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ORAL HEALTH STATUS AND DIET HABIT OF INSTITUTIONALIZED ELDER GROUP

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Running title
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ABSTRACT

Objectives:
The objective of the study was to determine the oral health status and diet habits of institutionalized elders in Lagos, Nigeria

Materials and Methods: This cross-sectional study was conducted among institutionalized elders in Lagos State, Nigeria. Age and sex matched non-institutionalized elderly were also selected to serve as control for the study. Data were obtained through interviewer-administered questionnaire and clinical oral examination was carried out. Data was analyzed using SPSS version 20.

Results
A total of 100 subjects with age range 60-90 years participated in the study. Majority of the subjects in institutions were widows. Socioeconomic class was a strong factor determining institutionalization (P=0.016). Oral hygiene of institutionalized elders was poor compared with non-institutionalized counterpart ($p < 0.05$). None (0%) of the institutionalized subjects wore any form of prosthesis compared to their non-institutionalized counterpart -63.2%-($p < 0.05$). There was a significant association between education and dental status of subjects ($p < 0.05$). Edentulism and soft diet were significantly associated ($p < 0.05$).

Conclusion
Oral health status of the institutionalized elders was poor compared to the non-institutionalized elderly but diet habits were relatively the same in both studied groups.

INTRODUCTION

There has been a projection of increased population of elders worldwide[3] and by implication, Africa.[1] It is estimated that by the year 2025 that the 11.5 million of this Africans will be aged 60 years and above which would represent 6 percent of the entire population. Lagos state is one of the thirty-six states that make up the country, Nigeria.[2,3] It is one of the most populous parts of the country, with an estimated population of 17.5 million constituting of children, adults and elderly.[2]

The care of elders in Africa is usually done by their children and relatives and is recognized as a cultural part of the country's multiple ethnic groups.[4] In the recent years, the care of some elders have been left for care institutions. [5] Although, long-term care institutions that provide care, support, social needs, health needs and security for elders who lack family

support or self-care ability exist, there are a limited number of elders in this institution because of cultural influence and it's cultural unacceptability.[5] Presently, there are limited numbers of care homes serving a population of 140 million.[6]

It has been stated that oral health can impact on general health and systemic disease.[7] Aging also has implication on oral health by having physiological effects on the soft and hard oral tissues and also x-raying the cumulative effects of diseases especially the irreversible ones.[8] The effect of aging likewise influences the ability and quality of oral hygiene measures among the aged population. The economic status of this dependent group also have consequences on their health.[9] The nature of residency of the aged may affect their oral and overall care.

Studying institution elderly residents is chal'enging due to the children's fear of identity disclosure of their relative since placement in institution is culturally and morally unacceptable in majority of ethnic groups. Identity disclosure will bring the family name held in high esteem to ridicule. This can be attested to by the scarce data on institution resident elderly in Nigeria and many developing countries. The null hypothesis is that there is no significant difference in the oral health status and diet habit of institutionalized and non-institutionalized elderly. The objective of the study was to determine the oral health status and diet habit of institutionalized elderly in Lagos, Nigeria.

MATERIALS AND METHODS

This cross-sectional study was conducted among institutionalized elderly in Lagos State, Nigeria. They were recruited from the three randomly selected old peoples homes in Lagos. All consenting elders in the institutions participated. The elders that did not grant verbal informed consent were excluded. Age and sex matched non-institutionalized elders were also selected to serve as control for the study.

The protocol for this study was reviewed and approved by the Local Ethics Committee (Lagos University Teaching Hospital, ethics review board). Written permission was obtained from the authorities in charge of the institutions. Verbal consent was obtained from all participants and institutional review board approved consent procedures. The study was conducted in full accordance with the world medical association declaration of Helsinki. Personal interview[7] was conducted with each subjects, two trained dentists conducted this with the assistant of two resident nursing staffs. A modification of the method that was used in a previous study in France was employed.[10] The investigators administered the pretested structured questionnaire to subjects. The questionnaire had two sections - the first section sought for information on demographics, medical history, oral habits, dietary habits, history of tooth replacement, tooth replacement, reason for no replacement, prosthetic status and experience while the second section involved oral examination to assess oral hygiene, missing teeth, presence of caries, gingival recession, mobile teeth. Oral hygiene was assessed using the Simplified Oral Hygiene Index (OHI-S).[11] This varies from the original OHI because it scores 6-tooth surface rather than the 12 surfaces. The six surfaces are from four specifically recognized posterior teeth and two anterior teeth. The same criterion is used for assigning scores to the tooth surfaces as those used for the OHI. An erect chair with good illumination and examination set was utilized during oral examination. The oral hygiene score of patients obtained using OHI-S was used to categorize the subjects into 3 oral hygiene status

Good = 0 -1.2
Fair = 1.3 -3.0
Poor = 3.1-6.0

Subjects were classified into 3 socioeconomic statuses [12]:

Class 1 = Skilled worker e.g. professionals and managerial officers and retirees of this cadre.
Class 2 = Unskilled workers e.g. Artisans and traders.
Class 3 = Dependants e.g. Retirees of class 2, those not on pensions, house wives of class 2 cadre, students whose parents are unskilled workers.
The diet of the subjects were categorized using the menu obtained from the studied institutionalized homes into 3 namely soft and a combination of soft, hard and hard constituency;
Soft constituency included food with low fibre, high in calorie, protein, fats and sugar. Examples of such foods includes rice (staple food), yam, bread, pap (made from corn flour), moin moin (bean cake), beans, p>0.05.

A total of 100 elders aged between 60 and 90 years participated in this study with 50% institutionalized and 50% non-institutionalized. The majority (76%) of the institutionalized elders were widowed while the majority (68%) of the non-institutionalized was married (p =0.000)(Table 1). A larger proportion (62%) of the institutionalized elders were in the socioeconomic class 3 while only 34% of the non-institutionalized elders were in the socioeconomic class 3 (p=0.016). The oral hygiene of institutionalized elders was poor compared to their non-institutionalized counterpart (p=0.036). Ten percent (10.0%) of institutionalized elders clean their teeth more than once daily while 30% of the non-institutionalized clean their teeth more than once daily. (p=0.017) (Table 11).
Table 111 shows that none (0%) of the elders in institution wore any form of prosthesis compared to the non-institutionalized elders (63.2%) p=0.000. Number of missing teeth, Kennedy classification, barrier to replacement, presence of caries, tooth mobility had no statistical significant association to whether participants was institutionalized or not.
Table 1V shows significant association between education attained and dental status of participants (p=0.016). The largest proportions of participants with partial edentulism were those who attained tertiary level and the largest proportion of participants with full edentulism were those who had no formal education.
In Table V, all participants (100%) with full dentition could eat all types of diet. 71.4% of full edentulous participants could only eat soft diets (p=0.00). All other variables such as age, gender, marital status, ethnicity, religion, educational attainment, social class and self reported medical condition had no significant association with diet habit.
Table V1 shows that the frequency of brushing was significantly associated with oral hygiene status (p=0.016). The proportion of those who brush twice a day with good oral hygiene was 50% while 50% of those who brush thrice a day either had good or fair oral hygiene.

fish, the swallows (amala, pounded yam, eba (made from cassava flour), wheat, local soups such as ewedu, vegetables, fruits.
Hard consistuency such as food with high fibre, protein. Example of such food include ponmo (cow skin, cow leg) , saki (cow intestine), fruits (apple, pear), red meat (which is usually not tender), beef and chicken(not tender/deboned).
Filled questionnaires were numbered and subject's names were not included to ensure confidentiality. Data was collected, inputted, cleaned and analyzed using SPSS 20. The univariate and bivariate statistical techniques including mean, frequency distribution, proportion, chi-square and Fisher's exact were employed. Statistical significance was set at

RESULTS

Table I: Demographic characteristics among the participants

Characteristics	Institutionalized n (%)	Non-institutionalized n (%)	Total n (%)	P-value
Age (years)				***
60-70	5 (10.0)	5 (10.0)	10 (10.0)	
71-80	33 (66.0)	33 (66.0)	66 (66.0)	
81-90	12 (24.0)	12 (24.0)	24 (24.0)	
Gender				***
Male	21 (42.0)	21 (42.0)	42 (42.0)	
Female	29 (58.0)	29 (58.0)	58 (58.0)	
Marital status				
0.000				
Married	6 (12.0)	34 (68.0)	40 (40.0)	
Divorced	6 (12.0)	0 (0.0)	6 (6.0)	
Widowed	38 (76.0)	16 (32.0)	54 (54.0)	
Educational attainment				
0.118				
Non-formal	12 (24.0)	11 (22.0)	23 (23.0)	
Primary	17 (34.0)	14 (28.0)	31 (31.0)	
Secondary	12 (24.0)	6 (12.0)	18 (18.0)	
Tertiary	9 (18.0)	19 (38.0)	28 (28.0)	

Table II: Socioeconomic, oral health status and diet habit amongst participant

Characteristics	Institutionalized n (%)	Non-institutionalized n (%)	Total n (%)	P-value
Social class				0.016
Class 1	11 (22.0)	16 (32.0)	27 (27.0)	
Class 2	8 (16.0)	17 (34.0)	25 (25.0)	
Class 3	31 (62.0)	17 (34.0)	48 (48.0)	
Religion				
0.071				
Christianity	47 (94.0)	40 (80.0)	87 (87.0)	
Islam	3 (6.0)	10 (20.0)	13 (13.0)	
Self-reported chronic medical condition				
0.065				
Yes	15 (30.0)	24 (48.0)	39 (39.0)	
No	35 (70.0)	26 (52.0)	61 (61.0)	
Numerical dentition status				0.337
Full dentition	9 (18.0)	12 (24.0)	21 (21.0)	
Partial edentulism	39 (78.0)	33 (66.0)	72 (72.0)	
Full edentulism	2 (4.0)	5 (10.0)	7 (7.0)	
Diet nature preference				1.000
Soft diet only	10 (20.0)	9 (18.0)	19 (19.0)	
Both soft & hard diet	40 (80.0)	41 (82.0)	81 (81.0)	
Oral hygiene				0.036
Good	5 (10.4)	14 (31.1)	19 (20.4)	
Fair	24 (50.0)	20 (44.4)	44 (47.3)	
Poor	19 (39.6)	11 (24.4)	30 (32.3)	

Daily mouth cleaning frequency				0.017
Once	45 (90.0)	35 (70.0)	80 (80.0)	
Twice	4 (8.0)	14 (28.0)	18 (18.0)	
Thrice	1 (2.0)	1 (2.0)	2 (2.0)	

*****= not as assessed because participants are age and sex matched.**

Table III: Prosthodontic characteristics and other variables among of the participants

Characteristics	Institutionalized n (%)	Non-institutionalized n (%)	Total n (%)	P-value
Number of missing teeth				0.419
1	8 (21.1)	5 (14.7)	13 (18.1)	
2-4	6 (15.8)	2 (5.9)	8 (11.1)	
5-10	16 (42.1)	16 (47.1)	30 (44.4)	
>10	8 (21.1)	11 (32.4)	19 (26.4)	
Kennedy classification				0.283
Class 1	4 (10.3)	4 (12.1)	8 (11.1)	
Class 2	12 (30.8)	5 (15.2)	17 (23.6)	
Class 3	21 (53.8)	19 (57.6)	40 (55.6)	
Class 4	2 (5.1)	5 (15.2)	7 (9.7)	
Type of replacement				0.000
Partial denture	0 (0.0)	10 (26.3)	10 (12.7)	
Bridge	0 (0.0)	1 (2.6)	1 (1.3)	
Complete dent	0 (0.0)	3 (7.9)	3 (3.8)	
None	41 (100.0)	24 (63.2)	65 (82.3)	
Barrier to replacement				0.171
Lack of money	2 (4.9)	4 (16.7)	6 (9.2)	
Lack of time	0 (0.0)	1 (4.2)	1 (1.5)	
Lack of awareness	5 (12.2)	1 (4.2)	6 (9.2)	
No reason	34 (82.9)	18 (75.0)	52 (80.0)	
Presence of caries				0.495
Absent	46 (95.8)	45 (100.0)	91 (97.8)	
Present	2 (4.2)	0 (0.0)	2 (2.2)	
Tooth mobility				
1.000				
None	44 (91.7)	43 (95.6)	87 (93.5)	
Grade 1	2 (4.2)	1 (2.2)	3 (3.2)	
Grade 2	1 (2.1)	1 (2.2)	2 (2.2)	
Grade 3	1 (2.1)	0 (0.0)	1 (1.1)	

Table IV: Association between Numerical dentition status and demographic characteristics of the participants

Characteristics	Full dentition n (%)	Partial edentulism n (%)	Full edentulism n (%)	P-value
Age (years)				0.089
60-70	2 (20.0)	7 (70.0)	1 (10.0)	
71-80	18 (27.3)	43 (65.2)	5 (7.6)	
81-90	1 (4.2)	22 (91.7)	1 (4.2)	
Gender				0.994
Male	9 (21.4)	30 (71.4)	3 (7.1)	
Female	12 (20.7)	42 (72.4)	4 (6.9)	
Marital status				0.553
Married	8 (20.0)	28 (70.0)	4 (10.0)	
Divorced	2 (33.3)	3 (50.0)	1 (16.7)	
Widowed	11 (20.4)	41 (75.9)	2 (3.7)	
Religion				0.103
Christianity	16 (18.4)	66 (75.9)	5 (5.7)	
Islam	5 (38.5)	6 (46.2)	2 (15.4)	
Education attainment				0.016
Non-formal	2 (8.7)	16 (69.6)	5 (21.7)	
Primary	11 (35.5)	20 (64.5)	0 (0.0)	
Secondary	4 (22.2)	13 (72.2)	1 (5.6)	
Tertiary	4 (14.3)	23 (82.1)	1 (3.6)	
Socialclass				0.765
Class 1	4 (14.8)	22 (81.5)	1 (3.7)	
Class 2	6 (24.0)	17 (68.0)	2 (8.0)	
Class 3	11 (22.9)	33 (68.8)	4 (8.3)	
Self-reported medical condition				0.346
Yes	11 (28.2)	26 (66.7)	2 (5.1)	
No	10 (16.4)	46 (75.4)	5 (8.2)	

Table V: Association between diet nature preference, demographic characteristics and oral health status among the participants

Characteristics	Soft diet only n (%)	Both soft & hard diet n (%)	P-value
Age (years)			0.575
60-70	3 (30.0)	7 (70.0)	
71-80	12 (18.2)	54 (81.8)	
81-90	4 (16.7)	20 (83.3)	
Gender			0.439
Male	6 (14.3)	36 (85.7)	
Female	13 (22.4)	45 (77.6)	
Marital status			0.836
Married	9 (22.5)	31 (77.5)	
Divorced	1 (16.7)	5 (83.3)	

Widowed	9 (16.7)	45 (83.3)	
Religion			0.055
Christianity	14 (16.1)	73 (83.9)	
Islam	5 (38.5)	8 (61.5)	
Educational attainment			0.192
Non-formal	7 (30.4)	16 (69.6)	
Primary	4 (12.9)	27 (87.1)	
Secondary	5 (27.8)	13 (72.2)	
Tertiary	3 (10.7)	25 (89.3)	
Social class			0.716
Class 1	4 (14.8)	23 (85.2)	
Class 2	6 (24.0)	19 (76.0)	
Class 3	9 (18.8)	39 (81.3)	
Self-reported medical condition			0.830
Yes	7 (17.9)	32 (82.1)	
No	12 (19.7)	49 (80.3)	
Numerical dentition status			0.000
Full dentition	0 (0.0)	21 (100.0)	
Partial edentulism	14 (19.4)	58 (80.6)	
Full edentulism	5 (71.4)	2(28.6)	

Table VI: Association between oral hygiene statuses, diet nature preference, demographic characteristics of the participants

	Oral hygiene status			
Characteristics	Good n (%)	Fair n (%)	Poor n (%)	P-value
Age (years)				0.088
60-70	5 (55.6)	3 (33.3)	1 (11.1)	
71-80	11 (18.0)	29 (47.5)	21 (34.4)	
81-90	3 (13.0)	12 (52.2)	8 (34.8)	
Gender				0.051
Male	6 (15.4)	15 (38.5)	18 (46.2)	
Female	13 (24.1)	29 (53.7)	12 (22.2)	
Marital status				0.070
Married	9 (25.0)	20 (55.6)	7 (19.4)	
Divorced	0 (0.0)	4 (80.0)	1 (20.0)	
Widowed	10 (19.2)	20 (38.5)	22 (42.3)	
Ethnicity				0.630
Hausa	0 (0.0)	1 (100.0)	0 (0.0)	
Igbo	3 (21.4)	8 (57.1)	3 (21.4)	
Yoruba	16 (20.5)	35 (44.9)	27 (34.6)	
Religion				0.122
Christianity	14 (17.1)	40 (48.8)	28 (34.1)	
Islam	5 (45.5)	4 (36.4)	2 (18.2)	
Educational attainment				0.336
Non-formal	2 (11.1)	8 (44.4)	8 (44.4)	
Primary	7 (22.6)	12 (38.7)	12 (38.7)	
Secondary	2 (11.8)	10 (58.8)	5 (29.4)	

Tertiary	8 (29.6)	14 (51.9)	5 (18.5)	
Social class				0.198
Class 1	7 (26.9)	14 (53.8)	5 (19.2)	
Class 2	2 (8.7)	10 (43.5)	11 (47.8)	
Class 3	10 (22.7)	20 (45.5)	14 (31.8)	
Self-reported medical condition				0.910
Yes	8 (21.6)	18 (48.6)	11 (29.7)	
No	11 (19.6)	26 (46.4)	19 (33.9)	
Diet nature preference				0.053
Soft diet	4 (28.6)	9 (64.3)	1 (7.1)	
Both soft & hard diet	15 (19.0)	35 (44.3)	29 (36.7)	

DISCUSSION

Traditionally, the family determines the care, support, status and security of African elders but due to modernization; urbanization and mass education there has been a decline in these care and support. Our findings revealed that majority of the institutionalized elderly were widows and large proportions were in low socioeconomic class. Studies have shown that extended family helps in giving support to the bereaved. [13] but in recent times rural-urban or international migration of the young/children has resulted in little or no availability of physical support to the bereaved elderly, which has resulted in the use of institutions for them. [14] In a study done in Brazil, most of the residents in elderly homes were in the poor socioeconomic class. [15] Our findings conforms to this and it further emphasizes the fact that the living arrangement of the elderly is a function of marital status and financial status.[16] A study done in Europe gave evidence of some socioeconomic inequality in the elders.[17] Another study done among the Finnish elderly population noted increased risk of institutionalization in older adults staying without the spouse especially among the males (70%). The study also noted a higher risk in those with lower educational and occupational status.[18]

Tooth brushing and flossing are the most common measures used to prevent caries and periodontal problem that can lead to loss of tooth/teeth.[19] In this study oral hygiene and oral hygiene measure (tooth brushing) was inadequate in the institutionalized subjects. The reason might be due to lack of dental motivation by the institutionalized elderly and the dependence by some elderly on the institution caregivers who have so many demanding conflicting priorities leading to the decision of trivializing oral hygiene measures. This conforms to the findings in previous studies.[15,20,21]

All of the institutionalized elders with edentulous space wore no form of prosthesis. This was a contrast to previous studies. [22,23, 24] Though these studies were carried out among the institutionalized older adults only, the findings were that of high unmet prosthetic need with incidence of prosthetic use especially removable prosthesis. Our study compared both institutionalized and non-institutionalized and found higher prosthetic unmet need in the non-institutionalized adult. The reason for our finding might be due to lack of adequate financial support, lack of dental awareness and lack of access to dental care.

Total tooth loss was common in subjects with no formal education. This conformed to previous studies done in South America[25] that stated an independent association between schooling and edentulism. The study done in Iran[26] noted a prevalence of

edentulism in those without high school education. In China, [27] subjects with lower education had higher risk of tooth loss and a study done in America[28] noted race and socioeconomic status as contributory factor when disparity in dental care were taken into account.

Our findings also show a significant relationship between dentition and diet. Earlier studies[29-31]have noted impaired mastication due to loss of teeth with a resultant lack of nutrition.[32,33] Chewing problem occurred as a result of total tooth loss which eventually leads to selection of food and poor nutritional intake. In a study[34] done to determine the association between edentulism and nutritional state, patient with edentulism tend to avoid more coarse foods such as fruits, vegetables and meats, which are naturally major sources of vitamins, minerals and proteins. They tend to take softer and more processed food, which are usually rich in fats, cholesterol, lacking in vitamins and minerals. This explains why most of the edentulous subjects take soft diet compared to other subjects. Increase frequency in daily tooth brushing also improves oral hygiene. It has been stated that mechanical disruption and removal of plaque is effective with tooth brushing and flossing. [35] The removal of this plaque prevents it from becoming pathogenic hence the improvement in the oral hygiene.[36]

In conclusion the socioeconomic class and marital status were contributory factors in determining whether the elderly was institutionalized or not. Overall, oral health status of the institutionalized elderly was worse than the non-institutionalized elderly but the dietary preferences were nature relatively the same in both studied group.

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References

1. Kisella K, Velkoff V A. An aging world 2001. US Census Bureau.
2. Lagos Bureau of statistics. Digest of statistics 2013. Ministry of economic planning & budget. The secretariat, Alausa, Ikeja, Lagos. Pg 1-3.
3. World Health Organization. Shaping the future. The World Health Report 2003; 540:36.
4. Peil M, Bamisaiye A, Ekpenyong S. Health and physical support for the elderly in Nigeria. J Cross Cultural Gerontol 1989; 4:89-106.
5. Berkley D. Current state of oral health care in institutionalized older adults. Spec Care Dent 1996; 16: 143-146.
6. Emewu I. Nigeria: with only 20 homes for elderly, it's a crime to be old. Seniors world chronicle. Digest of international news and report on aging. http://www.seniorsworldchronicle.com/2006/07/nigeria-with-only-20-homes-for-elderly.htm (accessed on 27/02/2015).
7. Chalmers JM, Levy SM, Buckwalter KC, Ettinger RL, Kambhu PP. Factors influencing nurses aides provision of oral care for nursing facility residents. Spec Care Dent 1996; 16:71-79.
8. Bruce J, Baum DM. Research on aging and oral health: an assessment of current status and future needs. Spec Care Dent 1981; 1:156-165.
9. Adler N, Joan M. Socioeconomic status and health in industrial nations: social, psychological, and biological pathways. Ann N Y Acad Sci 1999; 896:3-15.
10. Montal S, Tramini P, Triay J, Valcarcel J. Oral hygiene and the need for treatment of the dependent institutionalised elderly. Gerodontol 2006; 23:67-72.

11. Esan TA, Olusile AO, Akeredolu PA, Esan AO. Socio-demographic factors and edentulism; the Nigerian experience. BMC Oral Health 2004; 4:3.
12. Okumagba PO. Family support for the elderly in Delta State of Nigeria. Stud Home Comm Sci 2011; 5:21-27.
13. Cruz, TM, Obiena A. Future directions for aging policy in Philippines. In: Population Aging in Asia. Asian Population Studies 1991 Series 10 No. 108 (Bangkok Escap), pp. 54- 60.
14. Gaiao L, Leitao de Almeida M, Filho J, Leggat P, Heulkelbach J. Poor dental status and oral hygiene practices in institutionalized older people in Northeast Brazil. Int J Dent 2009; 26; 2009:846081.
15. Van Solinge H. Living arrangement of non-married elderly people in the Netherlands in 1990. Aging and Society1994; 14: 219-236.
16. Huisman M, Kunst AE, Mackenbach JP. Socioeconomic inequalities in morbidity among the elderly; a European overview. Soc Sci Med 2003; 57:861-873.
17. Nihtilä E, Martikainen P. Why older people living with a spouse are less likely to be institutionalized: the role of socioeconomic factors and health characteristics. Scand J Public Health 2008; 36:35-43
18. Choo A, Delac DM, Messer LB. Oral hygiene measures and promotion: review and considerations. Aust Dent J 2001; 46(3):166-173.
19. Marchini L, Vieira P, Bossan T, Montenegro F, Cunha V. Self-reported oral hygiene habits among institutionalised elderly and their relationship to the condition of oral tissues in Taubaté, Brazil. Gerodontol 2006; 23:33-37.
20. Altani A, Wyatt C. Oral hygiene and institutionalized elderly. Probe 2002; 36:91-96.
21. Vigild M. Denture status and need for prosthodontic treatment among institutionalized elderly in Denmark. Community Dent Oral Epidemiol 1987; 15:128-133.
22. Yang S, Moon H, Han D, Lee H, Chung M. Oral health status and treatment need of institutionalized elderly patients. J Korean Acad Prosthodont. 2008; 46:455-469.
23. Hegde V, Shenoy R. Dental Prosthetic Status and Prosthetic Need of the Institutionalized Elderly Living in Geriatric Homes in Mangalore: A Pilot Study. ISRN Dentistry 2011, Art ID 987126:3
24. Hugo FN, Hilgert JB, de Sousa Mda L, da Silva DD, Pucca GA Jr. Correlates of partial tooth loss and edentulism in the Brazilian elderly. Community Dent Oral Epidemiol 2007; 35:224-232.
25. Centers for Disease Control and Prevention (CDC). Total tooth loss among persons aged > or =65 years--selected states, 1995-1997. MMWR Morb Mortal Wkly Rep. 1999 Mar 19; 48:206-210.
26. Lin HC, Corbet EF, Lo EC, Zhang HG. Tooth loss, occluding pairs, and prosthetic status of Chinese adults. J Dent Res 2001; 80:1491-1495.
27. Gilbert GH, Duncan RP, Shelton BJ. Social determinants of tooth loss. Health Serv Res 2003; 38:1843-1862.
28. Marcenes W, Steele JG, Sheiham A, Walls AW. The relationship between dental status, food selection, nutrient intake, nutritional status, and body mass index in older people. Cad Saude Publica 2003; 19:809-16.
29. Hildebrandt GH, Dominguez BL, Schork MA, Loesche WJ. Functional units, chewing,

swallowing, and food avoidance among the elderly. J Prosthet Dent 1997; 77:588-95.

30. Sheiham A, Steele J. Does the condition of the mouth and teeth affect the ability to eat certain foods, nutrient and dietary intake and nutritional status amongst older people? Public Health Nutr 2001; 4:797-803.

31. Hollister MC, Weintraub JA. The association of oral status with systemic health, quality of life, and economic productivity. J Dent Educ 1993; 57:901-12.

32. Papas AS, Palmer CA, Rounds MC, Herman J, McGandy RB, Hartz SC, Russell RM, DePaola P. Longitudinal relationships between nutrition and oral health. Ann N Y Acad Sci 1989; 561:124-42.

33. Marcenes W, Steele JG, Sheiham A, Walls AW. The relationship between dental status, food selection, nutrient intake, nutritional status, and body mass index in older people. Cad Saude Publica 2003; 19:809-16.

34. Hutton B, Feine J, Morais J. Is there an association between edentulism and nutritional state? J Can Dent Assoc 2002; 68:182-1877.

35. Bakdash B. Current patterns of oral hygiene product use and practices. Periodontol 2000 1995; 8:11-14.

Lang NP, Cumming BR, Loe H. Toothbrushing frequency as it relates to plaque development and gingival health. J Periodontol 1973; 44:396-405