

Association between xerostomia and oral health-related quality of life of older adults

Mariana Marquazan^{1*} , Brenda Hammes do Nascimento² , Maria Eduarda Maldonado Silva² , Jessica Klöckner Knorst¹ , Luísa Helena do Nascimento Tôrres³ , Leandro José Corrêa Harb⁴ 

¹ Professor, Department of Stomatology, Dentistry Course, Federal University of Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brazil.

² Undergraduate student, Dentistry Course, Federal University of Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brazil.

³ Professor, Department of Preventive and Social Dentistry, Dentistry Course, Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, Rio Grande do Sul, Brazil.

⁴ Professor, Department of Morphology, Dentistry Course, Federal University of Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brazil.

Corresponding author:

Mariana Marquazan
Department of Stomatology
Federal University of Santa Maria
Avenida Roraima, 1000, Building 26F,
Room 2184, Camobi, 97105-900.
Santa Maria, Rio Grande do Sul, Brazil.
Tel: +55 3220 9269
E-mail: mariana.marquazan@ufsm.br

Editor: Dr. Altair A. Del Bel Cury

Received: Mar 14, 2024

Accepted: Mar 19, 2025

Objective: The aim of this study was to assess the impact of xerostomia, the subjective perception of dry mouth, on the oral health-related quality of life of older adults. **Methods:** This study involved 131 individuals who participated in the AcampaVida extension project between 2015 and 2018 in the city of Santa Maria, Rio Grande do Sul, Brazil. A structured questionnaire obtained demographic, socioeconomic, behavioral, and self-reported information about xerostomia. Also, the Brazilian version of the Oral Health Impact Profile-14 (OHIP-14) was used to assess oral health-related quality of life. Data were analyzed in STATA 14.0, and the association of xerostomia with predictive quality of life variables was performed using unadjusted and adjusted Poisson regression. **Results:** OHIP-14 scores were 28% higher in individuals with xerostomia. Regarding the questionnaire domains, the highest scores comprised physical pain and psychological discomfort in individuals with xerostomia. **Conclusion:** The results indicate that xerostomia had a negative impact on the oral health-related quality of life of the assessed older adults.

Keywords: Xerostomia. Quality of life. Aged. Oral health. Geriatric dentistry.



Introduction

Xerostomia is the sensation of dry mouth, therefore, a subjective perception of the individual¹. This condition affects 1% to 62% of the population and, more frequently, the older population². Xerostomia may or may not be associated with low salivary flow due to salivary gland hypofunction³. However, xerostomia should not be used as a synonym for hyposalivation, an objective measure of oral dryness based on reduced salivary production⁴. It has been shown that the subjective level of xerostomia and the salivary flow rate are not directly proportional. Generally, the subjective amount of saliva is related to previous individual experiences rather than an actual reduction of salivary flow⁵.

The etiology of this condition may be correlated to systemic diseases such as endocrinological, autoimmune, granulomatous diseases, infections, and other systemic causes or local factors such as the use of medications, head and neck radiotherapy, and harmful habits of the individual. Symptoms associated with xerostomia can affect both the functionality and morphology of the stomatognathic system. Thus, burning in the mouth, halitosis, glossitis, chapped lips, oral candidiasis, dental caries, difficulty swallowing, chewing, speaking, and sometimes even taste alteration can be observed⁶. Therefore, xerostomia has several harmful effects on oral health.

In this perspective, the concept of Quality of Life comprises a broad and subjective term associated with the patient's perception and composed of different dimensions⁷. For several years, the biomedical model predominated in assessing the population's health needs, identifying diseases based on clinical indicators without including the subjective perception of individuals^{8,9}. However, currently, there is a growing increase in the relevance of subjective experiences and individual interpretations in the health-disease process¹⁰. Thus, oral health emerges as a positive concept that reflects the essential attributes for oral health-related quality of life (OHRQoL)^{11,12}. Thus, as a multidimensional construct reflecting how oral conditions affect individuals' daily lives and well-being, the OHRQoL has been widely used as a valid and essential parameter in assessing patients¹³.

Previous studies conducted on convenience samples of adult patients found that the presence of xerostomia can negatively affect OHRQoL^{5,14}. However, the literature lacks studies in older patients since this population is the most affected by xerostomia. Thus, this study aimed to assess the association between xerostomia and OHRQoL in older people in southern Brazil. The conceptual hypothesis of this study is that older people with xerostomia would present a worse OHRQoL.

Materials and Methods

Study Population

This study was conducted at Federal University of Santa Maria, in the city of Santa Maria, Rio Grande do Sul, Brazil, during the extension event: AcampaVida. Santa Maria is a city in southern Brazil with an estimated population of 271.735 inhabitants, according to the last census. Among this population, 19.61% are older adults (IBGE, 2022¹⁵).

The Federal University of Santa Maria has the Extension Program “Integrated Center for Studies and Support for Elderly Persons - NIEATI”, created in 1984, which offers the community of Santa Maria and the region opportunities for physical activities for older adults, in order to assist in maintaining their autonomy and independence, as well as training human resources in gerontology. NIEATI annually holds AcampaVida, an event that aims to provide opportunities for the coexistence of older adults, allowing them to experience various manifestations of human knowledge. Several UFSM undergraduate courses hold workshops on leisure, health education, and general knowledge in this event. Between 2015 and 2018, Tutorial Education Program (PET) on Dentistry held workshops with the event participants and collected data on the presence of xerostomia and its impact on the OHRQoL of this population.

The sample consisted of 131 individuals who participated in the event between 2015 and 2018. Their participation was consented to by signing a Consent form, as described in the research project approved by the Human Research Ethics Committee of Federal University of Santa Maria (protocol number: 73198017.9.0000.5346) in compliance with the Helsinki Declaration. A power calculation verified the sample size. Considering a sampling error of 5% and a mean difference in OHIP-14 of 28.2 (SD 9.2) among older adults with xerostomia and 22.7 (SD 8.0) among older adults without xerostomia, a sample power of 99.9% was obtained.

Questionnaires

Socioeconomic and behavioral questionnaire

Participants answered a structured questionnaire about demographic, socioeconomic, behavioral, and self-reported characteristics of xerostomia. To this end, it contains items related to age, gender, color, smoking habits and/or drinking alcoholic beverages, systemic pathologies, medications in use, practice of physical activities, and subjective presence of dry mouth. Also, if the smoking habit was affirmative, the number of cigarettes per day and smoking time were requested, and if they no longer had this habit, how long ago they stopped smoking. Also, in the affirmative case of the presence of systemic diseases, the use of medicines, and the practice of physical activities, details were requested. Also, the question “Do you feel your mouth dry?” was included. An affirmative answer to the question corresponded to a self-report of xerostomia since the concept of xerostomia is described as a subjective perception of dry mouth¹.

Oral health-related quality of life

To assess the OHRQoL, the study's outcome, the individuals answered the Brazilian version of OHIP-14. This questionnaire contains 14 questions involving seven domains: functional limitation (FL), physical pain (PP), psychological discomfort (PD), physical disability (PDi), psychological disability (PsD), social disability (SD), and handicap (H). Each domain comprises two questions with a score ranging from 0 to 4 points. Thus, we used a Likert scale - psychometric response scale - with five points: Never = 0; Rarely = 1; Sometimes = 2; Repeatedly = 3; Always = 4. The total OHIP-14 score is determined by adding the points from the 14 questions, resulting in a score

range between 0 and 56. A higher score represents a worse perception of oral conditions and, therefore, worse OHRQoL¹⁴.

Statistical analysis

Data were analyzed in the STATA 14.0 program (StataCorp. 2014. Stata Statistical Software: Release 14.0. College Station, TX: StataCorp LP). A descriptive analysis of the sample characteristics was performed. The study's outcome was the total OHIP-14 score – the higher the score, the greater the impact of oral conditions on quality of life. The association between xerostomia and the other predictor variables in OHRQoL was assessed using unadjusted and adjusted Poisson regression. Variables with a p-value < 0.20 in the unadjusted analysis were considered in the adjusted model. An analysis of the presence of xerostomia was also performed according to the different domains of OHIP-14. Results are presented as a rate ratio (RR) and a 95% confidence interval (95% CI).

Results

The characteristics of the patients assessed in the research are shown in Table 1. The mean age of the participants was 67.13 years, ranging from 34 to 89 years, which were classified as adults or older adults according to the World Health Organization (WHO). As Brazil is a developing country, an older person is one who is 60 years old or older. Most of the sample comprised older adults (82.3%), with few adults participating in the event to accompany the older people. Most of the research participants were female and white. Considering behavioral characteristics, 86.1% reported using some medication, and approximately two-thirds had systemic disease. Finally, more than half of the individuals were affected by xerostomia. The overall mean OHIP-14 scores were 25.6 (SD 9.1).

Table 1. Distribution of the sample's demographic, socioeconomic, and clinical characteristics.

Variables	n	%
<i>Demographic variables</i>		
Sex		
Male	13	9.9
Female	118	90.1
Age		
Adult	23	17.7
Older adult	107	82.3
Skin Color		
White	114	87.7
Non-white	16	12.3

Continue

Continuation		
Behavioral characteristics		
Medication use		
No	18	13.9
Yes	112	86.1
Systemic disease		
No	44	33.9
Yes	86	66.1
Physical activity		
Yes	117	90.0
No	13	10.0
Xerostomia		
Absent	62	47.3
Present	69	52.7
Outcome		
OHIP-14 [mean (DP)]	25.6 (9.1)	
(n=131; values less than 131 are due to missing data).		

The overall OHIP-14 scores for the predictor variables are in Table 2. It was observed that female, adult, and non-white individuals had a higher score, and those who did not use medication, had systemic disease, and did not practice physical activity. Besides, participants assessed with xerostomia also showed a percentage score more eminent.

Table 2. Distribution of sample characteristics according to overall OHIP-14 scores.

Variables	OHIP-14 Mean (DP)
Demographic variables	
Sex	
Male	21.5 (7.5)
Female	26.0 (9.1)
Age	
Adult	28.3 (8.3)
Older Adult	24.9 (9.2)
Skin Color	
White	24.4 (8.7)
Non-White	27.6 (11.4)

Continue

Continuation	
Behavioral characteristics	
Medication use	
No	29.5 (11.6)
Yes	25.0 (8.5)
Systemic disease	
No	25.8 (9.6)
Yes	25.1 (8.2)
Physical activity	
Yes	25.5 (9.0)
No	26.1 (10.5)
Xerostomia	
Absent	22.7 (8.0)
Present	28.2 (9.2)

(n=131; values less than 131 are due to missing data).

There was no statistically significant difference in OHIP-14 scores between patients who had or did not have systemic disease and practiced or did not practice physical activity, and it is irrelevant to adjust its association with xerostomia and general scores (Table 3). After the adjusted analyses, it was observed that OHIP-14 scores were 28% higher in individuals with xerostomia (RR 1.28 95% CI 1.17-1.35), indicating a worse OHRQoL. Also, the mean scores of the OHIP-14 questionnaire were 11% lower for older adults and 14% lower for those who use some medication.

Table 3. Unadjusted and adjusted analyzes of the association between xerostomia and overall OHIP-14 scores, determined by Poisson regression.

Variables	Unadjusted RR (95%CI)	p-value	Adjusted RR (95%CI)
Demographic variables			
Sex			
Male	1 (reference)	0.002	1 (reference)
Female	1.21 (1.07-1.36)		1.09 (0.96-1.23)
Age			
Adult	1 (reference)	0.004	1 (reference)
Older adult	0.88 (0.80-0.95)		0.89 (0.81-0.97)*
Skin color			
White	1 (reference)	0.105	1 (reference)
Non-white	1.08 (0.98-1.20)		1.04 (0.94-1.15)

Continue

Continuation			
Behavioral characteristics			
Medication use			
No	1 (reference)	<0.01	(reference)
Yes	0.85 (0.77-0.93)		0.86 (0.78-0.95)*
Systemic disease			
No	1 (reference)	0.453	#
Yes	0.97 (0.90-1.04)		
Physical activity			
Yes	1 (reference)	0.695	#
No	1.02 (0.91-1.14)		
Xerostomia			
Absent	1 (reference)	<0.001	1 (reference)
Present	1.23 (1.15-1.32)		1.28 (1.17-1.35)*

RR, rate ratio; CI, confidence interval; *p<0.05; #Variables not included in the adjusted model.

Table 4 shows the overall OHIP-14 means according to the seven questionnaire domains. The highest scores were observed in the item corresponding to “physical pain”, which comprises pain in the mouth or teeth and discomfort when eating food, followed by the item of “psychological discomfort”. It is also possible to observe the total OHIP-14 scores of adults and older adults who have xerostomia or not, noting that those who have the disease have a worse quality of life.

Table 4. Overall means of OHIP-14 according to the different domains and according to the absence or presence of xerostomia.

OHIP-14	Xerostomia		p-value*
	Absent	Present	
Functional limitation	6.5 (2.7)	7.9 (3.2)	0.05
Physical pain	6.9 (3.2)	8.5 (3.2)	<0.05
Psychological discomfort	6.6 (2.9)	8.1 (4.7)	<0.05
Physical disability	3.9 (1.4)	5.0 (2.1)	<0.01
Psychological disability	3.5 (2.0)	4.6 (4.0)	0.06
Social disability	3.1 (1.3)	3.5 (1.6)	0.09
Handicap	2.6 (1.4)	3.4 (1.6)	<0.05
Total Scores	22.7 (8.0)	28.2 (9.2)	<0.01

*Determined by Poisson Regression adjusted for sex, age, skin color, and medication use.

Discussion

Our findings demonstrated that individuals who presented xerostomia were more likely to present worse OHRQoL, in agreement with the conceptual hypothesis. These

findings corroborate previous studies by Choi et al.⁵ (2021) and Niklander et al.¹⁴ (2017), conducted in adult individuals, demonstrating that xerostomia can negatively affect OHRQoL.

In the research by Choi et al.⁵ (2021), mean OHIP-14 scores of 44.3 were observed in patients with xerostomia, which is considered high compared to the result obtained in our study. One possibility for the discrepancy in values is that the previous study involved individuals who sought dental clinics with a main complaint of xerostomia, while the individuals in this research were participating in an extension project, not seeking dental care for any oral problem⁵. In the study by Niklander et al.¹⁴ (2017), a mean score of 20.1 OHIP-14 of individuals with xerostomia was obtained, a value lower than that found in this study. A possible explanation for this lower score may be that, although related to patients who sought dental assistance, the previous study involved younger individuals, from the age of 18, obtaining a mean of 46 years, while this study included participants with a mean age of approximately 67 years¹⁴. This may be related to the higher frequency of xerostomia in old age, especially after the age of 60, since several risk factors may be associated with this period of life^{16,17}.

Our results demonstrated that individuals with xerostomia had a worse OHRQoL. The individuals in the studied sample highlighted pain and discomfort to eat since saliva has a lubricating function in this process. Stress and worry belonging to the domain of psychological discomfort also had significant impacts in this study, corroborating the findings of other authors^{5,14,18}. These two most prevalent domains may be associated with each other since constant physical pain in the lives of individuals may contribute to increased stress and worry.

It was also shown that OHIP-14 scores were lower for older people than for adults, indicating better OHRQoL in this age group. This finding may reflect a particular characteristic of this sample of physically active elderly people, who live in community and participate in workshops developed by NIEATI extension project. Furthermore, since resilience is built throughout life, older people tend to be more resilient and not be so affected by problems¹⁹, which might explain this finding.

Individuals using some medication were protected from having an impact on OHRQoL. Possibly, the medications used would have a positive impact on the well-being of these individuals. Xerostomia can have a variety of etiologies, but the most common cause of the disease is the use of medications, and its risk increases according to the number of medications taken²⁰. In this perspective, Niklander et al.¹⁴ (2017), in their study, observed that the probability of having xerostomia increases 1.12 times for each additional medication taken. In the population studied in this research, 86.1% of the participants indicated using medications. However, the OHIP-14 questionnaire scores for individuals taking medications were 14% lower. In other words, the OHRQoL of these individuals was better than those who did not take medication. Possibly, most of the medications used by the individuals in the sample have no interference with xerostomia and, therefore, have not affected OHRQoL, especially the use of antihypertensives, medications to control blood glucose, cholesterol, and hormone replacement medications.

A limitation of this study is related to the use of a convenience sample, and the results cannot be extrapolated to other contexts. However, even though it is a

convenience sample, its selection occurred through an extension activity for older people, “AcampaVida”, providing them with different experiences of human knowledge. Therefore, this is not a convenience sample from a dental institution where individuals seek treatment when presenting oral health problems. Therefore, the study population did not attend the event due to oral health, but the signs and symptoms of xerostomia were identified from the activity performed. Thus, the relevance of this study and the extension event developed is shown since, without their occurrence, individuals identified with xerostomia would possibly take longer to diagnose this oral health problem and to manage it, which would negatively affect their well-being and OHRQoL.

Moreover, this study aimed to relate the impact of xerostomia on OHRQoL. Therefore, it did not consider other oral diseases, such as caries and periodontal disease, which could be important adjustment factors in the relationship. It is suggested that future studies consider these gaps, encompassing more representative samples and also of a longitudinal nature.

Despite the limitations, this study highlights the importance of using subjective indicators, such as the OHIP-14 questionnaire, as a complementary measure to clinical assessment. Thus, it is possible to ensure adequate diagnosis of diseases and individualized treatment since traditional models that consider only the clinical measurement of oral health do not analyze important individual perceptions, which may not establish a complete view of each population’s health conditions and quality of life²¹. Thus, the association of objective and subjective health indicators to better estimate oral health needs is relevant²².

In conclusion, individuals with xerostomia had worse OHRQoL, with the greatest impact being reported in terms of physical pain and psychological discomfort.

Acknowledgment

We thank the students of the Tutorial Education Program (PET) on Dentistry of the Federal University of Santa Maria who conducted the data collection and the participants of this research.

Data Availability Statement

The data supporting the conclusions of this study are not publicly available due to the request of the Human Research Ethics Committee of Universidade Federal de Santa Maria that the data should be stored with the responsible researcher. Data is available with Mariana Marquezan upon request.

Conflict of Interest Statement

The authors declare there are no conflicts of interest in the study.

Funding Sources

This manuscript is linked to the Tutorial Education Program (PET- Programa de Educação Tutorial, in Portuguese). PET students and PET tutor are supported by

scholarships from the National Education Development Fund (Fundo Nacional de Desenvolvimento da Educação - FNDE), Brazilian Ministry of Education (Ministério da Educação - MEC).

Authors' contributions

Mariana Marquezan: Validation, Resources, Writing - Original Draft, Data Curation, Writing - Review & Editing, Supervision, Funding acquisition. **Brenda Hammes do Nascimento:** Validation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization. **Maria Eduarda Maldonado Silva:** Validation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization. **Jessica Klöckner Knorst:** Validation, Formal analysis, Data Curation, Writing - Review & Editing. **Luísa Helena do Nascimento Tôres:** Validation, Resources, Data Curation, Writing - Review & Editing, Supervision, Funding acquisition. **Leandro José Corrêa Harb:** Conceptualization, Methodology, Validation, Investigation, Resources, Data Curation, Writing - Review & Editing, Supervision, Project administration, Funding acquisition.

References

1. Villa A, Wolff A, Narayana N, Dawes C, Aframian DJ, Lynge Pedersen AM, et al. World Workshop on Oral Medicine VI: a systematic review of medication-induced salivary gland dysfunction. *Oral Dis.* 2016 Jul;22(5):365-82. doi: 10.1111/odi.12402.
2. Agostini BA, Cericato GO, Silveira ERD, Nascimento GG, Costa FDS, Thomson WM, et al. How Common is Dry Mouth? Systematic review and meta-regression analysis of prevalence estimates. *Braz Dent J.* 2018 Nov-Dec;29(6):606-18. doi: 10.1590/0103-6440201802302.
3. Tanasiewicz M, Hildebrandt T, Obersztyn I. Xerostomia of various etiologies: a review of the literature. *Adv Clin Exp Med.* 2016 Jan-Feb;25(1):199-206. doi: 10.17219/acem/29375.
4. Kapourani A, Kontogiannopoulos KN, Manioudaki AE, Pouloupoulos AK, Tsalikis L, Assimopoulou AN, et al. A review on xerostomia and its various management strategies: the role of advanced polymeric materials in the treatment approaches. *Polymers (Basel).* 2022 Feb;14(5):850. doi: 10.3390/polym14050850.
5. Choi JH, Kim MJ, Kho HS. Oral health-related quality of life and associated factors in patients with xerostomia. *Int J Dent Hyg.* 2021 Aug;19(3):313-22. doi: 10.1111/idh.12528.
6. Millsop JW, Wang EA, Fazel N. Etiology, evaluation, and management of xerostomia. *Clin Dermatol.* 2017 Sep-Oct;35(5):468-76. doi: 10.1016/j.clindermatol.2017.06.010.
7. Graziani F, Tsakos G. Patient-based outcomes and quality of life. *Periodontol 2000.* 2020 Jun;83(1):277-94. doi: 10.1111/prd.12305.
8. Spanemberg JC, Cardoso JA, Slob EMGB, López-López J. Quality of life related to oral health and its impact in adults. *J Stomatol Oral Maxillofac Surg.* 2019 Jun;120(3):234-239. doi: 10.1016/j.jormas.2019.02.004.
9. Barbosa TS, Mialhe FL, Castilho ARF, Gavião MBD. [Quality of life and oral health in children and adolescents: conceptual and methodological aspects]. *Physis.* 2010;20(1):283-300. Portuguese. doi: 10.1590/S0103-73312010000100015.
10. Chimbinha ÍGM, Ferreira BNC, Miranda GP, Guedes RS. Oral-health-related quality of life in adolescents: umbrella review. *BMC Public Health.* 2023 Aug;23(1):1603. doi: 10.1186/s12889-023-16241-2.

11. Menezes KE, Pereira CAS, Pedro ACB, Dias AG. [Assessment of the impact of dental caries on the quality of life of children aged 6 to 12 years old treated at the dental clinic of Faculdade São Lucas]. *Rev Odontol Univ Cid Sao Paulo* 2009;21(1):24–30. Portuguese.
12. Glick M, Williams DM, Kleinman DV, Vujicic M, Watt RG, Weyant RJ. A new definition for oral health developed by the FDI World Dental Federation opens the door to a universal definition of oral health. *J Am Dent Assoc.* 2016 Dec;147(12):915-7. doi: 10.1016/j.adaj.2016.10.001.
13. Sischo L, Broder HL. Oral health-related quality of life: what, why, how, and future implications. *J Dent Res.* 2011 Nov;90(11):1264-70. doi: 10.1177/0022034511399918.
14. Niklander S, Veas L, Barrera C, Fuentes F, Chiappini G, Marshall M. Risk factors, hyposalivation and impact of xerostomia on oral health-related quality of life. *Braz Oral Res.* 2017 Jan;31:e14. doi: 10.1590/1807-3107BOR-2017.vol31.0014.
15. IBGE. Brazilian Institute of Geography and Statistics. [Cities and states. Santa Maria] 2022 [cited 2023 Dec 2]. Available from: <https://cidades.ibge.gov.br/brasil/rs/santa-maria/panorama>.
16. Han P, Suarez-Durall P, Mulligan R. Dry mouth: a critical topic for older adult patients. *J Prosthodont Res.* 2015 Jan;59(1):6-19. doi: 10.1016/j.jpor.2014.11.001. Epub 2014 Dec 9.
17. Lu TY, Chen JH, Du JK, Lin YC, Ho PS, Lee CH, et al. Dysphagia and masticatory performance as a mediator of the xerostomia to quality of life relation in the older population. *BMC Geriatr.* 2020 Dec;20(1):521. doi: 10.1186/s12877-020-01901-4.
18. Ikebe K, Matsuda K, Morii K, Wada M, Hazeyama T, Nokubi T, et al. Impact of dry mouth and hyposalivation on oral health-related quality of life of elderly Japanese. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2007 Feb;103(2):216-22. doi: 10.1016/j.tripleo.2005.12.001. Epub 2006 Mar 20.
19. MacLeod S, Musich S, Hawkins K, Alsgaard K, Wicker ER. The impact of resilience among older adults. *Geriatr Nurs.* 2016 Jul-Aug;37(4):266-72. doi: 10.1016/j.gerinurse.2016.02.014.
20. Johnell K, Fastbom J. Comparison of prescription drug use between community-dwelling and institutionalized elderly in Sweden. *Drugs Aging.* 2012 Sep;29(9):751-8. doi: 10.1007/s40266-012-0002-7.
21. Slade GD, Strauss RP, Atchison KA, Kressin NR, Locker D, Reisine ST. Conference summary: assessing oral health outcomes—measuring health status and quality of life. *Community Dent Health.* 1998 Mar;15(1):3-7.
22. Abanto J, Carvalho TS, Mendes FM, Wanderley MT, Bönecker M, Raggio DP. Impact of oral diseases and disorders on oral health-related quality of life of preschool children. *Community Dent Oral Epidemiol.* 2011 Apr;39(2):105-14. doi: 10.1111/j.1600-0528.2010.00580.x. Epub 2010 Oct 5.