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ASSOCIATION BETWEEN NUTRITIONAL STATUS AND ORAL HEALTH AMONG ELDERLY RESIDENTS IN RESIDENTIAL HOMES

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ABSTRACT

The relationship between nutritional status and oral health in older adults is complex and significantly influences their overall health and quality of life. With advancing age, both nutrition and oral health tend to decline, potentially aggravating existing conditions and increasing the risk of malnutrition. This study, titled **"Association between Nutritional Status and Oral Health among Elderly Residents Living in Residential Homes,"** aimed to examine the connection between dietary status and oral health among elderly residents in institutional settings. A total of 50 participants were selected from the target population. Data were collected through assessments of medical history, oral health issues, anthropometric measurements, dietary habits using a Food Frequency Questionnaire and a 3-day dietary recall. Nutritional status was evaluated using the Mini Nutritional Assessment (MNA), while oral health was assessed using the DMFT Index and the Xerostomia Inventory. The findings indicated a significant association between nutritional status and oral health in the elderly. Most participants demonstrated inadequate intake of macronutrients such as energy, protein, carbohydrates, and fats. A considerable proportion were identified as being at risk of malnutrition according to MNA scores. Mild xerostomia was common, and most subjects had low DMFT scores. The results underscore the critical role of oral health in maintaining adequate nutritional status and overall well-being. Nutritional education was provided to participants, highlighting the importance of proper oral hygiene practices, healthy eating behaviors, and geriatric-friendly food choices.

KEYWORDS: Geriatrics, Oral Health, Nutritional Status, Malnutrition, Macronutrient Intake, MNA, Xerostomia, DMFT Index.

INTRODUCTION

The ageing process is inevitable. At the beginning of the 21st century, nearly 600 million people worldwide were aged 60 years or older—three times the number recorded fifty years earlier. By 2050, older adults are expected to constitute about 20% of the global population (El Hélou, M. et al., 2014). Nutritional status plays a vital role in determining the overall health of older individuals. A French study reported that 7.4–14.8% of adults aged 65 and above were undernourished, as assessed using the Mini Nutritional Assessment (MNA). Malnutrition can lead to depression, reduced functional ability, increased susceptibility to infections, prolonged hospital stays, higher mortality, and increased healthcare costs. It also heightens the risk of falls and frailty (Khoury, C. et al., 2022).

Maintaining an optimal nutritional status is therefore crucial, as poor nutrition can result in underweight—raising vulnerability to infections and mortality—or overweight, which increases the risk of chronic diseases such as diabetes and hypertension (Rodrigues Junior, H.L. et al., 2012). Ageing is also associated with a higher likelihood of developing chronic conditions, including chronic obstructive pulmonary disease (COPD), diabetes, Alzheimer's disease (AD), Parkinson's disease, cardiovascular disease, osteoporosis (OP), and osteoarthritis (OA) (Guo, J. et al., 2022). Furthermore, multiple comorbidities become increasingly common after the age of 60.

Oral health issues are widespread among the elderly. Conditions such as chronic periodontitis, root caries, precancerous or cancerous lesions, oral infections,

xerostomia (dry mouth), tooth loss, and denture-related difficulties occur more frequently in this age group (Khoury, C. et al., 2022). Poor oral health in older adults is a significant global public health concern and contributes to the rising healthcare burden in many countries. It is closely linked to poor general health due to shared risk factors (De Marchi, R.J. et al., 2008).

Oral health plays a pivotal role in determining nutritional status and dietary intake among older adults. The relationship between dental health and nutritional well-being is central to understanding various adverse health outcomes associated with oral conditions, including frailty, functional decline, cognitive impairment, and mortality (Fukuyama, Y. et al., 2024). The oral cavity—the initial segment of the digestive tract—is essential for biting, chewing, salivary secretion, bolus formation, and swallowing. Oral health problems can impair these functions, leading to difficulties in eating and reduced food intake (Tran, T. et al., 2022).

Compromised dentition may restrict dietary variety due to chewing difficulties, posing risks to nutritional health and overall well-being (Sheiham, A. & Steele, J., 2001). Factors such as tooth loss, pain or discomfort due to caries, periodontal disease, and ill-fitting dentures are known to adversely affect chewing ability and, consequently, nutritional status (Touger-Decker, R. & Mobley, C.C., 2007). Although several comprehensive reviews suggest a negative relationship between oral health and malnutrition, many do not examine specific oral health indicators such as hard tissue status, hyposalivation/xerostomia, or subjective oral health perceptions among malnourished older adults. Improving oral health and preventing malnutrition in older individuals can significantly enhance overall health and quality of life (Algra, Y. et al., 2021).

This study aims to assess the association between oral health and nutritional status among elderly individuals aged 60 years and above residing in care homes in Chennai, using the MNA, DMFT Index, and Xerostomia Inventory (XI).

METHODOLOGY

A cross-sectional study was conducted to examine the association between nutritional status and oral health among elderly individuals residing in selected residential homes. The primary objectives of the study were to assess the nutritional status of older adults, evaluate their oral health using standard indices, and determine the relationship between dietary intake, oral health conditions, and risk of malnutrition. A total of 50 participants were selected through purposive sampling based on predetermined criteria. Elderly adults aged 60 years and above, residing in the facility for a minimum of six months, able to communicate independently, and willing to provide informed consent were included in the study. Individuals with severe cognitive impairment, terminal illness, acute infections, or conditions that prevented oral examination or accurate dietary assessment were excluded. Data were collected using a structured interview schedule to obtain demographic details, medical history, and self-reported dental issues. Anthropometric measurements, including height, weight, and BMI, were recorded using standardized procedures.

Dietary habits and nutrient intake were assessed through a Food Frequency Questionnaire and a 3-day dietary recall. Nutritional status was evaluated using the Mini Nutritional Assessment (MNA). Oral health was examined using the Decayed, Missing, and Filled Teeth (DMFT) Index and the Xerostomia Inventory to assess dental caries and severity of dry mouth respectively. All measurements and assessment tools were applied consistently, and the collected data were analysed to explore the relationship between oral health indicators and nutritional status among the elderly population.

RESULTS AND DISCUSSION

Table 1: Distribution of BMI, Mid Arm and Calf Circumference.

BMI Classification	**Frequency**	**Percentage**
Underweight (Below 18.5)	3	6
Normal weight (18.5 – 24.9)	29	58
Pre – obesity (25 – 29.9)	16	32
Obesity class 1 (30 – 34.9)	1	2
Obesity class 2 (35 – 39.9)	0	0
Obesity class 3 (Above 40)	1	2
Mid Arm Circumference (cm)	**Frequency**	**Percentage**
Severe Malnutrition (< 21 cm)	4	8
Moderate malnutrition (21-22 cm)	11	22
Normal (> 22 cm)	35	70
Calf Circumference (cm)	**Frequency**	**Percentage**
Low Muscle Mass/sarcopenia (< 31 cm)	42	84
Normal Muscle Mass (≥ 31 cm)	8	16

Table 1 presents the distribution of participants according to BMI, MUAC, and calf circumference

measurements. Based on BMI classification, 6% of the participants were underweight, 58% had normal weight, 32% were in the pre-obesity range, 2% belonged to obesity class I, and another 2% fell under obesity class III.

Assessment of MUAC showed that 70% of the elderly had normal arm circumference, whereas 22% were moderately malnourished and 8% were severely malnourished. Calf circumference findings indicated that 84% of the participants had values below 31 cm, suggesting low muscle mass, while only 16% demonstrated normal muscle mass (≥31 cm). These indicators collectively reveal a high prevalence of reduced muscle mass and possible sarcopenia among the study population despite a majority falling within the normal BMI range.

Table 2: Distribution of Nutritional Status based on Mini Nutrition Assessment.

Malnutrition indicator scale	Frequency	Percentage
Malnourished (Less than 17 points)	21	42
At risk of malnutrition (17 to 23.5 points)	28	56
Normal nutritional status (24 to 30 points)	1	2

The above table 2 showed the nutritional status among the elderly people living in residential homes. The data observed that 2% of the population had a normal nutritional status, while 56% were at the risk of malnutrition and 42% were classified as malnourished according to Mini Nutritional Assessment.

Table 3: Association of DMFT Index with MNA.

DMFT		MNA			p value
		Malnourished	At risk of malnutrition	Normal nutritional status	
Low	N	6	15	1	**0.027***
	%	30.00%	53.60%	100.00%	
Moderate	N	9	11	0	
	%	45.00%	39.30%	0.00%	
High	N	5	2	0	
	%	25.00%	7.10%	0.00%	
Total	N	20	28	1	
	%	100.00%	100.00%	100.00%	
* Statistical significance with 95% CI					

The above table 3 illustrated the relation between DMFT index with Mini Nutritional Assessment. Among the malnourished population 45% had moderate DMFT score, 25% had high DMFT score and 30% had low DMFT score, whereas in at risk of malnutrition subjects, 39.3% had moderate, 7.1% had high and 53.6% had low DMFT score. Notably, all participants with normal nutritional status had low DMFT score, with none having moderate or high score. The data highlighted the potential impact of poor oral health on the nutritional status leading to malnutrition.

The study showed a statistically significance association between dental health and nutritional status with a p value of 0.027, indicating that individuals with higher DMFT scores are more likely to be malnourished or at risk of malnutrition**.** The study conducted by Srinivasulu, G et al., (2014), shows relation between nutritional status and dental caries, hence our study is in accordance with previous study.

Table 4: Cross tabulation of DMFT Index with macronutrient intake.

DMFT	Variables	Energy Deficit	Protein Deficit	Carbohydrate intake		Fat Intake		
				Low	High	Low	Normal	High
Low	N	22	22	22	0	16	6	0
	%	44.90%	44.90%	45.80%	0.00%	43.20%	54.50%	0.00%
Moderate	N	20	20	19	1	17	2	1
	%	40.80%	40.80%	39.60%	100.00%	45.90%	18.20%	100.00%
High	N	7	7	7	0	4	3	0
	%	14.30%	14.30%	14.60%	0.00%	10.80%	27.30%	0.00%
Total	N	49	49	48	1	37	11	1
	%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
p value		-	-	0.477		0.294		

The above table 4 presented the distribution of DMFT index scores in relation to macronutrient intake such as

energy, protein, carbohydrate and fat. The data showed that individuals with low to moderate DMFT scores commonly experienced energy and protein deficits. All individuals with high carbohydrate intake fell within the moderate DMFT score, while those with low carbohydrate intake were mostly in the low and moderate DMFT scores. Fat intake varied across DMFT scores, with individuals having low DMFT score commonly showed normal fat intake, while high fat intake was seen only within the individuals having moderate DMFT score.

There is no statistically significance association was found between DMFT index and macronutrient intake of the elderly people living in residential homes as majority of the elderly were deficient in macronutrient intake. The study conducted by Akkurnaz, G et al., (2024) showed no association between DMFT Index and the Macronutrient Intake, hence our study is in accordance with the previous study.

Table 5: Cross tabulation of Xerostomia Inventory with MNA.

XI		MNA			p value
		Malnourished	At risk of malnutrition	Normal nutritional status	
Mild Dry Mouth	N	6	20	1	**0.030***
	%	28.60%	71.40%	100.00%	
Moderate Dry mouth	N	8	6	0	
	%	38.10%	21.40%	0.00%	
Severe Dry mouth	N	7	2	0	
	%	33.30%	7.10%	0.00%	
Total	N	21	28	1	
	%	100.00%	100.00%	100.00%	
* Statistical significance with 95% CI					

The above table 5 highlighted that among those with mild dry mouth, 71.4% were at risk of malnutrition, 28.6% were malnourished, and only one individual had normal nutritional status. In the moderate dry mouth group, 38.1% were malnourished and 21.4% were at risk, with no individuals showing normal nutritional status. 33.3% were malnourished, 7.1% were at risk of malnutrition, with no cases of normal nutritional status was observed among the individuals with severe dry mouth. The findings suggested that the risk of malnutrition tends to increase with increasing severity of dry mouth.

The study showed a statistically significance association between the prevalence of dry mouth and the nutritional status of the elderly people living in residential homes with a p value of 0.030. According to the study conducted by Khoury, C et al., (2022), Xerostomia was found to be associated with malnutrition or risk of malnutrition. Hence our study is in concordance with the previous study.

Table 6: Cross tabulation of Xerostomia Inventory with macronutrient intake.

XI	Variables	Energy Deficit	Protein Deficit	Carbohydrate intake		Fat intake		
				Low	High	Low	Normal	High
Mild Dry Mouth	N	27	27	27	0	23	3	1
	%	54.00%	54.00%	55.10%	0.00%	62.20%	25.00%	100.00%
Moderate Dry Mouth	N	14	14	13	1	11	3	0
	%	28.00%	28.00%	26.50%	100.00%	29.70%	25.00%	0.00%
Severe Dry Mouth	N	9	9	9	0	3	6	0
	%	18.00%	18.00%	18.40%	0.00%	8.10%	50.00%	0.00%
Total	N	50	50	49	1	37	12	1
	%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
p value		-	-	0.269		**0.017***		

The above table 6 illustrates the relationship between Xerostomia Inventory and Macronutrient Intake. The subjects with mild dry mouth experienced energy and protein deficits in both groups, with 54.0%, followed by those with moderate dry mouth with 28.0% and severe dry mouth with 18.0%. A similar trend was noted for carbohydrate consumption, where low intake was most common among the mild dry mouth group with 55.1%, and the only individual with from the moderate dry mouth group had high carbohydrate intake. Most participants with low fat intake experienced mild dry mouth symptoms (62.2%), whereas normal fat consumption was more prevalent among individuals with severe dry mouth (50.0%). Notably, high fat intake was solely found in the group with mild dry mouth (100%).

The study shows a statistically significance link between the level of fat consumption and the severity of dry mouth with a p value of 0.017. However, the relationship of xerostomia with energy, protein and carbohydrate consumption was not statistically significant. The study conducted by Lee, K.A et al., (2020) shows relation between dry mouth and energy and fat intake, hence our study is in accordance with the previous study.

CONCLUSION

The present study highlights a high prevalence of nutritional vulnerability among elderly residents in residential homes. Although the majority of participants had a normal BMI, assessments of mid-upper arm circumference and calf circumference revealed that a significant proportion were moderately to severely malnourished and exhibited reduced muscle mass, indicating sarcopenia. The Mini Nutritional Assessment further confirmed that over half of the participants were at risk of malnutrition, and 42% were malnourished. Oral health status, as assessed by DMFT index and Xerostomia Inventory, showed significant associations with nutritional status, suggesting that poor dental health and dry mouth symptoms may contribute to inadequate dietary intake and malnutrition. While macronutrient deficiencies were common across the study population, fat intake was significantly influenced by the severity of xerostomia. These findings emphasize the importance of a multidimensional approach to nutritional assessment, incorporating anthropometric measures, oral health evaluation, and dietary intake monitoring. Overall, the study underscores the need for targeted interventions addressing both oral health and nutrition to improve the health and quality of life of elderly individuals in institutional settings.

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