Factors of Dental Caries, Tooth Mobility, and Periodontal Pockets on the Occupation of Tooth Loss in the Elderly. (A Study in Karikil Village, Mangkubumi District, Tasikmalaya City)

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Abstract

BACKGROUND: Loss of teeth can disrupt daily activities such as chewing disorders, causing emotional problems, and loss of self-confidence. Tooth loss in the elderly is usually caused by dental caries and periodontal disease which are influenced by several other factors.

AIM: This study aims to obtain a mathematical equation for predicting tooth loss in the elderly based on dental caries, tooth mobility, and periodontal pockets which have been shown to have an effect.

MATERIALS AND METHODS: This research is a survey research with a cross-sectional design. The research subjects were 210 elderly people from Karikil Village, Mangkubumi District, Tasikmalaya City, sampling using the purposive sampling technique affected tooth loss, while the effects were dental caries, tooth mobility, and periodontal pockets. Tooth loss, dental caries, mobility of teeth, and periodontal pockets were measured using the fill-in format from the World Health Organization. Data analysis used the Chi-square correlation test and multiple logistic regression.

RESULTS: The results of the Chi-square test analysis showed that the variables of dental caries and tooth mobility had a very significant effect on tooth mobility (p = 0.000 and 0.007). The pocket periodontal variable did not show a significant relationship to tooth mobility (p = 0.947). The results of the multiple logistic regression analysis of dental caries and tooth mobility together contributed 12.2% (R^2 = 0.122) to tooth mobility in the elderly. Dental caries gave the greatest contribution to tooth loss, namely, 87.6%.

CONCLUSION: Dental caries gives the greatest contribution compared to tooth mobility and periodontal pockets to the occurrence of tooth loss in the elderly. In the elderly, the higher the level of dental caries and tooth mobility, the higher the risk of tooth loss.

Introduction

Teeth have an important role in the oral cavity that contributes to the process of mastication, speech, and esthetics. Loss of teeth can result in disruption of daily activities such as chewing disorders, causing emotional problems, and loss of self-confidence [1]. Tooth loss in the elderly is usually caused by dental caries and periodontal disease which is influenced by several other factors [2].

The results showed that dental caries and periodontal disease were the most common indications for the reason for permanent tooth extraction. The age factor is one of the causes of tooth loss [3]. Dental caries and tooth loss are important indicators of oral health for adults. With age, the quality of oral health decreases due to tooth decay and tooth loss [4].

Dental caries is a global health condition that affects both children and adults, which can cause disability, although it is largely preventable, the prevalence of dental caries in adults worldwide is very high. According to the World Health Organization (WHO), dental caries in adults aged 65 years or older is a significant problem in many countries. The average caries experience of Decay Missing Filled – Teeth in the age group of 65 years or older in the entire Eastern Mediterranean (Iran) region was reported as 23, the prevalence rate of edentulism (tooth loss) was 30%. According to a study conducted in Iran, it is estimated that the prevalence of edentulism is between 60% and 78% among people over 70 years of age [5].

As age increases, it will hurt a person's ability to maintain oral hygiene, causing many dental, and oral problems experienced by the elderly such as tooth loss due to the lack of frequency of dental and oral health checks [6]. As a result of increasing age, the teeth gradually decrease due to loss. Incomplete teeth can reduce the comfort of eating and limit the types of food consumed. The production of saliva with various enzymes it contains also decreases, which causes dry mouth, reduced ability to chew food, and possibly accelerates the accumulation of tartar. Important factors that can affect dental health in the elderly include a lack

of saliva production and poor oral and dental hygiene habits. At present, the overall prevalence of tooth loss in Indonesia in the elderly is around 12.5% [7]. Tooth loss is an indicator to determine oral health conditions in adults [8].

Materials and Methods

Study design

This research is non-experimental research, in which observations are made on several characteristics of the subject according to the actual situation without any manipulation or intervention by the researcher. The research design is cross-sectional to study the dynamics of the correlation between the independent variable and the dependent variable, measured, or collected at the same time and each subject is only observed once [9].

Participant and setting

The participants involved 210 elderly. The sample of the study was the elderly who actively visited Integrated Development Post in the Mangkubumi village, Mangkubumi district, Tasikmalaya city under the guidance of the puskesmas with inclusion criteria of 45–74 years of age, physically healthy which means that they can carry out activities independently. The exclusion criteria were not willing to fill out the informed consent. The research sample was divided into two parts of the elderly age group, namely, the middle age group (middle age) between the ages of 45–59 years, and the elderly group (elderly) between the ages of 60–74 years. The validity and reliability test of this measuring instrument was carried out on 25 pre-elderly people who were not sampled in the study at Posbindu, Mangkubumi Village, Mangkubumi District, Tasikmalaya City.

Data collection

Before the research was conducted, training and calibration were held for two dentists and two dental nurses to equalize the perception of understanding and application of the assessment or measurement of dental caries, tooth mobility, periodontal pockets, and tooth loss. These measurements used standard tools (mouth mirror, tweezers, and probe) with a kappa value of 0.85 which means adequate.

Data analysis

Data analysis was carried out with the help of data processing software. Statistical tests of correlation with Chi-square and multiple logistic regression were applied to determine the relationship between variables and dominant factors influencing tooth loss. The results of the multiple logistic regression analysis will obtain a mathematical equation to determine the probability of tooth loss based on the factors that are proven to be influential.

Ethical considerations

This research has received a research permit from the Research Ethics Committee of the Faculty of Dentistry, Gadjah Mada University, and has been assessed for feasibility and received approval based on the Ethical Examination Pass Certificate Number 00689/KKEP/FKG-UGM/EC/2021.

Results

Teeth loss can cause chewing issues, mental problems, and a loss of self-confidence, among other things. Dental caries and periodontal disease, which are impacted by a variety of other variables, are the most common causes of tooth loss in the elderly. This research intends to develop a mathematical equation for predicting tooth loss in the elderly based on dental caries, tooth mobility, and periodontal pockets, all of which have been linked to tooth loss.

In the research that has been done, the researchers involved 210 elderly people. The sample of the study was the elderly who actively visited the Posyandu in Mangkubumi Village, Mangkubumi District, Tasikmalaya City assisted by the puskesmas with inclusion criteria of 45–74 years old. From the analysis of the research results, the research data obtained are as follows.

Table 1 shows that most (68.58%) of the respondents in this study were female and the majority of respondents were aged 45–59 years (64.28%).

Table 1: Characteristics of participants by gender and age

Variable	f	%
Gender		
Man	66	31.42
Woman	144	68.58
Age		
45–59 (middle age)	135	64.28
60–74 (elderly)	75	35.72

Based on Table 2, we can find a significant relationship between dental caries and tooth loss in the elderly group, it can be seen from $p = 0.000$ ($p < 0.05$).

Table 2: Relationship between dental caries and tooth loss

Variable	Tooth Loss		p-value
	No	Yes	
Caries			
No	2	0	0.000
Yes	17	191	

Based on Table 3, we can find a significant relationship between tooth mobility and tooth loss in the elderly group, it can be seen from p = 0.007 (p < 0.05).

Table 3: Relationship between tooth mobility and tooth loss

Variable	Tooth Loss		p-value
	No	Yes	
Tooth Mobility			
No	16	99	0.007
Yes	3	92	

Based on Table 4, we can find no significant relationship between a periodontal pocket and tooth loss in the elderly group, it can be seen from p = 0.947 (p-value more than 0.05).

Table 4: Relationship between a periodontal pocket and tooth loss

Variable	Tooth Loss		p-value
	No	Yes	
Periodontal Pocket			
No	10	99	0.947
Yes	9	92	

Based on multiple logistic regression analyses in Table 5, it was shown that the variables of dental caries and tooth mobility had a significant effect on the occurrence of tooth loss (p = 0.000). Based on the results of multiple regression analysis, the determinant coefficient (R^2) of 0.122 shows that statistically, dental caries and tooth mobility variables contribute to tooth loss in the elderly in Posbindu, Mangkubumi Village, Mangkubumi District, Tasikmalaya City, the remaining 12.2% (87, 8%) is determined by other factors outside this study. The results of multiple regression analysis showed that dental caries had the most influence on the occurrence of dental caries (87.6%). The mathematical equation to determine the probability of tooth loss based on risk factors for dental caries and tooth loss is as follows: 1.008E-013 + 0.876 DC + 0.092 TM + e.

Table 5: Results of multiple regression analysis

Independent Variable	Beta Coefficient	Standardized Coefficients Beta	t_{count}	sig. (p-value)
Constant	1.008E-013	-	-	-
Dental caries (DM)	0.876	0.297	4.537	0.000
Tooth mobility (TM)	0.092	0.160	2.450	0.015
R^2		0.122		
f count		14.397		
Sig. (p-value)		0.000		

Discussion

Based on the results of the study, it can be found a significant relationship between dental caries and tooth loss in the elderly group, can be seen from p = 0.000 (p < 0.05). The results of the study found a significant relationship between tooth mobility and tooth loss in the elderly group, it could be seen from p = 0.007 (p < 0.05).

This is in line with research in India which states that dental caries and periodontal disease are the main causes of tooth loss. Other factors that can be changed such as culture, socioeconomic, access to dental care, unhealthy diet, behavior, and dental trauma are factors that support tooth loss [10]. Tooth loss caused by dental caries shows a significant result in the occurrence of tooth loss. The prevalence of dental caries is 41.9% of the elderly who live in nursing homes in Pradesh India [11]. Tooth loss in the elderly is usually caused by dental caries and periodontal disease which is influenced by several other factors [2].

While the results of the study, there was no significant relationship between periodontal pockets and tooth loss in the elderly group, it could be seen from p-value = 0.947 (p-value more than 0.05). The periodontal disease consists of gingivitis and periodontitis. Gingivitis or inflammation of the gums is the beginning of periodontal disease. Over time, it will develop into periodontitis which is characterized by gum recession and alveolar bone loss which can eventually lead to tooth loss (Michaud, 2017). Tooth loss in the elderly population is reported to be affected by periodontal disease due to the loss of gingival attachments which eventually lead to tooth loss [12].

As age increases, it will hurt a person's ability to maintain oral hygiene, causing many dental, and oral problems experienced by the elderly such as tooth loss due to the lack of frequency of dental and oral health checks [6].

Based on the results of multiple regression analysis, an R of 0.122 was obtained, this shows statistically, the variables of dental caries and tooth mobility contributed to tooth loss in the elderly in Posbindu Mangkubumi Village, Mangkubumi District, Tasikmalaya City by 12.2%, the rest (87.8%) was determined by other factors outside of this study. The results of multiple regression analysis showed that dental caries had the most influence on the occurrence of dental caries (87.6%). Tooth loss in the elderly is a multifactorial process involving dental caries, periodontal disease, and various other factors, namely, social and environmental factors such as socioeconomic status, education level, income, race, access to services, insurance status, and general health status [13]. Tooth loss is also influenced by attitudes, dental hygiene behavior, culture, and accessibility to dental services [8], [14] stated that there is a relationship between missing teeth and psychological factors. Cigarette smoking is a major risk factor for periodontitis resulting in tooth loss [15].

The welfare of the elderly is one of the main concerns, oral health contributes significantly to the quality of life. The elderly who experience poor health including dental caries, periodontal disease, and tooth loss can affect food intake and nutrition which is exacerbated by systemic disease [11].

Conclusion

1. There is a significant relationship between dental caries and tooth loss in the elderly

group, it can be seen from p = 0.000 (p < 0.05)

2. There is a significant relationship between tooth mobility and tooth loss in the elderly group, it can be seen from p = 0.007 (p < 0.05)

3. There is no significant relationship between a periodontal pocket and tooth loss in the elderly group, it can be seen from p = 0.947 (p-value more than 0.05)

4. Dental caries is the most influential factor in the occurrence of tooth loss (87.6%)

5. The results of multiple regression analysis obtained a determinant coefficient (R2) of 0.122 that this shows statistically, the variable dental caries and tooth mobility contributed to tooth loss by 12.2%, and the rest (87.8%) was determined by other factors outside the study.

6. The mathematical equation for the risk factors for dental caries and tooth loss is as follows: 1.008E-013 + 0.876 DC + 0.092 TM + e.

Acknowledgment

References

1. Yarmohammadi R, Mortazavi H, Rahmani A, Rahmani S. Tooth loss related to systemic disease. Int J Med Rev. 2015;2(4):331-7.

2. Barbato PR, Peres KG. Contextual socioeconomic determinants of tooth loss in adults and the elderly: A systematic review of the literature. Rev Bras Epidemiol. 2015;18(2):357-71.

3. Haworth S, Shungin D, Kwak SY, Kim HY, West NX, Thomas SJ, *et al*. Tooth loss is a complex measure of oral disease: Determinants and methodological considerations. Community Dent Oral Epidemiol. 2018;46(6):555-62. https://doi.org/10.1111/cdoe.12391

   PMid:29956852

4. Dye BA, Thornton-Evans G, Li X, Iafolla T. Dental caries and tooth loss in adults in the United States, 2011-2012. NCHS Data Brief 2015;197:2011-2.

5. Shoaee S, Sharifi F, Parsa PG, Sofi-Mahmudi A. Dental caries among the elderly in Iran: A meta-analysis. medRxiv 2020;84:84-104. https://doi.org/10.1101/2020.07.24.20161299

6. Fagundes NC, Couto RS, Brandão AP, de Lima LA, de Bittencourt LO, de Souza-Rodrigues RD, *et al*. Association between tooth loss and stroke: A systematic review. J Stroke Cerebrovasc Dis. 2020;29(8):104873. https://doi.org/10.1016/j.jstrokecerebrovasdis.2020.104873

   PMid:32689647

7. Riskesdas K. Hasil utama riset kesehata dasar (RISKESDAS). J Phys A Math Theor. 2018;44(8):1-200. https://doi.org/10.1088/1751-8113/44/8/085201

8. Filho VV, Gondinho BV, Silva-Junior MF, de Cavalcante DF, Bulgareli JV, da Luz Rosario de Sousa M, *et al*. Tooth loss in adults: Factors associated with the position and number of lost teeth. Rev Saude Publica. 2019;53:105.

   PMid:31826174

9. Pratiknya AW. Dasar-dasar Penelitian Metodologi KedokteranTitle. Jakarta: Rajawali Pers; 2010. p. 248.

10. Begum SS, Reddy VC, Kumar RV, Sudhir K, Srinivasulu G, Ali SN. Tooth loss prevalence and risk indicators among adult people visiting community health centers in Nellore district, Andhra Pradesh: A cross-sectional study. J Indian Assoc Public Heal Dent. 2016;14(4):413-8. https://doi.org/10.4103/2319-5932.195829

11. Agrawal R, Gautam NR, Kumar PM, Kadhiresan R, Saxena V, Jain S. Assessment of dental caries and periodontal disease status among elderly residing in old age homes of Madhya Pradesh. J Int Oral Health. 2015;7(8):57-64.

    PMid:26464541

12. Natto ZS, Aladmawy M, Alasqah M, Papas A. Factors contributing to tooth loss among the elderly: A cross sectional study. Singapore Dent J. 2014;35:17-22. https://doi.org/10.1016/j.sdj.2014.11.002

    PMid:25496581

13. Tiwari T, Scarbro S, Bryant LL, Puma J. Factors associated with tooth loss in older adults in rural colorado. J Community Health. 2016;41(3):476-81. https://doi.org/10.1007/s10900-015-0117-y

    PMid:26518778

14. Roohafza H, Afghari P, Keshteli AH, Vali A, Shirani M, Adibi P, *et al*. The relationship between tooth loss and psychological factors. Community Dent Health. 2015;32(1):16-9. https://doi.org/10.1111/idj.12153

    PMid:26263587

15. Dietrich T, Walter C, Oluwagbemigun K, Bergmann M, Pischon T, Pischon N, *et al*. Smoking, smoking cessation, and risk of tooth loss: The EPIC-Potsdam study. J Dent Res. 2015;94(10):1369-75. https://doi.org/10.1177/0022034515598961

    PMid:26243734