

Continuous Canonical Correspondence Analysis (CCCA) Mapping Applied To Denture Hygiene Among Elderly In Kelantan And Kedah: A Case Of Residential Care Homes

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Abstract: Denture hygiene plays a major role in oral health among the elderly. An unhealthy oral health usually has gum disease, which may cause serious health problems as such heart attacks, stroke and many more. A canonical correspondence analysis or biplot approach was applied for an oral hygiene care case study among the elderly aged more than 60 years living in Rumah Seri Kenangan (RSK) Pengkalan Chepa, Kelantan and RSK Bedong, Kedah. Data from 174 respondents who participated in this paper, which consisted of 87 elderly people in the RSK Pengkalan Chepa, Kelantan and 87 elderly people in the RSK Bedong, Kedah. A consistent finding from biplot for three different phases has shown that an elderly more than 64-years-old having poor denture hygiene care. In a conclusion, special care on denture hygiene is needed to maintain good oral hygiene among the elderly.

Index Terms: Oral hygiene, elderly, denture hygiene, and canonical correspondence analysis.

1. INTRODUCTION

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 condition such as long term care institution, elderly residents often have difficulty maintaining sufficient level of personal oral hygiene, not to mention their disinterest in accessing professional dental care [6]. 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. According to [4] indicated that oral hygiene can be related with interventions to prevent plaque related disease confined to respective areas such as oral mucosa, tongue, teeth, lips, gingival (gums), as well as dentures surfaces. The common problem of the elderly is maintaining good oral health and it is considered part of the aging process. Common oral health problems such as dental caries and periodontal disease are more difficult to deal with as individuals grow older due to 'cumulative effects'. This condition is often aggravated by insufficient oral hygiene practices, which can result in poor oral health status such as tooth loss or edentulism. The aftermath of natural tooth loss can lead to important problems such as the limitation of individual intake [10]. Furthermore, other oral conditions associated with the aging process, such as low saliva quality, salivary flow, and limited tissue healing ability may worsen oral health, leading to restrictions on food selection and selection of certain types of soft diet. Good oral hygiene is very important for maintaining good oral health and quality of life.. However, poor oral hygiene is not the first thing to keep in mind when considering the challenges of individuals living in long-term care homes. Despite the need to improve oral hygiene, residents often receive little emphasis on practicing proper oral hygiene. Residential care homes for 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 literatures around the world, exhibited with poor oral health status [1]. Preventive treatment was essential for this group of population, as it will decrease the treatment needed [9]. Besides, by incorporating proper hygiene care as part of the responsibility, the elderly life's ending can be met with more dignity.

2 DATA AND METHODS

2.1 Population and Sample

The reference population for this paper was elderly aged more than 60 years living in Rumah Seri Kenangan (RSK) in Malaysia. The source of population comprises of elderly living in RSK Pengkalan Chepa, Kelantan and RSK Bedong, Kedah. Rumah Seri Kenangan (RSK) is government funded public sheltered home for the disadvantage elderly who suffered from lack of financial and family support.

2.2 Sample Size Determination

For sample size calculation, PS Power and Sample Size Calculations software by [5] was used to calculate the sample size based on comparing means. Considering on study feasibility, allocation of time frame given for this study and 20% dropout rate, 87 subjects for the elderly in RSK Pengkalan Chepa and 87 subjects for the elderly in RSK Bedong were use in this research. Initially there was a total of 174 respondents who participated in this research, which consisted of 87 elderly people in the RSK Pengkalan Chepa and 87 elderly people in the RSK Bedong.

2.3 Canonical Correspondence Analysis

Canonical Correlation or Correspondence Analysis is an additional produce for assessing the relationship between variable. Specifically, this analysis allows to investigate the relationship between two sets of variables (examine the relationship between two nominal variables graphically in a multidimensional space). It computes row and column scores

plots based on the scores. Categories that are similar to each other appear close to each other in the plots (Amir, 2011). In this section, we used two statistical approaches to analyze the dataset. First statistical approach was correspondence analysis through the biplot. Correspondence analysis is an exploratory data technique used to analyze categorical data [3]. Canonical correspondence analysis is a mapping technique used to analyze data because of its ability to extract the most important dimensions, allowing simplification of the data matrix [8]. This technique allows us to investigate the relationship between two nominal variables graphically in a multidimensional space [2], [11]. It computes row and column scores and produces plots based on the scores. Categories that are similar to each other appear close to each other in the plot.

3 RESULTS AND DISCUSSION

3.1 Case 1: Class Denture Hygiene with Class of Age for Elderly

Phase I: Correspondence analysis for class denture hygiene with class of age for elderly

Biplot technique, allows us to investigate the relationship between two nominal variables graphically in a multidimensional space [11]. Table 1 give the summary of the cross tabulation between classification of age and class denture hygiene for phase I.

TABLE 1

CROSS TABULATION ANALYSIS CLASS OF AGE AND CLASS DENTURE HYGIENE PHASE I

Variables	Classification Denture Hygiene Phase I		
	Good n (%)	Moderate n (%)	Poor n (%)
Classification of Age			
60-64	2 (2.4%)	9 (11.0%)	8 (9.8%)
65-69	1 (1.2%)	7 (8.5%)	10 (12.2%)
70-74	0 (0.0%)	5 (6.1%)	5 (6.1%)
>75	1 (1.2%)	19 (23.2%)	15 (18.3%)

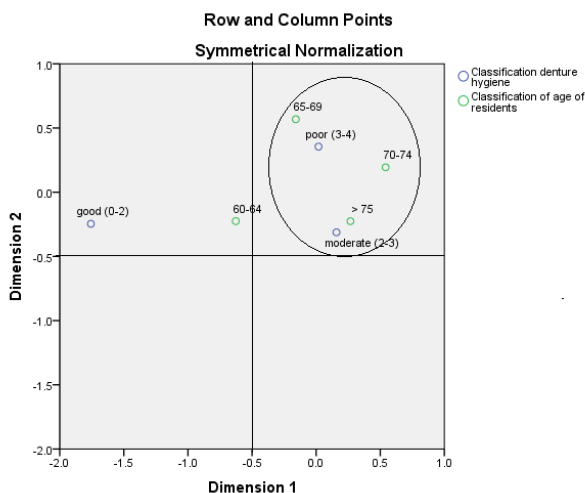


Fig. 1. Biplot analysis of class of age and class denture hygiene phase I

Figure 1 shows the biplot analysis on both dimensions

(classification denture hygiene and classification of age). The interpretation of the plot is fairly simple as the row and column points that are close together are more alike than points that are far apart. The symmetrical normalization makes it easy to examine the relationship between classification denture hygiene and classification of age. Firstly, the age of the elderly of 60-64 years old, 65-69 years old, 70-74 years old and more than 75 years old are associated with moderate or poor denture hygiene. At the overall of an assessment there was no good care of denture hygiene found at this Phase I. Phase II: Correspondence analysis for class denture hygiene with class of age for elderly

Table 2 give the summary of the cross tabulation between classification of age and class denture hygiene for phase II.

TABLE 2

CROSS TABULATION ANALYSIS CLASS OF AGE AND CLASS DENTURE HYGIENE PHASE II

Variables	Classification Denture Hygiene Phase II		
	Good n (%)	Moderate n (%)	Poor n (%)
Classification of Age			
60-64	1 (1.3%)	9 (11.3%)	8 (10.0%)
65-69	0 (0.0%)	6 (7.5%)	12 (15.0%)
70-74	0 (0.0%)	5 (6.3%)	4 (5.0%)
>75	0 (0.0%)	19 (23.8%)	16 (20.0%)

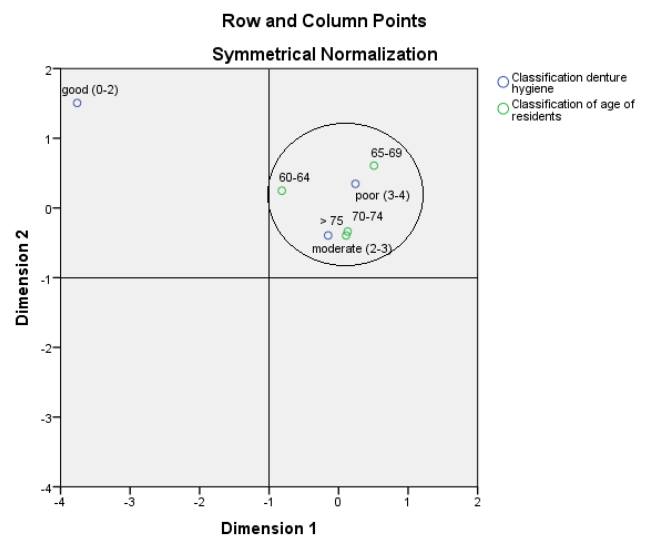


Fig. 2. Biplot analysis of class of age and class denture hygiene phase II

Phase II show the consistency of the Phase I result. According to the biplot analysis (Figure 2), the age of the elderly of 60-64 years old, 65-69 years old, 70-74 years old and more than 75 years old are near towards moderate or poor denture hygiene. At the overall of an assessment there was no good care of denture hygiene found at this Phase II. Phase III: Correspondence analysis for class denture hygiene with class of age for elderly Table 3 give the summary of the cross tabulation between classification of age and class denture hygiene for phase III.

TABLE 3

CROSS TABULATION ANALYSIS CLASS OF AGE AND CLASS DENTURE HYGIENE PHASE III

Variables	Classification Denture Hygiene Phase III		
Classification of Age	Good n (%)	Moderate n (%)	Poor n (%)
60-64	2 (2.6%)	4 (5.1%)	11 (14.1%)
65-69	0 (0.0%)	7 (9.0%)	10 (12.8%)
70-74	0 (0.0%)	6 (7.7%)	3 (3.8%)
>75	1 (1.3%)	16 (20.5%)	18 (23.1%)

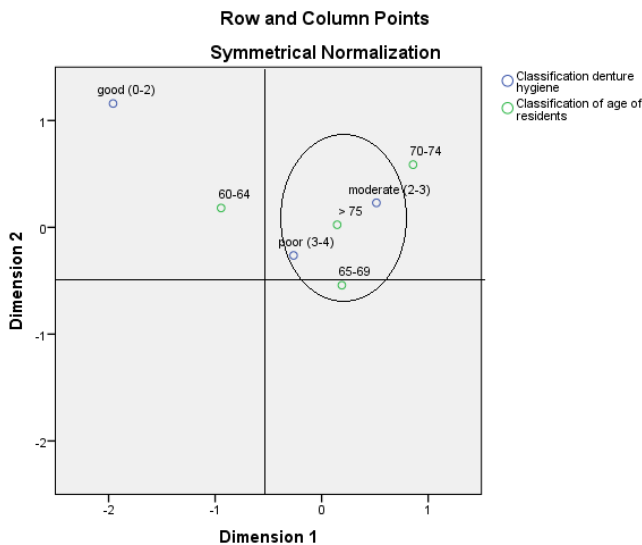


Fig. 3. Biplot analysis of class of age and class denture hygiene phase III

Phase III show the consistency of the Phase I and Phase II result. Based on the biplot analysis in Figure 3, the age of the elderly of 60-64 years old, 65-69 years old, 70-74 years old and more than 75 years old are near towards moderate or poor denture hygiene. At the overall of an assessment there was no good care of denture hygiene found at this Phase III. As a conclusion, all three phases indicate that denture hygiene care for the elderly is moderate and poor among the age group.

3.2 Case 2: Class Denture Hygiene with Body Mass Index for Elderly

Phase I: Correspondence analysis for class denture hygiene with body mass index for elderly

Table 4 below shows the summary of the cross tabulation between body mass index and class denture hygiene for phase I.

TABLE 4

CROSS TABULATION ANALYSIS BETWEEN BODY MASS INDEX AND CLASS DENTURE HYGIENE PHASE I

Variables	Classification Denture Hygiene Phase I		
Body mass index	Good n (%)	Moderate n (%)	Poor n (%)
<19	1 (1.8%)	4 (7.3%)	4 (7.3%)
19-20	0 (0.0%)	6 (10.9%)	5 (9.1%)
21-22	1 (1.8%)	6 (10.9%)	5 (9.1%)

>23	1 (1.8%)	13 (23.6%)	9 (16.4%)
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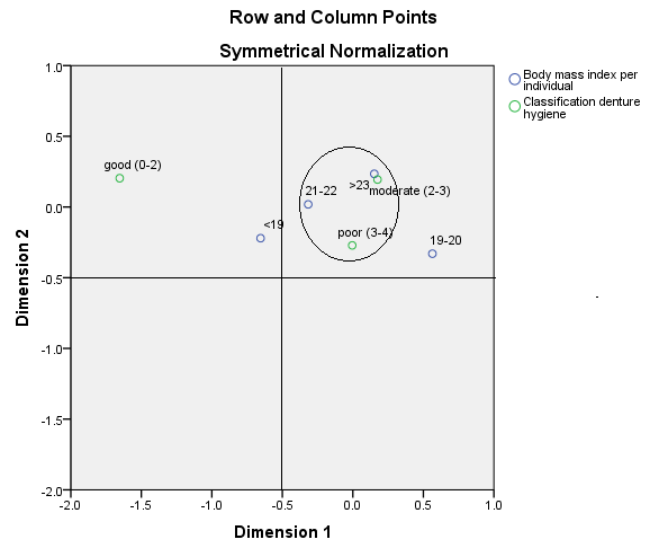


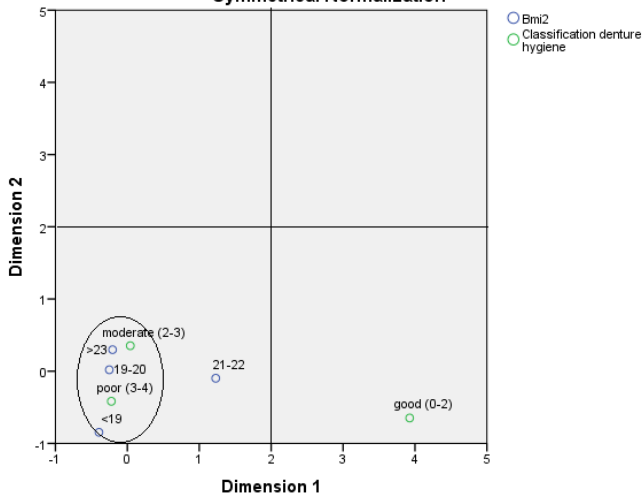
Fig. 4. Biplot analysis of body mass index and class denture hygiene phase I

Figure 4 shows the biplot analysis on both dimensions (classification denture hygiene and body mass for elderly). It computes row and column points and produces plots based on the points. Similar categories appear close to each other in the plots [12]. The body mass index of the elderly for less than 19, 19-20, 21-22 and more than 23 are associated with moderate or poor denture hygiene care. At the overall of an assessment there was no good care of denture hygiene found at this Phase I which means dental hygiene is not strongly associated with any particular body mass index for the elderly. Phase II: Correspondence analysis for class denture hygiene with body mass index for elderly Table 5 below shows the summary of the cross tabulation between body mass index and class denture hygiene for phase II.

TABLE 5

CROSS TABULATION ANALYSIS BETWEEN BODY MASS INDEX AND CLASS DENTURE HYGIENE PHASE II

Variables	Classification Denture Hygiene Phase II		
Body mass index	Good n (%)	Moderate n (%)	Poor n (%)
<19	0 (0.0%)	3 (5.7%)	5 (9.4%)
19-20	0 (0.0%)	6 (11.3%)	5 (9.4%)
21-22	1 (1.9%)	5 (9.4%)	3 (5.7%)
>23	0 (0.0%)	15 (28.3%)	10 (18.9%)



Row and Column Points

Symmetrical Normalization

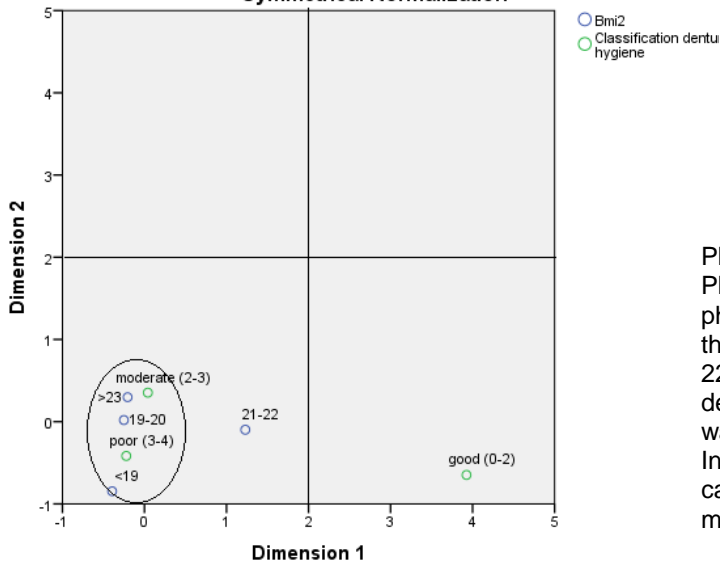


Fig. 5. Biplot analysis of body mass index and class denture hygiene phase II

Phase II has shown that the result same as Phase I. It shows that the consistency between this phase. The biplot analysis in Figure 5 shows that the body mass index of the elderly for less than 19, 19-20, 21-22 and more than 23 are near towards to moderate or poor denture hygiene care. At the overall of an assessment there was no good care of denture hygiene found at this Phase II. Phase III: Correspondence analysis for denture hygiene with body mass index for elderly Table 6 below shows the summary of the cross tabulation between body mass index and class denture hygiene for phase III.

TABLE 6

CROSS TABULATION ANALYSIS BETWEEN BODY MASS INDEX AND CLASS DENTURE HYGIENE PHASE III

Variables	Classification Denture Hygiene Phase III		
	Good n (%)	Moderate n (%)	Poor n (%)
<19	0 (0.0%)	3 (5.8%)	9 (17.3%)
19-20	0 (0.0%)	3 (5.8%)	5 (9.6%)
21-22	0 (0.0%)	7 (13.5%)	6 (11.5%)
>23	2 (3.8%)	10 (19.2%)	7 (13.5%)

Row and Column Points

Symmetrical Normalization

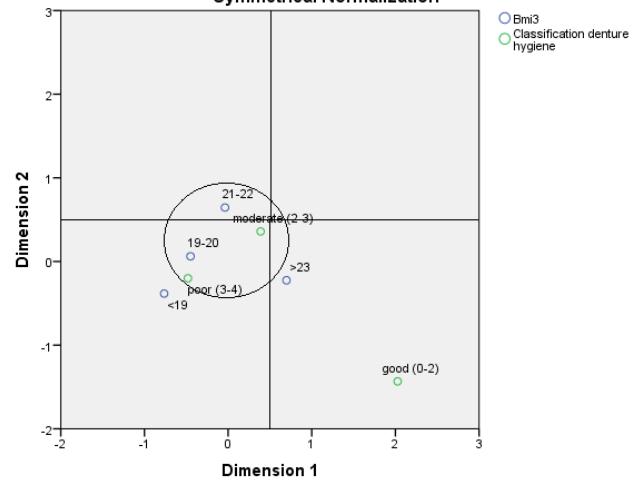


Fig. 6. Biplot analysis of body mass index and class denture hygiene phase III

Phase III has shown that the result same as Phase I and Phase II. It shows that the consistency between these three phase. According of the biplot analysis in Figure 6, shows that the body mass index of the elderly for less than 19, 19-20, 21-22 and more than 23 are near towards to moderate or poor denture hygiene care. At the overall of an assessment there was no good care of denture hygiene found at this Phase III. In conclusion, the three phases show that denture hygiene care for the elderly is moderate and poor between the body mass index groups for the elderly.

4 CONCLUSION

This paper examines the level of denture hygiene care from a different point of view. A biplot analysis approach between the classification of denture hygiene with the ages of the elderly and denture hygiene with the body mass index of the elderly was performed. This paper provides only a preliminary overview of the level of care for denture hygiene associated with the age and body mass index for the elderly. The main purpose of this paper is to demonstrate continuous canonical correspondence analysis mapping applied to denture hygiene among elderly in Kelantan and Kedah for a case of residential care homes. In this paper, the method used is canonical correspondence analysis. There are two cases (with three different phases for each cases) discussed in this paper, the first case is the classification of dental hygiene with age for the elderly and the second case is the classification of dental hygiene with the body mass index for the elderly. Finding shown that both of the cases with three phases has shown a similar findings. Case 1 shows that the three phases of biplot analysis indicate that denture hygiene care for the elderly is moderate and poor among the age group. Meanwhile, case 2 shows the three phases of biplot analysis of denture hygiene care for the elderly are moderate and poor with the body mass index groups for the elderly. As a conclusion, poor denture hygiene was found for the both cases of study. Regular awareness of repeated oral health practice should give a special attention from caregiver's. Repeated oral health

education programs directed at caregivers can maintain their knowledge and ensure important oral care tasks are considered [7]. In conclusion, there is clear evidence that the implementation of an interval oral hygiene program as part of an internal package result in reduced denture plaque and increase the level of good care for denture hygiene. Furthermore, to meet the long-term needs of the elderly, the best outcome for oral hygiene is when caregivers take an emphasis on oral hygiene. Regular oral hygiene education is required to maintain the caregiver's knowledge in further practice.

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