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# Oral Hygiene Care and Nutritional Status among Institutionalised Elderly in Kedah and Kelantan, Malaysia

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## ABSTRACT

**Introduction:** Unsatisfactory oral hygiene care can lead to poor nutritional status among the elderly. This study assessed the oral hygiene and nutritional status of the elderly living in institutional homes. **Methods:** A cross-sectional study of 174 respondents from public institutional homes in the Malaysian states of Kedah and Kelantan was conducted. A structured interview consisting of the Mini Nutritional Assessment Short Form (MNA-SF) and Dietary History Questionnaire (DHQ) was conducted to obtain information on the nutritional status and the dietary intake of the participants. Anthropometric measurements including body weight, height and calf circumference were taken. Oral hygiene assessments were conducted using the Sillnes & Loe index (1964) and the Ausburger & Elahi criteria (1982). Multivariate linear analysis was performed to explore the association and predictive values of explanatory variables. **Results:** The mean age of the respondents was 71.4 ± 7.6 years. The MNA-SF scores showed that 25.9% suffered from malnutrition whilst 39.1% were at risk of malnutrition. Poor oral hygiene was reported with a mean score of 2.72 ± 0.34 for dental plaque, and 2.82 ± 0.57 for denture plaque. Stepwise multiple linear regression analysis showed that energy intake was the most significant predictor contributing to the nutritional status of the elderly, after controlling for monthly income, self-health assessment and denture plaque score. **Conclusion:** Poor oral hygiene was evident amongst elderly residents, but no significant association with nutritional status was reported. Further studies on the effects of oral infection and oral hygiene care on the elderly's ability to taste and smell, as well as their nutritional status is recommended.

**Key words:** Elderly, nutritional status, oral hygiene

## INTRODUCTION

The Malaysian population is currently towards an ageing trend, with 3.9% and 5.1% of the population being over 65 years of age as of 2000 and 2010, respectively. This number is expected to increase to 3.4 million in 20 years.

The health status of the elderly is a matter of concern due to the complexity of treatment and usually requires an urgent clinical management (Sinor, 2013).

Nutrition is known to be an important determinant of health for people of all ages. However, nutritional deficiencies may be under-diagnosed amongst older persons, especially those residing in public homes for the elderly. They are a disadvantaged population group, and may be at risk of malnutrition (Saarela *et al.*, 2013). Lauque *et al.* (2000) reported that protein calorie malnutrition was common in institutions for the elderly, leading to more serious

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consequences such as high rates of infection, decreased wound healing rates, and death. Malnutrition is often involved in involuntary weight loss, a major problem among residents in long-term care facilities (Thomas *et al.*, 2000). Insufficient dietary intake due to tasteless food, lack of an appealing dining environment, dietary restrictions, and multiple illnesses and medications as well as the presence of existing infections, particularly exacerbate the existing risks.

Visvanathan, Newbury & Chapman (2014) report that the elderly living in Malaysian public institutions have a higher prevalence of malnutrition, as compared to the elderly living in the community or in acute hospital care. The Nutritional Health Checklist (NHC) of institutionalised elderly people in Malaysia identified 26.6% being at a high risk of developing malnutrition, and hence deserving serious health attention (Visvanathan *et al.*, 2005).

Lack of oral healthcare was considered one of the most important risks for malnutrition in the elderly, especially in hospital or institutional settings (Soini *et al.*, 2006). Several studies have linked malnutrition in the elderly with poor oral health status, with mixed results. Commonly, most studies have assessed the association between masticatory effects caused by loss of teeth with nutritional intake among the elderly. Sheiham *et al.* (2001) are of the view that compromised dentition due to poor oral health status has a detrimental effect on the chewing ability that influences food selection, and ultimately leads to the development of malnutrition amongst the elderly. Another local study by Seman, Manaf & Ismail (2007) among the elderly in the Malaysian state of Kelantan also suggest that there is a significant relationship between compromised dentition caused by tooth loss and inadequate calorie intake, leading to remarkable weight loss among the subjects.

There have been limited studies undertaken to investigate the link between oral hygiene and nutritional status amongst the elderly (Sumi *et al.*, 2010). Poor oral hygiene is an important matter to be considered, because it is a lead indicator of general oral disease. Lack of oral hygiene can lead to the accumulation of plaque in the oral cavity, development of dental caries, periodontal disease and oral lesions, which affect the oral health and indirectly impact nutritional intake. Meanwhile, a direct link between lack of dietary intake or disinterest in food amongst the elderly with the impairment of taste perception due to poor oral hygiene has gained growing interest amongst researchers. It was postulated that taste impairment might be caused by debris covering the taste buds, or mouth fatigue due to stimulation of decayed material in the oral cavity. Ohno *et al.* (2003) indicate that oral care improves the ability to taste, and it is important for the elderly as it promotes better appetite, mastication and salivation. This is in agreement with Sumi *et al.* (2010) who found that neglected oral hygiene not only deteriorates the oral environment, but also the condition of the subject's general health, particularly their nutritional status.

Numerous international studies have shown poor oral hygiene amongst the elderly being cared for in public institutions (Akar & Ergul, 2008; Saarela et al., 2013). Common issues identified included dentures covered by debris and related oral mucosal lesions. In a further study done by Arpin, Brodeur & Corbeil (2008), poor oral hygiene reported among the institutionalised elderly mainly resulted from inadequate oral care practices. A local study conducted by Sinor (2013) among the elderly living in public residential homes in the Malaysian state of Kelantan reported that 69.6% of the elderly had poor oral hygiene, and had the added complication of poor oral health status.

Based on this information, this study aimed to investigate the associated factors between oral hygiene and nutritional status amongst the elderly living in Rumah Seri

Kenangan (RSK) Bedong, Kedah and RSK Pengkalan Chepa, Kelantan. This study also aimed to highlight the importance of appropriate dental and nutritional care for the whole population to enhance the quality of life and long term health benefits as more people join this fast-growing segment of the population.

## METHODS

### Study design and sampling

This was a cross-sectional study conducted among the institutionalised elderly living in two public institutional homes from May to July 2014. The institutions, Rumah Seri Kenangan (RSK) Pengkalan Chepa, Kelantan and RSK Bedong, Kedah, were purposely selected due to their similar social characteristics and proximity to the researchers.

The total sample size required was 174, based on Ngoh & Harith. (2012). Older persons who met with these inclusion criteria (i.e., more than 60 years old, Malaysian citizen, and had dentures or had at least one tooth) were taken as subjects provided they did not meet the exclusion criteria (i.e., having severe mental problem, being aggressive, having terminal illness, having eating problems such as dysphagia or xerostomia, or having communication difficulties). This study was approved by the Human Ethics Committee, Universiti Sains Malaysia (ref: USM/EPeM/280.3.(7)) and Department of Social Welfare Malaysia (ref: JKMM 100/12/5/2:2013/308).

### Data collection

Written consent from each respondent was obtained prior to data collection. All respondents and respective caregivers were given a detailed explanation prior to seeking their consent. The subjects then underwent a structured interview session conducted in Bahasa Malaysia by one trained interviewer. Respondents had anthropometric measurements taken and had their oral hygiene assessed.

### Measurements

*Socio-demographic background*

Socio-demographic characteristics considered in this study included age, gender, education, income, length of stay, marital status, and self-perceived health status. The information was obtained using a questionnaire based on Seman *et al.* (2007).

*Nutritional status*

The MNA-SF was used to measure nutritional status. The MNA-SF consisted of six dimensions: anthropometric measurements (i.e., body mass index, weight loss); global assessment (motility); dietary assessment (food intake); and health assessment (acute disease, neurological problem) The total MNA-SF scores were used to categorise the subjects based on the findings of De Luis *et al.* (2011). Those with a score of >12 were normal. Those with a score that was between 8 and 11 were at risk of malnutrition. Those with a score between 0 and 7 were malnourished. The uses of MNA-SF was suitable for the institutionalised elderly and has been validated for the Malaysian population (Shahar & Hussain, 2007).

*Anthropometric measurements*

Anthropometric measurements were taken to obtain the body mass index (BMI) of each respondent for inclusion in the MNA-SF. The weight of the respondent was assessed in light clothing (without shoes) to the nearest 0.1 kg using a portable TANITA scale, whilst the height was measured using a tape at the nearest 0.5 cm by a trained medical assistant. For cases where an accurate measurement of standing height was not possible, the arm span was used to estimate height using Shahar & Pooy's (2003) method. Arm span was measured as the length between the tip of the middle finger of the right hand to the tip of the middle finger on the left hand, with both hands held straight horizontally and perpendicular to the body whilst the

subject stood straight against the wall. BMI was calculated by the weight in kilograms divided by the square of the height in meters; thus BMI = weight (kg) / height$^2$ ($m^2$). The cut-off points for the BMI were based on Tsai *et al.* (2009) and have been proven to be able to improve the predictive ability of the MNA-SF.

Calf circumference (CC) was measured if BMI of respondents was not available especially among those who were bedridden. It was indicated as an acceptable alternative to BMI in the MNA-SF as it reflected body muscle and functional status better than other measurements in most conditions especially for Asian populations (Tsai *et al.*, 2009). The CCs were measured twice with a flexible but non-stretchable measuring tape, and recorded to the nearest 0.1 cm by a medical assistant. If two CC measurements varied by more than 1 cm, a third measurement was taken with the average of the two closest measurements being used. The classification criteria of using CC to assess muscle wasting/malnutrition for elderly Malaysians was based on Sakinah *et al.* (2012).

*Nutrient intake*

Individuals' nutrient intakes were recorded based on their responses to the pre-coded dietary history questionnaire (DHQ). According Shahar, Earland & Abdulrahman (2000a) a DHQ is deemed suitable for use among elderly populations with high illiteracy rates (DHQs were administered individually for each meal per day for three days (two days during the weekday, and one day in the weekend). Three-day food record was decided for this study as longer periods may have been more time consuming and more burdensome to the caregivers (Resnicow *et al.*, 2000).

*Oral hygiene status assessment*

Oral hygiene assessments were conducted based on standard criteria detailed in Oral Health Survey: Basic Method (World Health Organization, 2013). They were performed under natural light where the respondents received maximum exposure. Instruments used were disposable mirrors, probes, and sterilised gauze with proper infection control. The assessments were made based on respondents' status of dentition. For the denture wearers, they were assessed on denture plaque scores by an independent examiner using criteria described by Augsburger & Elahi (1982) (0 = no plaque, 1 = light plaque 1-25%, 2 = moderate plaque 26-50%, 3 = heavy plaque 51-75%, 4 = very heavy plaque 76-100%). Meanwhile for the dentate elderly, dental plaque was scored by one examiner using the plaque index described by Silness & Loe (1964) (0 = no plaque, 1 = a film of plaque adhered to gingiva/teeth, 2 = moderate accumulation of soft matter at gingiva/teeth, 3 = abundance of soft matter at gingiva/teeth). All findings were then recorded in a standardised form.

**Data analysis**

Analyses of data were conducted using IBM SPSS version 22. Food records were analysed using Axxya Systems Nutritionist Pro 4.0 software. The data were transferred into IBM SPSS version 22.0 for the calculation of dietary adequacy based on "Recommended Nutrient Intakes for Malaysia 2005" (Ministry of Health, 2005) Descriptive analyses of the data were used to obtain means and standard deviations (SD) for continuous variables, and frequencies/percentages for categorical variables. Stepwise multiple linear regressions were used to yield a combination of factors with explanatory power in predicting nutritional status. The significance level was set at 0.05.

## RESULTS

A total 174 respondents were recruited for this study. The majority of the respondents were females (51.7%) with a mean age of 71.4 ± 7.59 years. Most respondents were

Malay (68.9%) with low levels of education. Almost 60% of elderly respondents had been living in the institutions for less than 60 months; with approximately 40% of them being elderly widows. More than half of the elderly were in a dentate condition. Of the non-dependent elderly (n=122), 29% had BMIs of more than 23 kg/m$^2$, whereas more than 50% of physically dependent elderly (n=52) had CCs less than minimum value. The distribution of the respondents' characteristics is shown in Table 1.

One quarter of the institutionalised elderly (25.9%) were in a state of malnutrition whilst 43.1% were at risk of malnutrition based on MNA-SF scores (see Table 2). It was noted that calorie intake amongst the elderly was insufficient following RNI for Malaysia (2005)(Ministry of Health, 2005) whereas protein intake was found to be adequate. The mean denture plaque from denture wearers was found

**Table 1.** Characteristics of respondents in RSK Bedong and RSK Pengkalan Chepa

| *Variables (N=174)* | *n* | *percent (%)* |
|---|---|---|
| Gender | | |
| Male | 84 | 48.3 |
| Female | 90 | 51.7 |
| Age | 71.4 | 7.59[a] |
| Education level | | |
| No formal education | 64 | 36.8 |
| Primary education | 92 | 52.9 |
| Secondary/tertiary education | 18 | 10.3 |
| Monthly income | | |
| >RM50 | 3 | 1.7 |
| <RM50 | 171 | 98.3 |
| Length of stay | | |
| >60 months | 72 | 41.4 |
| <60 months | 102 | 58.6 |
| Marriage status | | |
| Married | 53 | 30.5 |
| Widowed | 69 | 39.7 |
| Unmarried | 52 | 29.9 |
| Self perceived health status | | |
| Healthy | 101 | 58 |
| Not healthy | 73 | 42 |
| State of dentition | | |
| Dentate | 91 | 52.3 |
| Denture wearer | 83 | 47.7 |
| Body mass index (kg/m2) | | |
| <19 | 26 | 14.9 |
| 19-20 | 19 | 10.9 |
| 21 to less than 23 | 26 | 14.9 |
| ≥ 23 | 51 | 29.3 |
| Calf circumference (cm) | | |
| Male | | |
| < 30.1 | 15 | 57.7 |
| ≥ 30.1 | 11 | 42.3 |
| Female | | |
| <27.3 | 20 | 76.9 |
| ≥ 23 | 6 | 23.1 |

**Table 2.** Descriptive findings of oral hygiene status, nutrient intake and nutritional status among institutionalised elderly

| *Variables (N=174)* | *Mean± SD* |
|---|---|
| Oral hygiene status | |
| Dental plaque | 2.72 ±0.34 |
| Denture plaque | 2.82 ± 0.57 |
| Nutrient intake | |
| Calorie | 1504.45 ± 222.00 |
| Protein | 59.64 ± 6.66 |
| MNA-SF classification (n,%) | |
| Malnutrition | 45 ( 23.9) |
| Risk of malnutrition | 75 (43.1) |
| Normal | 54 (31.0) |

**Table 3.** Predictor factors that contributing to nutritional status based on MNA-SF

| *Variables (N=174)* | *SLR* | | *MLR* | | |
|---|---|---|---|---|---|
| | *b (95% CI)* | *p value* [a] | *Adjusted b (95% CI)* | *t-statistics* | *p value*[b] |
| Socio-demographics | | | | | |
| Age | -0.05 (-0.11, 0.14) | 0.13 | | | |
| Gender | 0.15 (-0.76, 1.07) | 0.74 | | | |
| Monthly income | -3.96 (-7.29, -0.62) | 0.02 | -1.14 (-4.33, 2.06) | -0.71 | 0.48 |
| Duration of stay | -0.02 (-0.95, 0.92) | 0.97 | | | |
| Self-health assessment | -1.45 (-2.35,-0.55) | 0.002 | -0.14 (-1.16, 0.88) | -0.28 | 0.78 |
| Dentition status | 0.60 (-0.31, 1.51) | 0.19 | | | |
| Oral hygiene | | | | | |
| Denture plaque score | -1.10 (-2.35, 0.16) | 0.04 | -0.23 (-1.29, 0.83) | -0.43 | 0.67 |
| Dental plaque score | -1.61 (-4.06, 0.83) | 0.19 | | | |
| Nutrient intake | | | | | |
| Calorie | 0.008 (0.007, 0.10) | <0.001 | 0.007 (0.005, 0.009) | 5.98 | <0.001 |
| Protein | 0.25 (0.19,0.30) | 0.07 | | | |

[a] Simple linear regression; [b] Multiple linear regression; $R^2 = 0.40$. The model fits well. Model assumptions met. There was no interaction or multicollinearity problems

slightly higher (2.82 ±0.57) compared to dental plaque from dentate elderly (2.72 ±0.34) (see Table 2).

Results of univariate linear regression analyses of respondents' characteristics are shown in Table 3. Four parameters were potentially associated with nutritional status of the respondents: monthly income, self-health assessment, denture plaque score, and energy intake ($p<0.25$). These parameters were further evaluated via stepwise multiple regression analyses (adjusted for monthly income, self-health assessment and denture plaque scores) which accounted for 40% of the variance $F(4, 77) = 12.06$, $p<.001$. Energy intake contributed the most to the regression variance, suggesting that higher calorie intake was associated with better nutritional status (MNA-SF scores) of the respondents.

## DISCUSSION

### Socio-demographic characteristics

The higher mean age of elderly respondents suggests that this group of people is exposed to an increased risk of competing death. Elderly women were the majority

of the residents in both institutions visited as part of this study. As indicated by Mafauzy (2000), women's longer life-spans might contribute to discrepancy in the gender ratio, and this condition is further worsened by prolonged dependency. As most of the elderly residents admitted into institutional care were singles with no dependents, this indicated that women's longer lifespans was a reasonable explanation for the gender ratios observed in this study.

Elderly residents with minimal education were found to have a lack of income. Poverty, caused by lower levels of education and income, is common in rural populations of Malaysia, which along with illiteracy has been shown to negatively impact on the population's general health. This finding concurs with Shahar, Earland & Rahman (2000) who indicated rural elderly Malaysian were often uneducated, unemployed and with no steady financial support.

The majority of respondents from both groups were either elderly widows or unmarried Helgeson (2002), suggests that the living arrangements of the elderly has a close relationship with their income, health status and caregivers' accessibility. An older person living alone was more prone to be in poverty as well as being exposed to many health problem, compared to those living with their spouse or other family members. This is reflected by RSK's standard policy which gives priority admissions to elderly meeting certain criteria (e.g., no family support, married with no children, living alone, etc.).

This study noted that more than 60% of the respondents in both institutions perceived themselves as being "healthy". Seman *et al.* (2007) suggesting that individuals with chronic diseases tended to self-assess themselves as being healthy. A possible explanation for this was that those who were overweight or obese understate their health issues.

More than half of the elderly respondents were in dentate condition. The role of teeth is important as they contribute to the efficacy of mastication (Seman *et al.*, 2007). The high proportion of elderly with teeth could be due to the fact that the respondents had their dental treatment covered by government health agencies.

It was also found that almost 30% of non-dependant elderly had BMIs of more than 23 $kg/m^2$. Food consumption and physical inactivity might have led to an increase in the number of people in this group being overweight. However, 57% of physically dependent elderly men and 77% women were found to have CCs less than the minimum cut-off value. Chen *et al.* (2012) also reported that higher proportions of elderly Malaysians in shelter homes (institutions) were actually suffering from both over overnutrition and undernutrition.

**Nutritional status (MNA-SF scores)**

Based on the MNA-SF nutritional assessment, one-third (25.9%) of the respondents were in a malnourished state, whereas nearly half (43.1%) were at risk of becoming malnourished. Saarela *et al.* (2014) also indicate that malnutrition or being at risk of malnutrition was common among the elderly living in assisted facilities. The risk of developing malnutrition is higher for the elderly living alone rather than for those living in institutions, considering morbidity and frailty due to their living conditions. Several other factors may also be simultaneously contributing to malnutrition such as lack of appetite, diminished taste and smell, deterioration of cognitive functions, use of multiple medicines, improper food serving method, and a lack of a varied menu (Peltola, Vehkalahti & Simoila, 2007).

This study showed that older people who are at risk of developing malnutrition can be identified relatively easily through the MNA-SF, suggesting that it is an

important tool for clinical evaluations of patients living in institutional care. The MNA-SF, which is derived from the long version of the Mini Nutritional Assessment is suitable since it has been constructed to identify elderly who are at risk of malnutrition either in hospital, institutional, or community settings (De Luis *et al.*, 2011). The MNA-SF is an easy to use, and inexpensive screening test for the elderly which associates biochemical indicators with nutritional status. The MNA-SF is able to discover elderly who are possibly malnourished, especially among the high risk population of elderly patients with multiple illnesses (De Luis *et al.*, 2011). The MNA-SF has been widely used in European countries and has high sensitivity, specificity and positive predictive value (Vellas *et al.*, 2000).

However, nutritional assessment faces limitations in being able to clearly differentiate changes in deficiencies due to disease or ageing. One of the components in the MNA-SF is the psychological condition of the respondents. Since there were elderly residents suffering from psychological problems, the total MNA-SF scores during the assessment may have been affected. These respondents (not including those with severe mental problems) were included in this study following ethical approval from the Human Ethics Committee, denoting that they were group with a greater need and therefore a priority for study. According to Soini, Routasalo & Lagstrom. (2004) the elderly with memory or psychological problems were actually at a higher risk for malnutrition and low body weight. This may affect the nutritional scores, and may explain the moderate MNA-SF scores amongst respondents in this study.

**Nutrient intake**

Low protein intake is a prevalent problem in elderly populations, and there has been an established relationship between protein intake, morbidity and mortality among them (Omran & Morley, 2000). This study found that energy intake amongst the elderly was generally below the recommended level based on RNI for Malaysia 2005 (Ministry of Health, 2005). Suominen *et al.* (2004) also found that the elderly in institutional care often have a low intake of energy and nutrients. This might be due to complications due to age as well as general poorer health amongst the elderly. The low energy intake might be due to poor appetite rather than the lack of food. In addition, solitude and isolation were the most important exogenous factors contributing to bad feeding habits. Pajalic *et al.* (2012) conclude that the very low ingestion of food by the lonely and depressed elderly in institutional care may have had a lowering effect upon the mean dietary intake of this population. In contrast, the protein intake was found to be at recommended levels. This was probably due to the main in-care meal services including food with high protein content such as fish and poultry.

This study found it challenging to assess the dietary intake of elderly people since there was a decline in short term memory of the respondents. The usual dietary assessments such as 24-h dietary recall or 7-day weighted record were not suitable for use since they required a higher degree of commitment and motivation. Meanwhile Dietary History Questionnaire (DHQ), a pre-coded dietary history with specific local food habit, requires limited effort from the respondents. It is also able to provide detailed information about the food consumed and the meal patterns (Shahar & Hussain, 2007). Thus, the DHQ is suggested for use with elderly populations with high rates of illiteracy.

**Oral hygiene status**

Dental plaque and denture plaque scores from both institutions were considered poor. This is consistent with previous

reports indicating that oral hygiene amongst the elderly in institutional care is often less than adequate, as measured by the presence of dental plaque and calculus covering the teeth surfaces and dentures (Saarela *et al.*, 2013). Nicol *et al.* (2005) state that elderly people generally do not complain about their oral problems and usually express feelings of discomfort only if their symptoms are severe. The elderly in institutional care were unlikely to request greater help than what is normally offered. This was mostly due to their living arrangement, which exposed them to unwanted apathy, feelings of passive acceptance and reluctance to cooperate with existing staff. Oral health examination was usually conducted on an on-demand basis, particularly when the elderly presented with symptoms or were referred by medical practitioners.

**Predictor factors influencing nutritional status among institutionalised elderly**

This study found energy intake to be the most significant predictor in the nutritional status of the elderly. The risk of inadequate intake of calories increases with age based on population nutritional surveys undertaken in the Netherlands (De Groot, Van Staveren & De Graf, 2000). Inadequate energy intake is a matter of importance since it causes low bodyweight and leads to a high prevalence of involuntary weight loss among the elderly in institutional care (Suominen, Kivisto & Pitkala, 2007; Lengyel, Whiting & Zello, 2008). In concurrence with previous studies, this study also found that low energy intakes caused the elderly to either suffer from malnutrition, or be at risk of being malnourished However, this finding needs to be further investigated using biological markers for a more conclusive result.

The finding also suggests that oral hygiene status, as this study's subject of interest, did not particularly influence nutritional status alongside other socio-demographic factors. Poor oral hygiene along with other medical conditions had a detrimental effect on oral infection such as oral candidiasis and diminished an individual's ability to taste. A microbiological investigation of the respondent's mouth for the occurrence of oral mucosal diseases and loss of the ability to taste due to malnutrition was not done. As this study was cross-sectional in design, the nutrition status of the respondents could have been skewed by other variables as well being influenced by a cohort effect. Hence, Paillaud *et al.* (2004) and Seman *et al.* (2007) suggest that studies taking into account the ability to taste and smell, oral infections and malnutrition condition needs to be undertaken to confirm the possible role of these factors.

## CONCLUSION

This study found a predominant percentage of women and elderly widows without financial support living in institutional homes. Poor oral hygiene was noted amongst the residents. One quarter of the residents suffered from malnutrition. Although poor oral hygiene, reflected by denture plaque, was not found to be significantly associated with the nutritional status of the elderly, oral care training should be emphasised to the staff at the institutions to improve both the oral cleanliness and general health of the residents.

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