International Journal of Advanced Health Science and Technology
Multidisciplinary : Rapid Review : Open Access Journal e-ISSN:2808-6422; p-ISSN:2829-3037

RESEARCH ARTICLE OPEN ACCESS

Manuscript received May 18, 2022; revised August 20, 2022; accepted August 12, 2022; date of publication August 25, 2022
Digital Object Identifier (**DOI**): https://doi.org/10.35882/ijahst.v2i4.96

How to cite: Deby Anggraeni, Isnanto, Ida Chairanna Mahirawatie, and Tanvish Nitin Manwatkar2, "The Relationship Between Knowledge Of Dental And Oral Health And The Number Of Functioning Teeth In Indonesian Elderly People ", International Journal of Advanced Health Science and Technology, vol. 2, no. 4, pp. 232–237, Augustus. 2022.

The Relationship Between Knowledge of Dental and Oral Health and The Number of Functioning Teeth in Indonesian Elderly People

Deby Anggraeni[1], Isnanto[1], and Ida Chairanna Mahirawatie[1], and Tanvish Nitin Manwatkar[2]
[1] Department of Dental Health, Health Polytechnic Ministry of Health Surabaya, Indonesia
[2] David Tvildiani Medical University, Georgia

Corresponding author: Isnanto (e-mail: nanto_am11@ymail.com).

"This work was supported in part by Department of Dental Health, Health Polytechnic Ministry of Health Surabaya"

ABSTRACT Tooth loss is a cause of decreased masticatory function that affects the oral cavity and general health in the elderly. The elderly was expected to have at least 20 working teeth, meaning that the masticatory, aesthetic and speech functions were considered normal, although less than 32 teeth. This study aims to determine the relationship between the dental and oral health of the elderly with the number of functioning teeth at the Hargo Dedali Nursing Home in Surabaya. This type of research is analytic with a cross sectional design. The total population is 38 elderly and the research sample is 35 elderly using random sampling technique with purposive sampling. Method analyzed technique uses the Pearson Correlation test. The result of this research is the elderly population is female. Their age range is between 60-92 years. Questions were answered correctly overall by 48.1%. The most questions answered incorrectly about tooth loss by 67.9%. There are 3 elderly who have 20 working teeth. The average working gear is 9.3 or 9 teeth per person. Data are normally distributed. There is a relationship between the two variables (0.000 < 0.05). Conclusion of this research is smaller the value of dental and oral health knowledge of the elderly, the less the number of teeth that work. The benefits of this research can provide awareness and motivation for families, nursing home managers, health workers in an effort to serve dental and oral health in the elderly.

INDEX TERMS Elderly Tooth, Knowledge of Dental and Oral Health, Number of Functioning Teeth.

I. INTRODUCTION

Teeth are parts of the human body that function for mastication, speech, and aesthetics. Some of the teeth that are owned by elderly humans are reduced because they are damaged or missing for certain reasons. Tooth loss is the most common cause of decreased masticatory function so that it affects the oral cavity and other general health that occurs in the elderly [1]. Research conducted by Melo et al. [2], that people have daily dental habits of 97.6 but the number of permanent tooth loss in adults is 70.3% and 6.4% is toothless. They claimed to have difficulty eating and/or drinking by 50.1%.

The elderly is expected to have at least 20 functioning teeth, meaning that the masticatory function is still considered normal, even though it has decreased from the proper number, which is 32 teeth. Aesthetic function and speech function are also considered normal if there are 20 functioning teeth [3][4]. Missing teeth that cause food indigestion, tooth pain is caused by inflammation of the periodontal tissue and caries [5][6]. Research conducted by Passarelli et al. [7], that dental issues of caries (52.2%) was the most common reason for extraction along with periodontal disease (35.7%).

Age classification according to WHO (World Health Organization) elderly there are four categories, namely middle age (middle age) between 45 - 59 years, elderly (elderly) between 60 - 74 years, old age (old) between 75 - 89 years, age very old (very old) more than 90 years [8]. In this group the aging process occurs, which has undergone changes in physical, mental and psychological. As a person ages, there is a decrease in the function of organs and physical changes. One

of them is in the oral cavity which can cause dental and oral disease [9].

The dental health status of the elderly is influenced by four factors, from the elderly themselves, family factors (heredity and family behavior in maintaining dental health), environmental factors in socio-culture, dental health service factors (elderly dental health programs, health worker services) [10]. Knowledge is the result of knowing a person about an object through his senses. A person's good knowledge can make a person's behavior able to maintain good and correct dental and oral hygiene [11]. Elderly people whose knowledge is lacking so that many teeth fall out will have psychological impacts such as difficulty chewing, decreased appetite, feeling embarrassed, weight loss, difficulty getting along with other people, reluctant to leave the place of residence, lack of concentration so that they cannot work properly [12]. Dental and oral health status is related to quality of life, namely dental and oral health problems that seriously reduce a person's quality of life. Poor quality of life was significantly related to the number of teeth. While the quality of life is good if it has 20 teeth or more [13]. Dental and oral health is physically and psychologically related to quality of life. Dental and oral health status affects one's self-esteem, feelings and social well-being [14]

Research conducted by Sarkar et al. [15], the process of getting old causes the elderly to experience physical and mental changes, which affect their economic and social conditions. The occurrence of these changes requires him to adapt continuously. If the process of adapting to the environment is not successful, various problems arise. The most influential thing in developing countries is the environment and behavior. In the elderly, dental health status is usually poor due to behavioral factors and is characterized by increased missing teeth, periodontal disease and poor oral and dental hygiene [16].

Research conducted by Moreno et al. [17], that association showed a gradient effect, so that the lower the number of teeth, the greater the risk of exhibiting cognitive decline. Research conducted by Nilsson et al. [18], analysis of data from the NHIS survey revealed that premature tooth loss in people under 45 years of age is associated with impaired cognitive function. Therefore, if we hypothesize a time frame for this relationship, it can be proposed that an effective strategy to promote oral health and dental maintenance in all age groups is important to minimize the impact of edentulism on cognitive function.

Research conducted by Pengpid, et al. [19], that the overall prevalence of edentulism in Indonesia is 29.8% at the age of 80 years and over. Various risk factors for tooth loss that influence are those who are not formally educated as much as 11.8%, have low social capital, besides that there are several general health disorders related to tooth loss such as hypertension, diabetes, and functional disability. The results of this study, so that researchers want to know whether there is a relationship between knowledge of oral health in the elderly with the number of teeth that are still functioning. It is hoped that knowing the relationship between the two variables can be used by other researchers to increase knowledge of dental and oral health for the elderly in order to reduce the number of tooth loss.

Based on the results of a survey conducted by researchers, 90% of the elderly have <20 functioning teeth. The elderly at the Hargo Dedali Nursing Home in Surabaya have an average of 9 teeth that are still functioning. The data in the study stated that the elderly at the Hargo Dedali Nursing Home in Surabaya were less than the target indicator of the degree of dental and oral health according to the Ministry of Health of the Republic of Indonesia, which was expected to have at least 20 functioning teeth so it could be said to be less than optimal.

This study aims to determine the relationship between the dental and oral health of the elderly and the number of functioning teeth at the Hargo Dedali Nursing Home in Surabaya by measuring the value of the knowledge of the elderly's dental and oral health and counting the number of functioning teeth and then analyzing the relationship between the two.

II. METHODHOLOGY

This research was conducted at the Hargo Dedali Nursing Home in Surabaya. This type of research is analytic with cross sectional design. The total population is 38 people at the Hargo Dedali Nursing Home in Surabaya. The sample used was 35 people according to the Slovin formula. Samples were taken from the entire population who according to the inclusion criteria did not experience communication disorders and were willing to be respondents. The exclusion criteria were having a communication disorder and not being willing to be a respondent.

The independent variable is knowledge of the elderly about dental and oral health. The dependent variable is Number of Functioning Teeth. The method of collecting data on dental and oral health knowledge with a questionnaire contained 25 questions. The method of collection of data on the number of functioning teeth by means of an objective examination. Observation of the examination using examination sheets and diagnostic tools (mouth mirror).

Researchers carried out data collection procedures by visiting the Werdha Hargo Dedali orphanage asking permission from the caretaker of the orphanage to conduct research by conducting interviews and explaining the procedures at the implementation stage as follows. After all the data was completed, the researcher carried out the completion stage, which was to give rewards for healthy food and donate money to the orphanage.

Data analysis of oral health knowledge in the elderly is a descriptive analytic calculated the average number. The results of the examination of the number of functioning teeth included in the examination sheet for the number of missing teeth were descriptive analytic and calculated the average number. Both variables were analyzed using the Pearson

Correlation test. The technique of assessing 25 questionnaires by means of each correct answer is worth 4 and the wrong answer is 0. The assessment technique is divided into two, namely the elderly with 20 functioning teeth or the elderly with <20 functioning teeth. The data measuring scale in this study is the interval and ratio.

This study uses the Pearson correlation statistical test. If the significant value of $p < (0.05)$ then H_1 is accepted and H_o is rejected. The research hypotheses are as follows:

H_1 : There is a relationship between knowledge of oral health and the number of functioning teeth in the elderly at the Hargo Dedali Nursing Home in Surabaya.

H_o : There is no relationship between knowledge of oral health and the number of functioning teeth in the elderly at the Hargo Dedali Nursing Home in Surabaya.

III. RESULT

This research was conducted on the elderly at the Hargo Dedali Nursing Home in Surabaya at Manyar Kartika IX no. 22-24, Menur Pumpungan, Sukolilo District, Surabaya, Indonesia. This orphanage is one of the social institutions that serves as a substitute for the family in an effort to provide attention and care to the elderly, has carried out its duties in accordance with applicable standards in dealing with elderly problems. Some of the caretakers of the orphanage are women who graduated from nursing school. There are no health workers from health care facilities who are officially and routinely for health checks for the elderly. All of the population are female. There are 35 elderlies with ages between 60 and 92 years.

TABLE 1
Frequency of Elderly Hargo Dedali Nursing Homes in Surabaya

No.	Age	Frequency	Persentage
1.	60-70	8	22,85%
2.	71-80	17	48,6%
3.	81-90	9	25,7%
4.	91-100	1	2,85%
	Total	35	100%

Based on table 1, it can be seen that the elderly living in the Hargo Dedali Nursing Home in Surabaya in 2022 are in the age range of 60-92 years and the most are in the age range of 71-80 years with a total of 48.6% as many as 17 parents. The least are those in the age range of 91-100 years with a total of 2.85% as many as 1 elderly. Table 2 shows that the most correct scores on questions about cavities are 80.7% and 113 correct answers from 4 questions. The least values about missing teeth are 32.1% and 90 correct answers from 8 questions. The value of dental and oral health knowledge in this study were an average of 48,1 from 35 respondents. The data explains that more elderly people are still wrong in doing problems and lack of knowledge about cavities than about tooth loss.

TABLE 2
Frequency Distribution of Knowledge Value of Dental and Oral Health for the Elderly at Panti Werdha Hargo Dedali Surabaya 2022

Knowledge	questions	Frequency			
		True	%	False	%
Brushing teeth	9	121	38,4	194	61,6
Cavities	4	113	80,7	27	19,3
Tartar	4	58	41,4	82	58,6
Missing teeth	8	90	32,1	190	67,9
Total	25	382	192,6	493	207,4
Average		15	48,1	20	51,9

TABLE 3
Distribution of the Number of Functioning Teeth in the Elderly at Hargo Dedali Nursing Home in Surabaya 2022

Number of Functioning teeth	Number of Elderly	Frequency	Persentage (%)
≥ 20 Functioning teeth	3	68	20,85
<20 Functioning teeth	32	258	79,14
Total	35	326	100
Average		9,3	

Table 3 shows that only 3 elderlies have 20 functioning teeth and 35 elderly have < 20 functioning teeth almost all of population have under 20 functioning teeth. The average result is that the elderly only has 9,3 or 9 teeth per person.

The results of the study using a questionnaire and an examination of the number of functioning teeth, a data normality test was carried out on the variable of knowledge of dental and oral health and the variable number of functioning teeth using the Shapiro Wilk method because the population <80 respondents was as follows.

TABLE 4
Data Normality Test with Shapiro Wilk Method

	Shapiro-Wilk		
	Statistic	df	Sig.
Number of Knowledge	,950	35	,125
Number of Functioning Teeth	,949	35	,103

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on table 4 shows that the value of is 0,05 and the p value for the knowledge value variable is 0,110 and the p value for the number of functioning teeth is 0,125. Both variables are more than 0,05 meaning that the data is

normally distributed, then the method of analyzing the relationship between the two variables can be continued using the Pearson correlation test. Based on table 5 using the Pearson correlation test method, it known significant value (2-tailed) of 0,000 <0,05 means that there is a significant relationship between the knowledge of oral health in the elderly and the number of functioning teeth.at the Hargo Dedali Nursing Home Surabaya 2022.

TABLE 5
Relationship Between Knowledge of Oral and Dental Health and Number of Functioning Teeth at Hargo Dedali Nursing Home in 2022

		Number of Knowledge	Number of Functioning Teeth
Number of Knowledge	Pearson Correlation	1	.802**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	8546.74	2882.05
	Covariance	251.37	84.76
	N	35	35
Number of Functioning Teeth	Pearson Correlation	.802**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	2882.05	1509.54
	Covariance	84.76	44.39
	N	35	35

**. Correlation is significant at the 0.01 level (2-tailed).

IV. DISCUSSION

The data obtained based on the results of research on 35 elderly people at the Hargo Dedali Nursing Home in Surabaya showed the average value of dental and oral health knowledge was 48.1 from the maximum value, which was 100. This study is in line with research by Wong [20], showing that knowledge of dental and oral health is poor, because more than 50% of the elderly answered some questions incorrectly. This may be due to some elderly living with limited mobility, senses hearing and sight to communicate with each other so that the information obtained from the environment where they currently live is also limited [21]. The decline in physical quality and cognitive function related to learning and memory abilities (learning and remembering) will affect social interactions which in turn will also have an impact on the quality of life of the elderly [22].

The results of this research questionnaire related to tooth loss that most elderly people could not answer the questions correctly. Lack of knowledge about the impact of tooth loss that is allowed to continue also results in functional disorders of mastication [17]. If knowledge of the impact of tooth loss is lacking, the elderly will underestimate tooth loss so that it is not a problem if their teeth are lost even though they can be preserved. The results of research by Moreno et al. [17], showed that the lower the number of teeth, the greater the risk for exhibiting cognitive decline. Further impacts that may occur will also result in adverse health effects such as systemic diseases. This is due to a lack of balance in the food consumed [23].

Based on data analysis of the number of functioning teeth in the elderly at Hargo Dedali Nursing Home in Surabaya 2022, there are 3 elderly who have 20 functioning teeth and 32 elderly who do not match the indicators of dental and oral health. The stipulation that people aged 65 years and over have at least 20 functioning teeth or 75% of the total number of teeth. Tooth loss is influenced by several other factors, for example due to poor oral health status, especially caries and periodontal disease as the most common causes of tooth loss. It can occur due to trauma, attitudes and characteristics towards dental health services, socio-demography and lifestyle [24].

The above explanation is in line with research by Passareli et al. [7], that caries is a dental and oral problem that causes a high percentage of tooth extraction. The caries problem is influenced by eating habits, nutritional status and oral health in the elderly. In the study of Martinon et al. [25], the prevalence of periodontal disease increases with age. Limitations of food consumed and infrequent chewing activity so that the formation of dental plaque is easier due to physiological changes in saliva resulting in the tissue that supports the teeth being disturbed if allowed to continue.

The elderly experience a decrease in physical function, cognitive function, and behavior so that it affects the health of their teeth and mouth. They pay less attention to activities such as brushing their teeth or having their teeth checked regularly. Facilities such as toothbrushes have been neglected with some damaged conditions.

There are several places for dental and oral health services around the nursing home. Even though the location is ±1 km away, regarding dental examinations, the caretaker of the orphanage gives the full decision to the elderly family. In fact, many elderly people do not have a problem with the condition of their teeth. Factors that may occur, namely the lack of awareness of the elderly and their families about the importance of maintaining dental and oral health.

Research conducted by Stones and Gullifer [26], that some of the elderly are more comfortable living at home than in a nursing home. Family support has a big influence on the physical and mental health of the elderly. When family support decreases, it can cause the quality of life of the elderly to decrease as well. Research conducted by Ezalina [27], that neglect from family can cause the elderly to slowly withdraw from relationships with their surroundings society

so that it can affect social interaction. Family support in question is starting from giving attitudes, actions, and receiving well to family members, especially elderly parents. Providing health support both physically and mentally can increase the age of the elderly from short-term death.

The results of data analysis showed that there was a relationship between knowledge of the oral health of the elderly and the number of functioning teeth at the Hargo Dedali Nursing Home in Surabaya. This study is in line with the research by celine et al. [28] which states that the results of knowledge research have an impact on the incidence of tooth loss in the elderly. This is also in line with research by Haque et al. [29], which states that the knowledge of the elderly is closely related to the status of oral hygiene. The better the knowledge of the elderly in maintaining dental and oral hygiene, the better the status of their dental hygiene. Research conducted by Li et al. [30], showed the number of functioning teeth in the oral cavity was significantly associated with cognitive function.

The implication of this research is that it can provide awareness and motivation for families, nursing home managers, health workers in an effort to provide dental and oral health services to the elderly and most importantly for ourselves to always maintain our own dental and oral health. This can be felt when we are getting older so that we can reduce the number of tooth loss and maintain teeth as long as possible in the oral cavity so that they function normally according to dental and oral health indicators.

The limitations of this study are the short research time because the research took place during a pandemic, the number of respondents in a small number, the difficulty of communicating with the elderly due to decreased levels of vision and hearing in answering questions.

IV. CONCLUSION

The purpose of this study was to determine the relationship between knowledge of the oral health of the elderly and the number of functioning teeth at the Hargo Dedali Nursing Home in Surabaya.The results of the value of dental and oral health knowledge in this study were an average of 48,1, it means that the value of knowledge is still less than the total value if all are answered correctly. The number of functioning teeth in the elderly at the Hargo Dedali Nursing Home in Surabaya was 9 teeth per person from out of 32 total teeth. There is a relationship between the two. The lower the knowledge value the less the number of teeth should be. The results of this study can be used as input for dental health workers and hold counseling activities and periodic checks on dental and oral health at Panti Werdha Hargo Dedali Surabaya in order to increase knowledge and reduce tooth loss in the elderly. For the family and the caretaker of the orphanage, they can contribute to help and support the facilities needed so that the dental and oral health of the elderly will be better in terms of knowledge and in maintaining teeth. For families and caretakers of the orphanage, they can contribute to help and support the facilities needed so that the oral health of the elderly will be better in terms of knowledge and in maintaining teeth. For future researchers, it is hoped that the results of this study can be developed to be able to make more research variables to help prevent tooth loss in the elderly with a larger number of respondents and a wider range.

REFERENCES

[1] M. O. P. Alvarenga, R. de O. Ferreira, M. B. Magno, N. C. F. Fagundes, L. C. Maia, and R. R. Lima, "Masticatory Dysfunction by Extensive Tooth Loss as a Risk Factor for Cognitive Deficit: A Systematic Review and Meta-Analysis," *Front. Physiol.*, vol. 10, no. July, 2019, doi: 10.3389/fphys.2019.00832.

[2] P. Melo, S. Marques, and O. M. Silva, "Portuguese self-reported oral-hygiene habits and oral status," *Int. Dent. J.*, vol. 67, no. 3, pp. 139–147, 2017, doi: 10.1111/idj.12273.

[3] C. A. Ramseier *et al.*, "Natural history of periodontitis: Disease progression and tooth loss over 40 years," *J. Clin. Periodontol.*, vol. 44, no. 12, pp. 1182–1191, 2017.

[4] S. L. Christian Stock, Hendrik Jürges, Jing Shen, Kayvan Bozorgmehr, "A comparison of tooth retention and replacement across 15 countries in the over-50s," *Community Dent. Oral Epidemiol.*, vol. 44, no. 3, pp. 223–231, 2016.

[5] N.-Y. Yi and J.-H. Choi, "Evaluation of the nutrient quotient for the elderly (NQ-E) using congregate meal services according to their oral health conditions," *Nutr. Res. Pract.*, vol. 16, 2022.

[6] A. Heidari, M. Shahrabi, M. S. Shahrabi, M. Ghandehari, and P. Rahbar, "Comparison of the Level of Substance P and Neurokinin A in Gingival Crevicular Fluid of Sound and Symptomatic Carious Primary Teeth by ELISA.," *J. Dent. (Tehran).*, vol. 14, no. 4, pp. 173–179, 2017, [Online]. Available: http://www.ncbi.nlm.nih.gov/pubmed/29285027%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC5745221.

[7] P. C. Passarelli *et al.*, "Reasons for tooth extractions and related risk factors in adult patients: A cohort study," *Int. J. Environ. Res. Public Health*, vol. 17, no. 7, 2020, doi: 10.3390/ijerph17072575.

[8] A. M. Briggs *et al.*, "Musculoskeletal Health Conditions Represent a Global Threat to Healthy Aging: A Report for the 2015 World Health Organization World Report on Ageing and Health," *Gerontologist*, vol. 56, pp. S243–S255, 2016, doi: 10.1093/geront/gnw002.

[9] H. Kim, J. Lee, E. Lee, and H. Ahn, "Improvements in oral functions of elderly after simple oral exercise," *J. Oral Rehabil.*, vol. 44, no. 1, pp. 59–64, 2019.

[10] P. I. Eke *et al.*, "Periodontitis prevalence in adults ≥ 65 years of age, in the USA," *Periodontol. 2000*, vol. 72, no. 1, pp. 76–95, 2016.

[11] K. Yao, Y. Yao, X. Shen, C. Lu, and Q. Guo, "Assessment of the oral health behavior, knowledge and status among dental and medical undergraduate students: A cross-sectional study," *BMC Oral Health*, vol. 19, no. 1, pp. 1–8, 2019, doi: 10.1186/s12903-019-0716-6.

[12] K. E. Dahl, G. Calogiuri, and B. Jönsson, "Perceived oral health and its association with symptoms of psychological distress , oral status and socio-demographic characteristics among elderly in Norway," *BMC Oral Health*, vol. 18, no. 1, pp. 1–8, 2018.

[13] L. B. Ortíz-Barrios, V. Granados-García, P. Cruz-Hervert, K. Moreno-Tamayo, E. Heredia-Ponce, and S. Sánchez-García, "The impact of poor oral health on the oral health-related quality of life (OHRQoL) in older adults: The oral health status through a latent class analysis," *BMC Oral Health*, vol. 19, no. 1, pp. 1–10, 2019, doi: 10.1186/s12903-019-0840-3.

[14] A. G. Grecu, R. Balazsi, D. Dudea, A. S. Mesaros, M. Strîmbu, and D. L. Dumitrascu, "Oral health related quality of life and self-esteem in a general population," *Med. Pharm. Reports*, vol. 92, no. 3, pp. 65–72, 2019, doi: 10.15386/MPR-1520.

[15] S. M. Sarkar, B. K. Dhar, S. S. Crowley, F. K. Ayittey, and M. A. I. Gazi, "Psychological Adjustment and Guidance for Ageing Urban Women," *Ageing Int.*, no. 0123456789, 2021, doi: 10.1007/s12126-021-09467-1.

[16] L. Al-Nasser and I. B. Lamster, "Prevention and management of

periodontal diseases and dental caries in the older adults," *Periodontol. 2000*, vol. 84, no. 1, pp. 69–83, 2020.

[17] P. Galindo Moreno *et al.*, "The impact of tooth loss on cognitive function," *Clin. Oral Investig.*, vol. 26, no. 4, pp. 3493–3500, 2022, doi: 10.1007/s00784-021-04318-4.

[18] H. Nilsson, J. S. Berglund, and S. Renvert, "Longitudinal evaluation of periodontitis and development of cognitive decline among older adults.," *Clin. Oral Investig.*, vol. 22, no. 5, pp. 2103–2109, 2018.

[19] S. Pengpid and K. Peltzer, "The prevalence of edentulism and their related factors in Indonesia, 2014/15," *BMC Oral Health*, vol. 18, no. 1, pp. 1–9, 2018, doi: 10.1186/s12903-018-0582-7.

[20] F. M. F. Wong, "Factors Associated with Knowledge , Attitudes , and Practices Related to Oral Care Among the Elderly in Hong Kong Community," pp. 1–15, 2020.

[21] L. Appel *et al.*, "Older Adults With Cognitive and/or Physical Impairments Can Benefit From Immersive Virtual Reality Experiences: A Feasibility Study," *Front. Med.*, vol. 6, no. January, 2020, doi: 10.3389/fmed.2019.00329.

[22] M. Gao *et al.*, "Does social participation reduce the risk of functional disability among older adults in China? A survival analysis using the 2005-2011 waves of the CLHLS data," *BMC Geriatr.*, vol. 18, no. 1, pp. 1–13, 2018, doi: 10.1186/s12877-018-0903-3.

[23] B. Kamdem, L. Seematter-Bagnoud, F. Botrugno, and B. Santos-Eggimann, "Relationship between oral health and Fried's frailty criteria in community-dwelling older persons," *BMC Geriatr.*, vol. 17, no. 1, pp. 1–8, 2017, doi: 10.1186/s12877-017-0568-3.

[24] J. Jaidee, S. Chatrchaiwiwatana, and A. Ratanasiri, "FACTORS RELATED TO TOOTH LOSS AMONG INDUSTRIAL WORKERS IN PHATHUM THANI, THAILAND," *Southeast Asian J. Trop. Med. Public Health*, vol. 48, no. 1, pp. 253-264., 2017.

[25] P. Martinon, L. Fraticelli, A. Giboreau, C. Dussart, D. Bourgeois, and F. Carrouel, "Nutrition as a Key Modifiable Factor for Periodontitis and Main Chronic Diseases," *J. Clin. Med.*, vol. 10, no. 2, p. 197, 2021, [Online]. Available: https://doi.org/10.3390/jcm10020197.

[26] D. Stones and J. Gullifer, "'At home it's just so much easier to be yourself': Older adults' perceptions of ageing in place," *Ageing Soc.*, vol. 36, no. 3, pp. 449–481, 2016, doi: 10.1017/S0144686X14001214.

[27] E. Ezalina, R. Machmud, N. Effendi, and Y. Maputra, "Effectiveness of the elderly caring model as an intervention to prevent the neglect of the elderly in the family," *Open Access Maced. J. Med. Sci.*, vol. 7, no. 14, pp. 2365–2370, 2019, doi: 10.3889/oamjms.2019.650.

[28] C. L. Céline Catteau, Sophie Piaton, Emmanuel Nicolas, Martine Hennequin, "Assessment of the oral health knowledge of healthcare providers in geriatric nursing homes: additional training needs required," *Gerodontology*, vol. 33, no. 1, pp. 11–19, 2016.

[29] S. E. Haque *et al.*, "Effect of a school-based oral health education in preventing untreated dental caries and increasing knowledge, attitude, and practices among adolescents in Bangladesh," *BMC Oral Health*, vol. 16, no. 1, pp. 1–10, 2016, doi: 10.1186/s12903-016-0202-3.

[30] J. Li, H. Xu, W. Pan, and B. Wu, "Association between tooth loss and cognitive decline: A 13-year longitudinal study of Chinese older adults," *PLoS One*, vol. 12, no. 2, pp. 2–9, 2017, doi: 10.1371/journal.pone.0171404.