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# PREVALENCE OF MALNUTRITION AND SARCOPENIA AMONG OLDER ADULTS IN SELECTED OLD AGE HOMES OF URBAN CHENNAI: A SYSTEMATIC SURVEY

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## ABSTRACT

**Background:** Malnutrition and sarcopenia are prevalent geriatric health issues in institutionalized elderly individuals, considerably contributing to morbidity, diminished functional capacity, and impaired quality of life. **Aim:**This study sought to investigate the prevalence of malnutrition and sarcopenia among older inhabitants of selected nursing homes in urban Chennai, as well as to examine relevant dietary and health aspects.

**Methods:**A cross-sectional study was performed with 60 elderly individuals living in designated senior care facilities in the urban area of Chennai. Information pertaining to demographic characteristics, comorbid conditions, treatment history, physical activity, and dietary habits was gathered by a structured questionnaire. The nutritional consumption was evaluated by a 3-day dietary recall approach. Variables were categorized and evaluated using descriptive statistical approaches including frequency and percentage distribution.

**Results:** The study findings demonstrated a high frequency of malnutrition and sarcopenia among the older subjects. Dietary assessment suggested frequent eating of cereal-based meals with comparatively reduced intake of protein-rich foods, fruits, and nutrient-dense food items. Participants exhibited prevalent comorbidities such as diabetes mellitus, hypertension, arthritis, anemia, thyroid diseases, and renal illnesses. Decreased physical activity and extended institutional stays correlated with inferior nutritional results.

**Conclusion:**Malnutrition and sarcopenia continue to pose considerable nutritional and functional health issues for institutionalized elderly individuals in urban Chennai. Insufficient nutritional diversity, concomitant conditions, and sedentary lifestyle habits were recognized as significant contributing causes. Consistent nutritional assessments, well-structured dietary interventions, and specialized geriatric care approaches are crucial for enhancing the nutritional and health conditions of senior individuals living in nursing facilities.

**KEYWORDS:** Malnutrition; Sarcopenia; Older adults; Dietary recall; Old age homes; Geriatric nutrition.

## INTRODUCTION

Population ageing has arisen as a major global public health concern due to the rapid growth in life expectancy and the growing population of aged adults globally. Advancing age is often associated with increasing physiological decline, poorer immunological response, lower functional ability, and increased sensitivity to chronic diseases. Among the major health difficulties impacting older persons, malnutrition and sarcopenia are two significant geriatric syndromes that greatly influence morbidity, mortality, reliance, and quality of life.[1]

Malnutrition among older adult is generally characterized by inadequate consumption of energy, protein, and important micronutrients, resulting in unintentional weight loss, decreased muscle mass, weakened immunity, and impaired physical performance. Age-related changes such as reduced appetite, chewing difficulty, altered taste perception, gastrointestinal troubles, and various comorbidities further contribute to nutritional deficits in elderly persons. In institutional settings such as old age homes, these variables may become more pronounced due to limited dietary diversity, social isolation, dependence on standardized meal patterns, and diminished specialized nutritional care.[2]

Sarcopenia, defined as the progressive loss of skeletal muscle mass and muscle strength with aging, has gained significant clinical importance in geriatric nutrition and public health research. The condition is highly connected with impaired mobility, higher risk of falls, frailty, hospitalization, disability, and mortality.[3] Inadequate protein consumption, physical inactivity, chronic inflammation, and long-term illness conditions are regarded as key contributing factors to the development of sarcopenia among aged adults. The presence of malnutrition and sarcopenia substantially aggravates health deterioration and functional decline in institutionalized older persons.[4]

India is currently witnessing a large surge in its old population due to demographic shift and improved healthcare facilities. Urbanization, relocation of younger family members, and changing social structures have contributed to an increased need on old age institutions for elderly care.[5] Although institutional care facilities provide housing and basic support services, multiple studies have shown low dietary intake and poor health outcomes among residents of such facilities. Older persons

staying in old age homes are particularly prone to nutritional deficiencies because of lower dietary quality, chronic diseases, limited physical activity, and psychosocial stressors.[6]

Dietary assessment serves a significant role in determining the nutritional adequacy and meal consumption habits of elderly populations. The 3-day dietary recall approach is frequently used to analyze food intake, dietary diversity, and nutritional behavior in community and institutional settings. Assessment of regular meal patterns and dietary choices provides useful insight into characteristics linked with malnutrition and sarcopenia risk among older persons.[7]

Despite the growing problem of geriatric malnutrition in India, insufficient data are known addressing the combined prevalence of malnutrition and sarcopenia among institutionalized aged people in urban Chennai. Furthermore, there remains limited research concerning the food habits and associated health conditions influencing nutritional status among older persons dwelling in old age homes. Therefore, the present study was done to investigate the frequency of malnutrition and sarcopenia among older persons in selected old age homes in urban Chennai and to analyze their dietary patterns and related health issues

**Research Hypothesis**

**Null Hypothesis ($H_0$):** There is no significant association between nutritional status, sarcopenia risk, demographic variables, biochemical parameters, and lifestyle factors among older persons staying in selected old age homes in urban Chennai.

**Alternative Hypothesis ($H_1$):** There is a strong correlation between nutritional status, sarcopenia risk, demographic variables, biochemical parameters, and lifestyle factors among older persons staying in selected old age homes in urban Chennai.

## MATERIALS AND METHODS

The present study was a cross-sectional descriptive survey conducted among elderly people dwelling in chosen old age facilities in urban Chennai, Tamil Nadu, India. The study was done to determine the prevalence of malnutrition and sarcopenia and to investigate nutritional intake habits and other health-related factors among institutionalized older persons. A total of 60 elderly people aged 60 years and above were involved in the study. Participants who were physically and cognitively competent of responding to the interview schedule and willing to participate in the study were selected. Elderly adults who were seriously ill, significantly cognitively disabled, or reluctant to engage were excluded from the study.

A purposive sample strategy was utilized for the selection of participants from the selected old age facilities. Prior approval was acquired from the various institutional authorities before beginning of data collection. The objectives and purpose of the study were fully stated to all participants, and informed consent was obtained before the commencement of the survey. Confidentiality and anonymity of the acquired information were strictly preserved during the study period.

Data were collected utilizing a standardized and pre-tested interview schedule built expressly for the project. Information pertaining to demographic parameters, educational status, occupation, marital status, duration of stay in the institution, treatment history, physical activity pattern, dietary habits, comorbidities, and past medical history was acquired using direct interview approach. All study variables were properly coded to aid statistical analysis and interpretation of the acquired data.

Dietary assessment of the subjects was conducted out utilizing a 3-day dietary recall approach. Detailed information regarding food intake during breakfast, mid-morning, lunch, evening snacks, and dinner was documented for three consecutive days. The quantity of food consumed was noted using typical household measures such as bowls, plates, grams, milliliters, and number of pieces. The acquired dietary data were applied to analyze meal consumption patterns, dietary diversity, and overall nutritional adequacy among the senior individuals.

Assessment of malnutrition and sarcopenia was performed based on dietary intake characteristics, physical activity patterns, comorbid conditions, and clinical observations gathered during the survey. Indicators such as inadequate dietary intake, limited dietary diversity, sedentary lifestyle, and presence of chronic diseases were included while evaluating nutritional risk and sarcopenia-related disorders among the participants.

The acquired data were coded, tabulated, and evaluated using acceptable statistical procedures. Descriptive statistical approaches including frequency distribution and percentage analysis were employed to summarize demographic information, food patterns, comorbidities, and other study factors. The analyzed findings were presented in the form of tables and graphical representations whenever applicable.

## RESULTS

### Demographic Characteristics of the Study Participants

A total of 60 elderly participants residing in selected old age homes were included in the present study. The age of the participants ranged from 60 to 95 years, indicating inclusion of both young-old and oldest-old individuals.

Among the study participants, males constituted the majority (n=38, 63.3%), whereas females accounted for 36.7% (n=22). The predominance of male participants may reflect higher institutionalization rates among elderly men in the selected old age homes.

Regarding educational status, 26.7% of the participants were illiterate, 25.0% had primary education, 26.7% had secondary education, and 21.7% were graduates. Lower literacy levels among a substantial proportion of the elderly population may influence nutritional awareness, health-seeking behavior, and disease management.

Most participants were currently employed in some form of activity (n=37, 61.7%), while 23 participants (38.3%) were not engaged in any occupation. Marital status analysis showed that 38.3% were unmarried, 31.7% were married, and

30.0% were separated. A higher proportion of unmarried and separated elderly individuals suggests social vulnerability and dependence on institutional care.
The duration of stay in old age homes revealed that 35.0% had stayed for more than five years, 40.0% for 1–5 years, and 25.0% for less than one year.

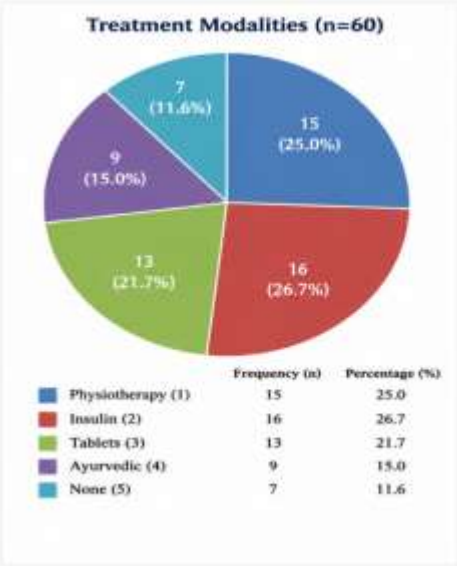
**Table 1:** Demographic Characteristics of Participants (n=60)

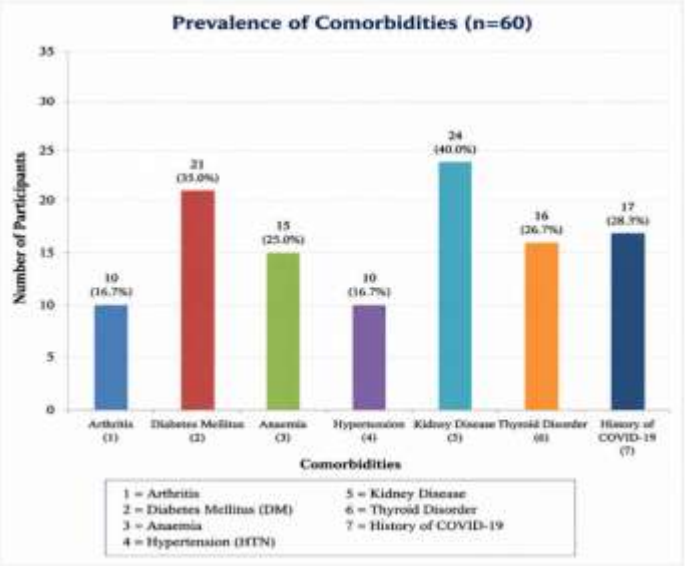
| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 38 | 63.3 |
| | Female | 22 | 36.7 |
| Education | Illiterate | 16 | 26.7 |
| | Primary | 15 | 25.0 |
| | Secondary | 16 | 26.7 |
| | Graduate | 13 | 21.7 |
| Occupation | Yes | 37 | 61.7 |
| | No | 23 | 38.3 |
| Marital Status | Married | 19 | 31.7 |
| | Unmarried | 23 | 38.3 |
| | Separated | 18 | 30.0 |
| Period of Stay | <1 year | 15 | 25.0 |
| | 1–5 years | 24 | 40.0 |
| | >5 years | 21 | 35.0 |

**Clinical Characteristics and Comorbidities**
Comorbid conditions were highly prevalent among the elderly participants.[8] Thyroid disorders, kidney disease, diabetes mellitus, anaemia, hypertension, arthritis, and history of COVID-19 were frequently observed.
Diabetes mellitus was identified either alone or in combination among several participants, highlighting the growing burden of metabolic disorders in elderly populations. Kidney disease and thyroid disorders were also commonly observed. History of COVID-19 was present in multiple participants, indicating the long-term health implications experienced by elderly individuals following the pandemic.[9]
Past medical history was present among 56.7% of the participants, whereas 43.3% reported no significant past medical illness.
Regarding treatment modalities, insulin therapy and Ayurvedic treatment were common among participants, followed by physiotherapy and tablet-based treatment. Some participants were not under any current treatment.

**Table 2:** Clinical Characteristics of Participants

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| Past Medical History | Yes | 34 | 56.7 |
| | No | 26 | 43.3 |
| Current Treatment | Physiotherapy | 10 | 16.7 |
| | Insulin | 14 | 23.3 |
| | Tablets | 10 | 16.7 |
| | Ayurvedic | 10 | 16.7 |
| | None | 16 | 26.6 |
| Diet Pattern | Vegetarian | 31 | 51.7 |
| | Non-Vegetarian | 29 | 48.3 |




| **Figure 1**Pie chart showing treatment modalities among participants (n=60). | **Figure 2** Multiple bar graph showing prevalence of comorbidities among participants (n=60). Participants may have more than one comorbidity. |
|---|---|
| | |

**Anthropometric Assessment**

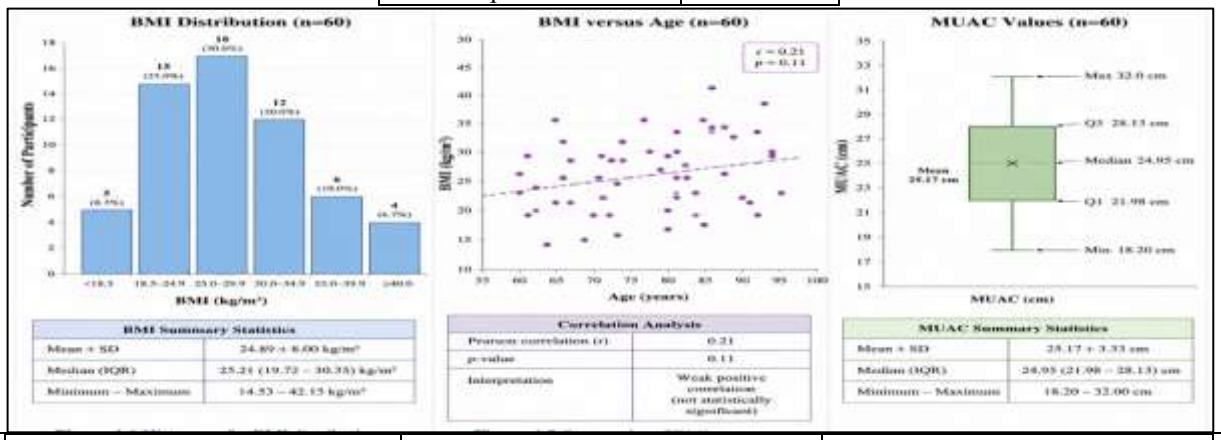
Anthropometric examination revealed substantial variance in body composition among the elderly subjects.

The mean height and weight of participants were 155.8 cm and 64.5 kg respectively. Body Mass Index (BMI) readings ranged from 14.5 kg/m² to 42.1 kg/m², demonstrating the coexistence of undernutrition and obesity among the older population.

Several subjects had BMI values < 18.5 kg/m², indicating undernutrition, whereas others indicated overweight and obesity. Mid Upper Arm Circumference (MUAC) values also differed widely, revealing variances in muscle mass and nutritional reserves.[10]

**Table 3:** Anthropometric Measurements of Participants

| Parameter | Mean ± SD |
|---|---|
| Height (cm) | 155.8 ± 10.8 |
| Weight (kg) | 64.5 ± 14.2 |
| BMI (kg/m²) | 27.1 ± 7.2 |
| MUAC (cm) | 25.5 ± 4.3 |
| Chest Circumference (cm) | 91.4 ± 11.5 |
| Waist-Hip Ratio | 0.89 ± 0.11 |




| **Figure 3**Histogram showing BMI distribution among participants (n=60). | **Figure 4** Scatter plot showing the relationship between BMI and age among participants (n=60). | **Figure 5** Box plot showing MUAC values among participants (n=60). |
|---|---|---|

**Biochemical Profile of Participants**

Biochemical research indicated changes in blood glucose, protein status, cholesterol, calcium, phosphorus, and vitamin D levels among subjects.

Several elderly patients reported higher blood glucose levels suggestive of poor glycemic control. Vitamin D insufficiency was regularly found, while fluctuations in blood protein levels may indicate reduced nutritional intake.

**Table 4:** Biochemical Parameters of Participants

| Parameter | Mean ± SD |
|---|---|
| J | 137.4 ± 28.6 |
| Total Protein (g/dL) | 7.0 ± 0.9 |
| Total Cholesterol (mg/dL) | 186.2 ± 42.7 |
| Calcium (mg/dL) | 9.1 ± 0.8 |
| Phosphorus (mg/dL) | 3.5 ± 0.6 |
| Vitamin D (ng/mL) | 29.8 ± 8.7 |

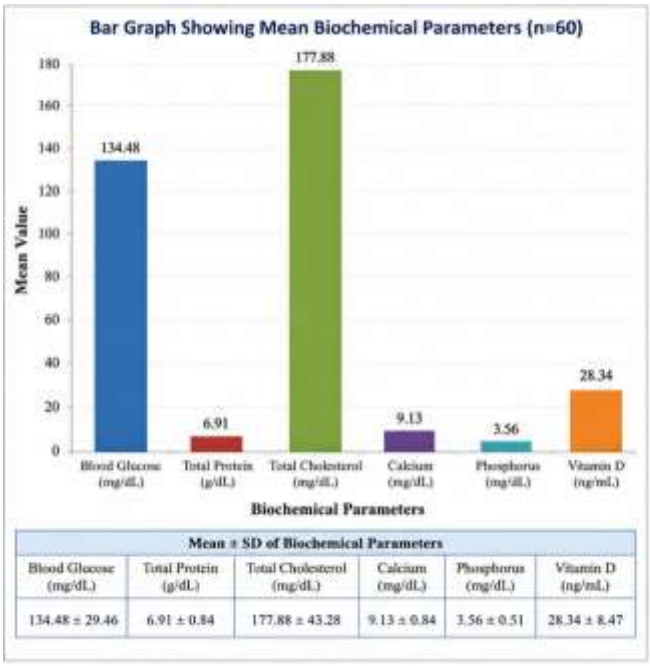



**Figure 6**Bar graph showing mean biochemical parameters among participants (n=60).

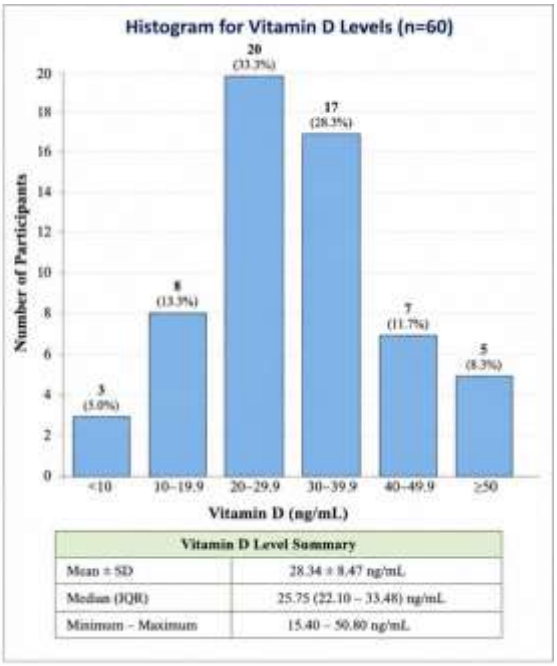



**Figure 7** Histogram showing distribution of vitamin D levels among participants (n=60).

**Table 5:** Association Between Physical Activity and BMI Category Among Participants (n=60)

| Physical Activity | Underweight (<18.5) | Normal (18.5–24.9) | Overweight (25–29.9) | Obese (≥30) | Total |
|---|---|---|---|---|---|
| Weekly thrice | 3 | 0 | 1 | 4 | 8 |
| Weekly twice | 1 | 2 | 2 | 7 | 12 |
| Weekly once | 3 | 4 | 3 | 2 | 12 |
| Daily <1 hr | 1 | 2 | 5 | 2 | 10 |
| Daily >1 hr | 2 | 6 | 5 | 5 | 18 |
| **Total** | **10** | **14** | **16** | **20** | **60** |

**Chi-square value ($\chi^2$) = 14.84, Degrees of freedom (df) = 12, p-value = 0.250 (Not Significant)**
**Interpretation**
No statistically significant association was observed between physical activity level and BMI category among the participants (p>0.05).

**Functional Assessment and Physical Activity**
Functional assessment demonstrated diversity in muscular strength and physical performance among subjects.[11]

Hand grip strength ratings ranged from 10 kg to 40 kg. Lower grip strength levels were more common among females and those with chronic diseases. Sit-to-stand test results also differed greatly.
Regarding physical exercise, daily activity for more than one hour was reported by a considerable proportion of participants, while some engaged in action just once or twice weekly.

**Table 6:** Functional Assessment of Participants

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| Physical Activity | Weekly thrice | 8 | 13.3 |
| | Weekly twice | 11 | 18.3 |
| | Weekly once | 12 | 20.0 |
| | Daily <1 hr | 12 | 20.0 |
| | Daily >1 hr | 17 | 28.4 |

**Dietary Pattern and Food Restrictions**
Dietary examination found that 51.7% of participants consumed vegetarian meals, while 48.3% followed non-vegetarian dietary habits.
Several subjects reported eating restrictions including low salt diet, low sugar diet, soft food, and vegetarian-only intake. Such limits were generally connected with chronic conditions such diabetes mellitus, hypertension, and kidney problems.

**Table 7:** Food Restrictions among Participants

| Food Restriction | Frequency | Percentage |
|---|---|---|
| Low salt | 8 | 13.3 |
| Low sugar | 10 | 16.7 |
| Soft food | 12 | 20.0 |
| Vegetarian only | 14 | 23.3 |
| None | 16 | 26.7 |

**DISCUSSION**
The present study investigated the prevalence of malnutrition and sarcopenia-related risk factors among older persons residing in selected old age facilities in urban Chennai. The findings demonstrated the presence of chronic diseases, nutritional imbalance, biochemical abnormalities, diminished physical performance, and dietary constraints among institutionalized older adults. The study also highlighted the dual burden of malnutrition, with the occurrence of both undernutrition and overweight/obesity among the subjects.
The demographic profile suggested that a bigger proportion of the participants were males and belonged to lower educational categories. Similar findings have been observed in studies with institutionalized aged people in India, where illiteracy and poor socioeconomic background were associated with reduced nutritional and health status.[11,12,13] Lower educational attainment may effect awareness of health, diet, and healthcare utilization. In addition, prolonged residence in old age homes may increase access to healthcare and supportive services, while social isolation and dependency may still harm overall wellbeing.[15,16]
A high frequency of chronic disorders was reported among the individuals. Diabetes mellitus, hypertension, kidney illness, thyroid diseases, anemia, arthritis, and history of COVID-19 were frequently mentioned. The increasing burden of non-communicable diseases among senior adults considerably affects nutritional status, physical functioning, and quality of life. The coexistence of various illnesses may contribute to malnutrition and sarcopenia through lower appetite, impaired food absorption, chronic inflammation, drug effects, and decreased physical activity. Similar observations have been found in geriatric research conducted in institutional settings.[17]
Anthropometric parameters such as BMI, MUAC, chest circumference, and waist-hip ratio revealed various degrees of dietary imbalance among the subjects. Both low and increased BMI values were detected, demonstrating the coexistence of undernutrition and obesity among institutionalized older persons. Reduced BMI and MUAC may indicate muscle wasting and protein-energy deficiency, whereas elevated BMI and waist-hip ratio are related with increased risk of metabolic diseases and cardiovascular problems.[18,19] These findings are comparable with earlier research conducted among senior people staying in long-term care institutions.
Biochemical markers offered additional data regarding the dietary and metabolic status of the subjects. Elevated blood glucose levels were reported among some senior adults, which coincides with the high prevalence of diabetes mellitus in the study population. Reduced blood protein levels among some participants may indicate inadequate protein consumption and increased risk of sarcopenia and frailty. Vitamin D insufficiency was also widespread, presumably due to diminished sunshine exposure, limited outdoor activity, low food intake, and age-related metabolic changes. Similar findings have been documented in institutionalized geriatric groups.[20]
Functional deterioration was another key finding of the present investigation. Hand grip strength evaluation indicated variable levels of muscle strength and physical performance across subjects. Reduced hand grip strength is considered a key indicator of sarcopenia, frailty, disability, and mortality among older persons.[21] Participants with lower levels of physical activity demonstrated poorer functional performance, underscoring the importance of regular exercise and mobility in maintaining muscle mass, independence, and general quality of life in senior adults.

Dietary patterns and food restrictions also influenced the nutritional status of the subjects. Many older adults followed modified diets such as low-salt, low-sugar, vegetarian, and soft diets for disease management. Although therapeutic dietary adjustments are important in geriatric care, excessive dietary restrictions may diminish dietary diversity and nutrient intake, hence raising the risk of malnutrition. The regular use of soft diets may also imply chewing difficulty, swallowing problems, poor dentition, or other age-related oral health disorders typically encountered in older adults.[22]

Thus, the findings of the present study show the complicated link between aging, chronic diseases, nutritional inadequacies, lower physical activity, and functional deterioration among institutionalized older adults. The confluence of malnutrition and sarcopenia-related risk factors underscores the necessity for complete geriatric assessment and multidisciplinary care in old age facilities. Regular nutritional evaluation, tailored dietary management, physical rehabilitation programs, biochemical monitoring, and integrated healthcare services are needed to improve the nutritional and functional welfare of senior inhabitants.

## CONCLUSION

The present study investigated the prevalence of malnutrition and sarcopenia among older persons residing in selected old age homes in urban Chennai using demographic, anthropometric, biochemical, clinical, nutritional, and functional assessment parameters. The data indicated that institutionalized older adults are especially sensitive to dietary imbalance, chronic diseases, diminished muscle strength, and functional decline.

Anthropometric measurements demonstrated the coexistence of undernutrition and overweight/obesity, indicating a twofold burden of malnutrition among the individuals. Functional measures such as hand grip strength and sit-to-stand performance revealed diminished muscular function and elevated sarcopenia risk among numerous senior people. Biochemical research also found anomalies in blood glucose, serum protein, cholesterol, and vitamin D levels, showing poor nutritional and metabolic health.

The study also discovered a significant prevalence of comorbidities including diabetes mellitus, hypertension, renal illness, thyroid problems, anemia, arthritis, and history of COVID-19, all of which may severely influence nutritional status and quality of life. Dietary limitations and modified dietary patterns, although medically required, may further lead to poor nutritional intake among senior adults.

Thus, the study reveals the enormous burden of malnutrition and sarcopenia-related risk factors in institutionalized older adults. Early nutritional screening, individualized dietary counselling, regular physical activity, biochemical monitoring, and multidisciplinary geriatric healthcare interventions are essential to improve nutritional status, muscle health, functional independence, and overall quality of life among elderly residents in old age homes.

## Conflict of Interest

The authors declare that there is no COI regarding the publication of this study.

## REFERENCES


1. Khan HT, Addo KM, Findlay H. Public health challenges and responses to the growing ageing populations. Public health challenges. 2024 Sep;3(3):e213.
2. Kolberg M, Paur I, Sun YQ, Gjøra L, Skjellegrind HK, Thingstad P, Strand BH, Selbæk G, Fagerhaug TN, Thoresen L. Prevalence of malnutrition among older adults in a population-based study-the HUNT Study. Clinical Nutrition ESPEN. 2023 Oct 1;57:711-7.
3. Lin CC, Ou HY, Hsu HY, Cheng KP, Hsieh TJ, Yeh CH, Su FC, Kuo LC. Beyond Sarcopenia: older adults with type II diabetes mellitus tend to experience an elevated risk of poor dynamic balance—a case–control study. BMC geriatrics. 2022 Feb 18;22(1):138.
4. Benz E, Pinel A, Guillet C, Capel F, Pereira B, De Antonio M, Pouget M, Cruz-Jentoft AJ, Eglseer D, Topinkova E, Barazzoni R. Sarcopenia and sarcopenic obesity and mortality among older people. JAMA network open. 2024 Mar 25;7(3):e243604.
5. Thampi K, Mathew LM. Aging in place for community-dwelling older adults in India: A qualitative exploration of prospects and challenges. Gerontology and Geriatric Medicine. 2024 Jan;10:23337214231223636.
6. Burholt V, Shoemark EZ, Maruthakutti R, Chaudhary A, Maddock C. Dignity and the provision of care and support in 'old age homes' in Tamil Nadu, India: a qualitative study. BMC geriatrics. 2022 Jul 14;22(1):577.
7. Fang H, Huang K, Guo Q, Yu D, Xu X, Ju L, Zhao L. Comparison study of food, energy and nutrient intake by 24-hour dietary recall method on two consecutive days versus three consecutive days. Wei Sheng yan jiu= Journal of Hygiene Research. 2024 Jul 1;53(4):519-26.
8. Peter RM, Logaraj M, Ramraj B. Association of comorbidities with activity of daily living (ADL) in a community-based sample of older adults in Tamil Nadu, India. Clinical Epidemiology and Global Health. 2022 May 1;15:101068.
9. Mohan V, Misra A, Bhansali A, Singh AK, Makkar B, Krishnan D, Chadha M, Shah P, Samaddar R, Saraogi10 RK, Bhattacharya11 S. Role and Significance of Dietary Protein in the Management of Type 2 Diabetes and Its Complications in India: An Expert. Journal of the Association of Physicians of India. 2023 Dec;71(12):37.
10. Hoogwerf BJ. Diabetes and Sarcopenia: Intersection of Co Morbid Conditions. OBM Geriatrics. 2025 Feb;9(1):1-23.
11. Wang X, Soh KG, Samsudin S, Deng N, Liu X, Zhao Y, Akbar S. Effects of high-intensity functional training on physical fitness and sport-specific performance among the athletes: A systematic review with meta-analysis. Plos one. 2023 Dec 8;18(12):e0295531.

12. Chew ST, Tey SL, Yalawar M, Liu Z, Baggs G, How CH, Cheong M, Chow WL, Low YL, Huynh DT, Tan NC. Prevalence and associated factors of sarcopenia in community-dwelling older adults at risk of malnutrition. BMC geriatrics. 2022 Dec 24;22(1):997.
13. Darroch P, O'Brien WJ, Mazahery H, Wham C. Sarcopenia prevalence and risk factors among residents in aged care. Nutrients. 2022 Apr 28;14(9):1837.
14. Sapthagiri TV, PATIL PB, PUJAR L, CHANNAL GP. Quality of life among institutionalized and non-institutionalized elderly: A comparative study. Journal of Farm Sciences. 2024 Mar 25;37(01):103-7.
15. Bertolazzi A, Quaglia V, Bongelli R. Barriers and facilitators to health technology adoption by older adults with chronic diseases: an integrative systematic review. BMC public health. 2024 Feb 16;24(1):506.
16. Zaidman, E. A., Scott, K. M., Hahn, D., Bennett, P., & Caldwell, P. H. (2023). Impact of parental health literacy on the health outcomes of children with chronic disease globally: A systematic review. *Journal of Paediatrics and Child Health*, *59*(1), 12-31.
17. Chang R, Chen TY, Wang SI, Hung YM, Chen HY, Wei CC. Risk of autoimmune diseases in patients with COVID-19: a retrospective cohort study. EClinicalMedicine. 2023 Feb 1;56.
18. Widiany FL, Metty M, Inayah I, Nurtyas M, Byo WO, Anggunita F, Pratama AB. Determinants of muscle mass in hemodialysis patients: the role of BMI, MUAC, and MAMC. Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition). 2025;14(1):11-8.
19. Crystal F, Fulai R, Kaonga P, Davenport A. Malnutrition, protein energy wasting and sarcopenia in patients attending a haemodialysis centre in sub-Saharan Africa. European Journal of Clinical Nutrition. 2024 Sep;78(9):818-22.
20. McCartney CR, McDonnell ME, Corrigan MD, Lash RW. Vitamin D insufficiency and epistemic humility: an endocrine society guideline communication. The Journal of Clinical Endocrinology & Metabolism. 2024 Aug;109(8):1948-54.
21. Szaflik P, Zadoń H, Michnik R, Nowakowska-Lipiec K. Handgrip strength as an indicator of overall strength and functional performance—systematic review. Applied Sciences. 2025 Feb 11;15(4):1847.
22. Mazza E, Ferro Y, Maurotti S, Micale F, Boragina G, Russo R, Lascala L, Sciacqua A, Gazzaruso C, Montalcini T, Pujia A. Association of dietary patterns with sarcopenia in adults aged 50 years and older. European Journal of Nutrition. 2024 Aug;63(5):1651-62.