

CONTINUOUS HEALTH ASSESSMENT ON DENTURE HYGIENE CARE AMONG INSTITUTIONALIZED ELDERLY: A CASE STUDY IN KEDAH AND KELANTAN, MALAYSIA

Ruhaya H.^{1*}, Ahmad W.M.A.W.¹, Rohim R.A.A.¹,
Ghazali F.M.M.¹ and Enny E.¹

¹School of Dental Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kelantan, Malaysia.

*Corresponding author: Ruhaya Hassan, School of Dental Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kelantan, Malaysia.

Email: ruhaya@usm.my

<https://doi.org/10.32827/ijphcs.6.6.89>

ABSTRACT

Background: Good daily oral hygiene is particularly crucial to maintain good oral health and quality of life. This is even more important for people of advanced age. However, poor oral hygiene is not the first thing that comes to mind when considering the challenges of individuals living in long-term care residents. This study focuses on health assessment among elderly in Kelantan and Kedah. The objective of this study was to assess whether the continuous health assessment of denture at three phases of intervention will provide the consistent results at every interval

Materials and Methods: The reference population for this study was elderly aged more than 60 years living in Rumah Seri Kenangan (RSK) in Malaysia. The source of population comprises elderly living in RSK Pengkalan Chepa, Kelantan and RSK Bedong, Kedah. The risk factors of health and oral health assessment were established by multiple logistic regression models using SPSS statistical software.

Result: The results from multiple logistic regression reveals that all assessment phase I, phase II and phase III have the same significant factors. There are three variables (class of age, education level, and marriage status) based on three assessment were identified to the relationship of health assessment. Therefore, BMI, gender, and class of dentures were not found to be significantly associated with the health assessment among institutionalized elderly in Kedah and Kelantan

Conclusion: This finding may provide us with a better understanding of the relationship between the variables

Keywords: Oral hygiene, Institutionalized elderly, multiple logistic Regression, Oral health assessment, risk factors

1.0 Introduction

Noncommunicable disease is fast becoming the leading cause of disability and mortality. In coming decade's health and social policymakers will face tremendous challenges posed by the rapidly changing burden of chronic disease in old age. Chronic disease and most oral disease share common risk factors (Peterson and Yamamoto, 2005). Information on oral health status, treatment needs, and other oral health-related issues including oral hygiene among Malaysian elderly population are scarce and limited. In a cross-sectional survey among Malaysian adult patients, Esa *et al.* (1991) demonstrated that older people have poor oral hygiene habits compared to the younger ones. A nationwide survey on Malaysian adults (NOHSA 2010) reported that the prevalence periodontal condition was at 82.8%, whereas detectable calculus was at 26.7% among the 60-year-old population (Oral Health Division, 2013). A pilot study by Loke *et al.* (2003) among elderly institution homes in Sabah (East Malaysia) suggested that 65.4% of elderly had fair to poor oral hygiene status, with high occurrence of caries and gingivitis reported. In the meantime another cross-sectional study by Sinor (2013) in public institution homes "Rumah Seri Kenangan" in Kelantan state, Malaysia reported that oral hygiene of the occupants was neglected, complicated with high rate of edentulism, dental caries, periodontal disease and oral mucosal lesion. It was concluded that insufficient manpower in institution home as well as limited knowledge among caregivers in empowering good oral hygiene care towards, were amongst the important factors that contributed to the existing problems.

Good daily oral hygiene is particularly crucial to maintain good oral health and quality of life. This is even more important for people of advanced age. However, poor oral hygiene is not the first thing that comes to mind when considering the challenges of individuals living in long-term care residents. Despite the need for improving oral hygiene, residents often receive little emphasis on practicing proper oral care. Institutionalized elderly are very much dependent on their caregivers in managing their daily life, including general and oral hygiene care. However as indicated earlier, oral hygiene care is often neglected and considered as lower priority compared to other health issues. Poor oral hygiene among elderly has been reported in many works of literature around the world, exhibited with poor oral health status (Altani and Wyatt, 2002). Preventive treatment was essential for this group of population, as it will decrease the treatment needed (Samson *et al.*, 2009). Besides, by incorporating proper hygiene care as part of the responsibility, the elderly life's ending can be met with more dignity. Oral hygiene, literally known as oral cleanliness, has been regarded as an important method in preserving good oral health status. Most people brush their teeth for several reasons, such as to avoid halitosis (bad breath), being presentable and confident in appearance. However in certain conditions such as long term care institutions, elderly residents often have difficulty maintaining sufficient level of personal oral hygiene, not to mention their disinterest in accessing professional dental care (Kullberg *et al.*, 2009). Meanwhile, oral hygiene care can be defined as prevention methods of plaque-related diseases, by disrupting plaque with several mechanical actions such as brushing, flossing, or the use of other oral hygiene aids. Capezuti *et al.* (2007) Indicated that oral hygiene can be related to interventions to prevent plaque related diseases confined to respective areas such as oral mucosa, tongue, teeth, lips, gingiva (gums), as well as dentures surfaces. In our

knowledge, there are limited studies to determine oral hygiene status among institutionalized elderly in Malaysia. Therefore, the objective of this study was to assess whether the continuous health assessment of denture at three phases of intervention will provide the consistent results at every interval.

2.0 Materials and Methods

2.1 Data Collection

This current study focused on elderly living in public institution homes as a special interest, as they are disadvantaged group in most of health aspects. The public institution care home, known as Rumah Seri Kenangan (RSK) or the “Home to Cherish Fond Memories” is a government fully-funded nursing home for disadvantaged elderly and specifically managed by the Department of Social Welfare. The reference population for this study was elderly aged more than 60 years living in Rumah Seri Kenangan (RSK) in Malaysia. The source of population comprises elderly living in RSK Pengkalan Chepa, Kelantan and RSK Bedong, Kedah. The table 1 shows that the description of SPSS data.

Table 1: Description of SPSS data

No	Variable Name	Code	Variable Description
1	Health assessment	Y	Health self-assessment (0 = Not Healthy, 1= Healthy)
2	Class of Age	X_1	Age of residents: 0= 60-64; 1=65-69; 2 = 70-74; 3= >75
3	BMI	X_2	Body mass index (weigh(kg)/[height(m)] ²)
4	Gender	X_3	Gender of Residents : 0 = <19 ; 1= 19-20; 2 = 21-22 3= >23
5	Education	X_4	Educational level: 0 = Primary school; 1 = Secondary/tertiary; 2 = non formal
6	Marriage status	X_5	Marriage status: 0 = married; 1 = widow/widower; 2 = single
7	Class Denture Hygiene	X_6	Classification denture hygiene: 0 = good (0-2); 1 = moderate (2-3) 2= poor (3-4)

2.2 Fitting Logistic Regression Model

Logistic regression analysis studies the association between a categorical dependent variable and a set of independent (explanatory) variables. The name logistic regression is used when the dependent variable has only two values. Suppose the numerical values of 0 and 1 are assigned to the two outcomes of a binary variable. Often, the 0 represents a negative response and the 1 represents a positive response. The mean of this variable will be the proportion of positive responses. If p is the proportion observations with an outcome of 1, then $1-p$ is the probability of an outcome of 0. The ratio $p/(1-p)$ is called the odds and the logit is the logarithm of the odds or just log odds.

Mathematically the logit transformation is written $f = \text{logit}(p) = \ln \frac{p}{(1-p)}$ (Ahmad *et al.*, 2010).

In multiple regression, a mathematical model of a set of explanatory variables is used to predict the mean of a continuous dependent variable. In logistic regression, a mathematical model of a set of explanatory variables is used to predict a logit transformation of the dependent variable. Logistic regression competes with discriminant analysis as a method for analyzing the categorical response variable. Many statisticians feel that logistic regression is more versatile and better suited for modeling most situations than is discriminant analysis. This is because logistic regression does not assume that the independent variables are normally distributed as discriminant analysis does (Ahmad *et al.*, 2010).

3.0 Result

Logistic regression is a statistical tool used in order to modeling and analyzes the data. Logistic regression has the following general form:

$$\log\left(\frac{\pi}{1-\pi}\right) = \alpha + \sum \beta x$$

To explore the underlying association between health self-assessment among the elderly and the selected explanatory variables, a set of logistic regression models is fitted in this section. For the binary logistic regression approach, we take the following dichotomous variables. X is a vector of independent variables including class of age, BMI of residents, Gender, Education level, marriage status, class denture hygiene, and β is the vector of estimated coefficients. π is also likely outcomes or events to being there. The health assessment based on code $Y = 0$ Unhealthy elderly and $Y = 1$ healthy elderly. Then let us define the following proposed model (Phase I, Phase II and Phase III) according to three health assessment among elderly. We obtained the following model:

$$\text{Health assessments} = \beta_0 + \beta_1 (\text{Class of age}) + \beta_2 (\text{BMI}) + \beta_3 (\text{Gender}) + \beta_4 (\text{Education level}) + \beta_5 (\text{Marriage status}) + \beta_6 (\text{Class Denture Hygiene})$$

Phase I

The details about the first health assessment (Phase I) is given as follow:

Table 2: The Parameters Estimates of the logistic regression model for Health Assessment

Dependent Variable	Independent Variable	Std. Coefficient B	p -value	Odds Ratio	95% C.I. for Adjusted OR	
					Lower	Upper
	Gender	0.366	0.611	1.442	0.352	5.914
	Class of Age	0.606	0.033*	1.833	1.051	3.197

Health assessment	Education Level	0.616	0.079*	1.852	0.931	3.684
	Marriage status	-0.801	0.119*	0.449	0.164	1.228
	Class denture hygiene	0.203	0.725	1.225	0.396	3.787
	BMI	-0.116	0.714	0.891	0.480	1.654
	constant	-1.822	0.216	-0.162		

Hosmer-Lemeshow $p = 0.154$

Classification Table overall percentage= 80%

*Significant level < 0.25

The results obtained model for Phase I

$$\text{Health assessments} = -1.822 + 0.366 (\text{Gender}) + 0.606 (\text{Class of age}) + 0.616 (\text{Education level}) + (-0.801) (\text{Marriage status}) + 0.203 (\text{Class denture hygiene}) + (-0.116) (\text{BMI})$$

Phase II

The details about the first health assessment (Phase II) is given as follow:

Table 3: The Parameters Estimates of the logistic regression model for Health Assessment

Dependent Variable	Independent Variable	Std. Coefficien t B	p-value	Odds Ratio	95% C.I. for Adjusted OR	
					Lower	Upper
Health assessment	Gender	0.415	0.566	1.514	0.367	6.246
	Class of Age	0.619	0.032*	1.857	1.054	3.273
	Education Level	0.685	0.061*	1.985	0.969	4.067
	Marriage status	-0.737	0.143*	0.478	0.178	1.284
	Class denture hygiene	0.518	0.425	1.678	0.470	5.987
	BMI	0.148	0.629	1.159	0.637	2.108
	constant	-2.877	0.072	0.056		

Hosmer-Lemeshow $p=0.158$

Classification Table overall percentage= 75%

*Significant level < 0.25

The results obtained model for Phase II

$$\begin{aligned} \text{Health assessments} = & -2.877 + 0.415 (\text{Gender}) + 0.619 (\text{Class of age}) + 0.685 (\text{Education level}) \\ & + (-0.737) (\text{Marriage status}) + 0.518 (\text{Class denture hygiene}) + 0.148 (\text{BMI}) \end{aligned}$$

Phase III

The details about the first health assessment (Phase III) is given as follow:

Table 4: Estimates of parameters of the logistic regression model for Health Assessment

Dependent Variable	Independent Variable	Std. Coefficient <i>B</i>	<i>p</i> -value	Odds Ratio	95% C.I. for Adjusted OR	
					Lower	Upper
Health assessment	Gender	0.328	0.651	1.388	0.336	5.745
	Class of Age	0.621	0.032*	1.861	1.053	3.287
	Education Level	0.484	0.190*	1.623	0.787	3.346
	Marriage status	-0.669	0.180*	0.512	0.192	1.363
	Class denture hygiene	-0.221	0.492	0.802	0.427	1.505
	BMI	-0.359	0.606	0.698	0.179	2.733
	constant	-0.854	0.588	0.426		

Hosmer-Lemeshow $p=0.267$

Classification Table overall percentage= 78%

*Significant level < 0.25

The results obtained model for Phase III

$$\begin{aligned} \text{Health assessments} = & -0.854 + 0.328 (\text{Gender}) + 0.621 (\text{Class of age}) + 0.484 (\text{Education level}) \\ & + (-0.669) (\text{Marriage status}) + (-0.221) (\text{Class denture hygiene}) + (-0.359) (\text{BMI}) \end{aligned}$$

4.0 Discussion

Table 2, Table 3 and Table 4 shows the parameter estimates of the logistic regression model for Health Assessment phase I until phase III among Institutionally elderly. It is clearly observed from the results that class of age and education level ($p < 0.25$) have been positively associated with the health assessment. Marriage status ($p < 0.25$) negatively with a health assessment. The factors of Gender, class denture hygiene and BMI were not associated with health assessment among elderly ($p > 0.25$). Mickey and Greenland (1989) recommendation that 0.25 level be used as a screening criterion for variable selection in logistic regression. According to them, statistical level such as $p = 0.05$ often fails to identify variables known to be important. The Hosmer and Lemeshow goodness of fit test was used to assess whether the final model accurately fits the data used. According to the model a six predictor logistic model was fitted to the data. From the model, class of age and education level ($p < 0.25$) was positively related to health assessment (phase I, phase II and phase III). Marriage status ($p < 0.25$) negatively related to health assessment (phase I, phase II and phase III). The factors of Gender, class denture hygiene and BMI were not related to health assessment among elderly ($p > 0.25$) but still include in logistic model. For each point increase on the class of age, the odds of being health assessment among elderly (according phase I, II and III) increase from 1.850, for the odd ratio education level it is increase from 1.820 and marriage status decrease from 0.480 of being health assessment among elderly according three-phase. Therefore, BMI, gender and class of denture not significant with health assessment according the three health assessments among elderly. The inferential goodness of fit test is the Hosmer Lemeshow, test that yield (phase I: $p= 0.154$; phase II: $p=0.158$; phase III: $p=0.267$) was obtained greater than 0.05 (p -value > 0.05) and suggesting that the model was fit to the data well (Hosmer and Lemeshow, 2000). The effectiveness analysis model with an overall percentage of the model is considered good if the percentage exceeds 50% (Peng et al., 2002). Based on the multiple logistic regression analysis was performed, the overall percentage for three health assessment among elderly was (phase I= 80%; phase II= 75%; phase III= 78%) which is more than 50% and this shows the effectiveness of the model is good.

5.0 Conclusion and recommendation

Nowadays, the logistic regression model has become a standard method of analysis in many situations. Logistic regression is used extensively in medical research and also help to make medical decisions. This paper examines the factors that influence the health assessment among institutionalized elderly in Kedah and Kelantan, Malaysia. There are three variables (class of age, education level, and marriage status) based on three assessment were identified to the relationship of health assessment. Therefore, BMI, gender, and class of dentures were not found to be significantly associated with the health assessment among institutionalized

elderly in Kedah and Kelantan. According to the three assessments, this study found that the factors influencing the health assessment are the same variables. Last but not least, this finding may provide us with a better understanding of the relationship among the variables especially in oral health, medical and health science field.

Acknowledgement

The authors would like to express their gratitude to Universiti Sains Malaysia for providing the research funding (Grant no.1001/PPSG/8012278, School of Dental Sciences, Universiti Sains Malaysia) and (Grant no. 304/PPSG/61312136).

Declaration

Author(s) declare that there is no conflict of interest with the publication of this article.

Author's contribution

Author 1: initiation of idea, final manuscript review and editing

Author 2: manuscript review and editing

Author 3: manuscript review and editing

Author 4: literature searching and drafting the manuscript

Author 5: literature searching and drafting the manuscript

References

- Altani, A. & Wyatt, C. (2002). Oral hygiene and institutionalized elders. *Economic Issues*, **17**, 19.
- Capezuti, L., Capezuti, E. A. & Mezey, M. (2007). Evidence-based geriatric nursing protocols for best practice. Springer Publishing Company.
- Hosmer & Lemeshow D.W, applied logistic regression, second edition, John Wiley & Sons, 2000.

- Esa, R., Razak, I., Jallaudin, R. & Jaafar, N. (1991). A survey on oral hygiene practices among Malaysian adults. *Clinical Preventive Dentistry*, **14(1)**, 23-27.
- Kullberg, E., Forsell, M., Wedel, P., Sjöberg, P., Johansson, O., Herbst, B. & Hoogstraate, J. (2009). Dental hygiene education for nursing staff. *Geriatric Nursing*, **30(5)**, 329-333.
- Loke, S., Jalil, N., Giam, E. & Lee, S. (2003). The prevalence of oral diseases and treatment needs in the institutionalized elderly in Sabah. *Mal J Pub Health Med*, **3**, 30-35.
- Oral Health Division (2013). National Oral Health Survey of Adults (NOHSA) 2010, Ministry of Health Malaysia.
- Peng, C.J & So, T.H. Logistic Regression analysis & Reporting: A Primer, understanding statistics, 2002. 1(1), 31-70.
- Petersen, P. E. & Yamamoto, T. (2005). Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community Dentistry and Oral Epidemiology*, **33(2)**, 81-92.
- Samson, H., Berven, L. & Strand, G. V. (2009). Long-term effect of an oral healthcare programme on oral hygiene in a nursing home. *European Journal of Oral Sciences*, **117(5)**, 575-579.
- W.M.A.W Ahmad, N.A Aleng and Zalila Ali. Binary Logistic regression analysis technique used in analyzing the categorical data in education science. A case study of terengganu state, Malaysia. *World Appl. Sci. J*, 9(9), 2010, 1062-1066.