove EL, Schiffman EL, Dworkin SF. The research diagnostic criteria for temporomandibular disorders. IV: evaluation of psychometric properties of the axis II measures. J Orofac Pain. 2010 Winter;24(1):48-62.
29. Silveira AM, Feltrin PP, Zanetti RV, Mautoni MC. Prevalence of patients harboring temporomandibular disorders in an otorhinolaryngology departament. Braz J Otorhinolaryngol. 2007 July-Aug;73(4):528-32.
30. Progiante PS, Ficht DM, Lemos MS, Grossi PK, Grossi ML. Prevalence of temporomandibular disorders and orofacial pain in battered women in Brazilian shelters. Rev Odonto Ciênc. 2011;26(3):227-31.
31. Sasa S, Ljiljana K, Dragan M, Slobodan V, Mirjana B. Prevalence of Temporomandibular dysfunctions symptoms in children and in adults. Healthmed. 2012;6(5):1779-85.
32. Osterberg T, Carlsson GE. Relationship between symptoms of temporomandibular disorders and dental status, general health and psychosomatic factors in two cohorts of 70-year-old subjects. Gerodontology. 2007 Sept;24(3):129-35.
33. Unell L, Johansson A, Ekbäck G, Ordell S, Carlsson GE. Prevalence of troublesome symptoms related to temporomandibular disorders and awareness of bruxism in 65- and 75-year-old subjects. Gerodontology. 2012 June;29(2):e772-9.
34. Vilalta VC, dos Santos MBF, da Cunha VPP, Marchini L. Depression and TMD among elderly: A pilot study. Braz Dent Sci. 2012 Apr-June;15(2):71-5.
35. Saintrain MV, Bizerril DO, Vieira APG. Oral Health of Institutionalized and Non-institutionalized Elders. Sci-Afric J. Sci. Issues. Res. Essays. 2014 Apr;2(4):160-65.