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台灣地區老人無牙狀態危險因素之研究

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目的：本研究目的為探究台灣地區65歲以上老人無牙狀態的危險因素為何。方法：隨機選取1,600名老人為研究樣本，以研究人員自行設計的結構式問卷為研究工具，經由受過訓練的訪員到受訪者家中進行面對面訪視並收集資料。統計方法係以對數式迴歸分析模式呈現哪些因素會造成老人無牙的狀況。結果：造成老人無牙狀態的危險因子如下，年齡愈大、女性、教育程度愈低、每周社交活動頻率愈低、刷牙頻率較低、有咀嚼檳榔的習慣、罹患高血壓或糖尿病、無固定看牙醫的習慣、無固定就醫的牙醫診所、無使用牙線。結論：建議有關單位應該建立家庭牙醫師制度，以促進個人口腔保健照護的完整性；宣導良好的口腔衛生保健知識，教導正確的口腔衛生保健行為；以及針對特定慢性病族群進行口腔篩檢追蹤，即時提供治療。

關鍵詞：老人、無牙狀態、危險因子

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Population aging has become a common trend among a number of advanced countries worldwide, and topics related to elders, those aged over 65 years, have also prompted attention from researchers and analysts in Taiwan. While discussions related to the overall health status of senior citizen groups are taking place, it is also important to note that oral hygiene is an essential factor, for it not only affects the quality of how nutrition is processed, but also provides foresight concerning a person's health status, making it the foundation for health improvement [1,2]. Therefore, in order to maintain an elderly person's overall healthy condition and improve the quality of living, oral hygiene should not be overlooked. Loss of teeth is a common oral hygiene issue seen in seniors. In some cases, seniors may even lose all of their teeth. Being toothless has a major impact in senior citizens' life. Not only does it affect the clarity of speech but also one's external image, creating limitations in social activities and declination of quality of life [3]; it severely interferes with eating and chewing, affecting the amount of nutrients absorbed, which in turn results in an increase in weight endangering one's overall health [4-8].

There are numerous factors contributing to the loss of teeth. Not only does age play a major role [9-14], but specific characteristics such as: gender [9,10,13,15], marital status [15], education level [10,12,16], and financial status [9,10,12,17,18] also affect the rate of edentulism. Poor lifestyles [10,11,16,18], such as smoking, chewing betel nuts, as well as certain preexisting medical conditions [11,14,19-22], such as diabetes and osteosclerosis, will also increase the rate or chance of edentulism. Some of the published literatures have also pointed out that use of dental services and maintenance of oral hygiene (for examples, regular dental checkups, using the same dental service, as well as frequency of brushing and flossing) will affect the occurrence of edentulism [9,10,18,19]. The purpose of this study is to explore the possible causes of edentulism among Taiwanese elders aged over 65 years. It's hoped that the results of this study may serve as a holistic reference for policy-making.

Methods

This research was performed in accordance of the plan: "Dentures for the Elders Using Public Funding" proposed by the Health Department of Kaohsiung City. To date, the plan is still in progress. A total of 1,600 elders who wear complete denture, were randomly selected via cluster-sampling method. Information was collected on structured questionnaires by trained individuals who interviewed the subjects at their homes. The collection

period ranged from July 2001 to October 2001. The overall response rate was 71.62%. The subjects were categorized into two groups, "dentulous" and "edentulous", consisting of 305 and 552 elders, respectively.

Measurement parameters used in this research were structured questionnaires composed by the researchers, with context including 220 questions. This paper only used portions of the information obtained and further analyzed, with the following analysis categories: (1) basic information of census; (2) social resources and financial status; (3) habitual usage of dental services and oral hygiene maintenance and wellness; (4) lifestyles and health functioning status. The top five diseases among the subjects were analyzed. The scores of physical functionalities were calculated by referring to Ware and colleagues' [23] development of the physical functioning (PF) of SF-36 (MOS 36-Item Short-Form General Health Survey Measure). The rest questions of the questionnaire captured the information of participant's nutritional intake status, quality of life, knowledge of the denture wearing and maintenance, and satisfaction of denture wearing. The above information will not be addressed in details because the information is irrelevant to the main focus of this research.

A Chi-Square test (X^2-test) and logistic regression were performed in this research. The X^2-test was used to determine whether difference exists and the distribution of each variable among those who are edentulous and those with natural teeth, and finally, using logistic regression analysis to determine the factors that cause elders to become completely toothless. By using the stepwise method and narrowing down to the final model, the P-values for entry and exit from the model are found to be 0.05 and 0.10.

Results

When looking at the census information and social-economic situation (Table 1), excluding financial status, statistics showed that obvious difference was present and noted in all remaining variables for both dentulous and edentulous subjects ($p<0.05$). Results demonstrated that older women had a higher probability of becoming edentulous. The ratio of being edentulous was inversely proportional to the educational level. Those without spouse were also more likely to become edentulous. It was also noted that the higher the frequency of social activities, the lower the probability of edentulism.

In areas of habits of dental service usage and oral hygiene maintenance behaviors (Table 2), obvious statistical difference could

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Table 1. Census Information and Social-Financial Status

Variable	Total	Dentulous	Edentulous	p value (χ^2-test)
	n	n(%)	n(%)	
Age				
65-69 years	222	169(59.1)	53(10.4)	＜0.001
70-74 years	202	47(16.4)	155(30.4)	
75-79 years	203	53(18.5)	150(29.4)	
≧80 years	169	17(5.9)	152(29.8)	
Gender				
Male	468	187(61.3)	281(50.9)	＜0.01
Female	389	118(38.7)	271(49.1)	
Education level				
Illiterate	220	48(15.8)	172(31.5)	＜0.001
Elementary and below	368	130(42.8)	238(43.6)	
Middle school	99	38(12.5)	61(11.2)	
High school and above	163	88(28.9)	75(13.7)	
Marital Status				
With spouse (Married)	567	226(74.1)	341(61.8)	＜0.001
Single/Divorced/Widowed	290	79(25.9)	211(38.2)	
Weekly social activity levels				
One or more times a day	258	107(35.8)	151(27.9)	＜0.01
Two to six times per week	284	109(36.5)	175(32.3)	
Once a week	133	40(13.4)	93(17.2)	
None or Never	165	43(14.4)	122(22.6)	
Financial status				
Sufficient / High income	179	75(24.6)	104(18.8)	＞0.05
Enough to get by / Middle income	465	150(49.2)	315(57.1)	
Slightly insufficient or Hard to get by / Low income	213	80(26.2)	133(24.1)	
Total	857	305(35.6)	552(64.4)	

Table 2. Habits of Dental Service Usage and Oral Hygiene Maintenance Behavior

Variable	Total	Dentulous	Edentulous	p value (χ^2-test)
	n	n(%)	n(%)	
Regularity of dental visit				
Yes	117	54(17.7)	63(11.5)	＜0.05
No	737	251(82.3)	486(88.5)	
Consistent clinic of dental visits				
Yes	507	212(70.0)	295(53.7)	＜0.001
No	345	91(30.0)	254(46.3)	
Frequency of tooth-brushing				
Once a day	269	75(25.5)	194(37.0)	＜0.01
Twice or more a day	549	219(74.5)	330(63.0)	
Flossing				
Yes	85	55(18.4)	30(5.5)	＜0.001
No	756	244(81.6)	512(94.5)	
Frequency of snacking				
Never snack	192	61(20.1)	131(23.8)	＜0.01
Seldom snack	361	150(49.3)	211(38.4)	
Occasionally snack	244	81(26.6)	163(29.6)	
Snack Everyday	57	12(3.9)	45(8.2)	
Total	857	305(35.6)	552(64.4)	

be seen in all variables between dentulous and edentulous subjects（$p< 0.05$）. Edentulous subjects made up higher percentage of those not having regular dental checkups. When edentulous people encountered toothache, the probability of not attending a consistent dental clinic was higher. Additionally, compared to dentulous groups, edentulous subjects brush and floss teeth less frequently. The snacking frequency was directly proportional to the edentulous percentage.

When looking at the lifestyles and health functioning status（Table 3）, more specifically in the four variables of currently suffering hypertension and diabetes, monthly hospital or doctor's visits required, instrumental activities of daily living（IADL）, and physical functioning（PF）, researches have shown that significant difference were present between dentulous and edentulous subjects（$p<0.05$）. A higher percentage of edentulous subjects suffered from hypertension and diabetes than that of dentulous subjects. In the area of requiring monthly hospital or doctor's visits, it showed that 53. 8% of the edentulous people had such a need. It was also noted that the probability of having an abnormal level of IADL was higher among edentulous people. The PF level also appeared to be lower than average for edentulous subjects, meaning that they were more likely to have poor physical status.

Several variables were used in the logistic regression model（Table 4）in determining the effects they had on the elderly groups and whether they still possessed natural teeth. Factors such as: age, gender, education level, number of weekly social activities, consistent dental visits and location of dental clinics, frequency of tooth brushing, frequency of snacking, current or previous habit of consuming betel nuts, as well as currently suffering from hypertension and diabetes（$r^2=0.368$）. As shown in Table 4, for example, it was more probable for women to become edentulous than men, yielding an OR value of 1.86.

Discussion

With Bivariate Analyses, differences were noted in the original statistical calculations for certain variables. However, these differences became less obvious when applied to the regression model, for example, whether the subjects were having regular dental checkups, using dental floss regularly, as well as IADL or PF. Yet certain literatures still pointed out that having regular dental checkups would result in less prevalence of dental health problems or severity of oral diseases[24], and hence, less probability of tooth loss. Those who were frequent users of dental floss would have

Table 3. Lifestyle and Health Functioning Status

Variable	Total	Dentulous	Edentulous	p value (χ^2-test)
	n	n(%)	n(%)	
Has/Had habit of chewing betel nuts				
Yes	30	10(3.3)	20(3.6)	＞0.05
No	827	295(96.7)	532(96.4)	
Has/Had habit of cigarette smoking				
Yes	247	80(26.2)	167(30.3)	＞0.05
No	610	225(73.8)	385(69.7)	
Cataract				
Yes	253	88(28.9)	165(29.9)	＞0.05
No	604	217(71.1)	387(70.1)	
Hypertension				
Yes	244	64(21.0)	180(32.6)	＜0.001
No	613	241(79.0)	372(67.4)	
Arthritis or Rheumatism				
Yes	112	32(10.5)	80(14.5)	＞0.05
No	745	273(89.5)	472(85.5)	
Cardiovascular disease				
Yes	139	46(15.1)	93(16.8)	＞0.05
No	718	259(84.9)	459(83.2)	
Diabetic				
Yes	122	33(10.8)	89(16.1)	＜0.05
No	735	272(89.2)	463(83.9)	

Experience of hospitalizing in last six months				
Yes	107	34(11.3)	73(13.6)	>0.05
No	731	267(88.7)	464(86.4)	
Physician visits per month				
Yes	434	138(45.5)	296(53.8)	<0.05
No	419	165(54.5)	254(46.2)	
Vision				
Good or Excellent	220	88(28.9)	132(24.0)	>0.05
Fair	413	140(46.1)	273(49.6)	
Poor or Blind	221	76(25.0)	145(26.4)	
Instrumental activities of daily living (IADL)				
Normal	510	222(72.8)	288(52.2)	<0.001
Abnormal	347	83(27.2)	264(47.8)	
Physical functioning (PF)				
≤ 59 points	222	47(15.4)	175(31.8)	<0.001
60~84 points	181	59(19.3)	122(22.1)	
85~94 points	183	61(20.0)	122(22.1)	
≧ 95 points	270	138(45.2)	132(24.0)	
Satisfaction level of current lifestyle				
Very satisfied	266	106(34.9)	160(29.3)	>0.05
Fairly satisfied	515	176(57.9)	339(62.0)	
Unsatisfied	70	22(7.2)	48(8.8)	
Total	857	305(35.6)	552(64.4)	

Table 4. Logistic Regression Analysis of Risk Factors for Edentulism

					95% confidence interval	
Variable	Coefficient	Standard error	p-value	Odds ratio	Lower limit	Upper limit
Intercept	-4.39	0.46	＜0.001			
Age						
65-69 years				1.00		
70-74 years	3.02	0.29	＜0.001	20.48	11.46	36.60
75-79 years	2.94	0.29	＜0.001	19.06	10.65	34.10
≧80 years	3.77	0.36	＜0.001	43.52	21.36	88.66
Gender						
Male				1.00		
Female	0.62	0.25	＜0.05	1.86	1.13	3.05
Education level						
Illiterate	1.65	0.36	＜0.001	5.22	2.55	10.64
Elementary and below	1.07	0.26	＜0.001	2.92	1.73	4.93
Middle school	0.96	0.34	＜0.01	2.63	1.34	5.16
High school and above				1.00		
Frequency of weekly social activities						
One or more times a day				1.00		
None or Never	0.63	0.29	＜0.05	1.89	1.05	3.37
Consistent clinic of dental visits						
Yes				1.00		
No	0.75	0.21	＜0.001	2.11	1.39	3.22

Tooth-brushing frequency						
Twice or more a day				1.00		
Once a day	0.53	0.23	<0.05	1.70	1.08	2.69
Frequency of snacking between meals						
Never/seldom snack				1.00		
One or more times everyday	1.42	0.48	<0.01	4.17	1.62	10.70
Has/Had habit of chewing betel nuts						
Yes	1.17	0.59	<0.05	3.24	1.02	10.32
No				1.00		
Hypertension						
Yes	0.73	0.24	<0.01	2.08	1.28	3.39
No				1.00		
Diabetic						
Yes	0.79	0.31	<0.05	2.21	1.19	4.10
No				1.00		

Note：r^2=0.368

healthier teeth, and incidence of tooth loss also decreased [19,25,26]. Physical or mobility disability also contributes to edentulism in elders, with the odds of tooth loss increasing [27,28]. In general, IADL referred to the elders being self-sufficient and capable of handling tasks in their daily lives. The loss of these capabilities would greatly affect the usage of dental and oral health maintenance services. Although the factors stated above could not provide significant meanings for the statistical results in the regression model, the effects they had on edentulism in elders should not be overlooked.

Results of logistic regression showed that as age increased, the occurrence of aging of all parts of body became parts of the natural processes; hence the older the age, the greater the probability of tooth loss, proportionally, resulting in the higher percentage of the edentulous [9-14]. As for the correlations between gender and edentulism, research results provided by literatures related to this topic had not yet come to a definite conclusion. Some researches suggested that men are more prone to tooth loss due to their poor lifestyle; but on the other hand, other researches [9,29,30,31] were in agreement with our results and suggested a higher probability of tooth loss in women. One of the possible reasons might be associated with the result of bone loss after women experienced menopause. Additionally, literatures [10,12,16] had pointed out that the higher the education level, the easier and better the knowledge of dental health maintenance that could be obtained; hence, the probability of tooth loss that leads to edentulism was lower. This coincided with the results of this research.

In area of usage of dental service usage and oral health maintenance behaviors, researches done by Gilberts and Richards [9,24] suggested that those who obtained services regularly（i.e. regular dental checkups, consistent location of dental services）were less likely to have oral diseases. The probability of tooth loss that leads to becoming edentulous also decreased proportionally. In addition, the higher the frequency of tooth brushing, the easier it was to achieve positive results in oral health maintenance, thus drastically reducing the danger of edentulism due to tooth loss [10, 27]. On the other hand, with the increase in the frequency of snacking, signs of tooth loss would significantly increase if no additional actions were taken in maintaining oral health as well as in enhancing hygiene behaviors, resulting in a rising probability of edentulism; all of which can also be proven in the conclusions of this research.

Betel nuts are special crops that exist in many Asian countries. Derived from clinical

observation, people who chewed betel nuts demonstrated signs of having excess damages in teeth alignments as well as tartar buildup in the gums. Patients with slight cases of such buildup might experience periodontal diseases, resulting in tooth loss; those with severe cases are prone to oral cancer and put their lives in danger; therefore, those who consumed betel nuts had a higher possibility of tooth loss that eventually leads to edentulism. The effects of chronic diseases on natural teeth also should not be ignored, especially diseases such as diabetes and hypertension, for they affect oral health to a great extent. Literatures in the past had identified that patients with diabetes [14,19-21,32-34] and hypertension [32,35,36] were more likely to have dry mouth, cavities, and periodontal diseases, causing teeth to fall out easily and as result, raising the chances of edentulism occurring.

This research mainly focused on the several factors (e.g. demographics, overall health functioning status, and usage of medical sources) that might cause edentulism among Taiwanese elders. In order to broaden our understanding of risk factors causing edentulism among elders and to provide a holistic perspective of oral health maintenance for policy making, consideration of the possible impact of other factors (e.g. types of oral diseases, level of severity) in future studies is strongly suggested. Besides, in the future, the government shall exert great efforts to establish the family-dentist system for better dental health care and protection, to publicize the correct knowledge of dental hygiene, to instruct the correct guidance of keeping good oral health condition; and also, to regularly follow up the oral screen and dental check on particular population with chronic disease in order to provide the therapy as needed.

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Risk Factors for Edentulism among the Elderly of Taiwan

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Object: The purpose of this study is to explore the possible causes of edentulism among Taiwanese over 65 years elders. Methods: A sample of 1,600 elders was randomly selected. Measurement parameters used in this research were structured questionnaires composed by the researchers. Information gathering was done by trained individuals who visited the subjects at their homes. A logistic regression analysis was performed to determine the factors that cause the elders to become completely toothless. Results: The risk factors of edentulism are as follows: individuals who are older age（i.e., aging）, female, having lower education level, having lower frequency of weekly social activities, having lower frequency of tooth brushing, having the habit of chewing betel nuts, or having hypertension and diabetes, not having regular dental checked, not visiting a fixed dental clinic for service, not using the dental floss. Conclusions: In the future, the government shall exert great efforts to establish the family-dentist system for better dental health care and protection, to publicize the correct knowledge of dental hygiene, to instruct the correct guidance of keeping good oral health condition; and also, to regularly follow up the oral screen and dental check on particular population with chronic disease in order to provide the therapy as needed.

Key words: elderly, edentulism, risk factor

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