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Original Article

A Comparative Community-Based Analysis of Malnutrition and Multi-Variable Risk Factors Among Urban and Rural Geriatric Cohorts in South India

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ABSTRACT

Background: Shifting global demographic patterns have caused an unprecedented expansion of the geriatric population, yet regional data on their nutritional security remain scarce. This study estimated, analyzed, and contrasted the prevalence and underlying multi-variable risk factors of malnutrition among urban and rural community-dwelling elderly individuals.

Materials and Methods: A community-based analytical cross-sectional study was conducted from January to April 2026 among 400 geriatric participants (N = 400; 200 urban, 200 rural) in Coimbatore, Tamil Nadu. Systematic multistage random sampling was deployed. Data collection utilized structured interviews, clinical inventories, anthropometric metrics, and the standardized Mini Nutritional Assessment (MNA). Multi-variable binary logistic regression determined adjusted prevalence ratios (aPR) with 95% confidence intervals (CI).

Results: The aggregate prevalence of "possible malnutrition" (malnourished + at-risk) was significantly higher among rural elderly (61.0%) than urban elderly (40.0%; $p < .001$). Multi-variable regression isolated key independent risk drivers across cohorts, including advanced age (≥ 80 years; urban aPR = 3.42, rural aPR = 2.68), living alone (urban aPR = 3.10, rural aPR = 2.45), low socioeconomic status (urban aPR = 2.65, rural aPR = 3.91), and multiple co-morbidities (≥ 2; urban aPR = 2.11, rural aPR = 2.04). Rural malnutrition was additionally driven by financial dependency (aPR = 2.78), dental issues (aPR = 2.54), and chemosensory loss (aPR = 2.30). Literacy exerted strong protective effects across both settings ($p < .05$).

Conclusion: Geriatric malnutrition is highly prevalent, with a disproportionately heavy burden falling on the rural sector. Addressing this challenge requires integrating standardized nutritional screening into primary care, enhancing financial and food security safety nets, and resolving correctable sensory and dental impairments to support healthy aging.

Keywords: Geriatric Assessment; Malnutrition; Nutrition Assessment; Rural Population; Urban Population; Socioeconomic Factors.

INTRODUCTION

The concept of malnutrition is formally defined as a pathological state stemming from an absolute or relative deficiency, or conversely, an excess, of one or more vital nutrients [1]. This condition broadens into four distinct clinical manifestations: undernutrition, overnutrition, nutrient imbalance, and specific micronutrient deficiencies. While global and national health paradigms have historically channeled substantial infrastructure and funding toward maternal health, neonatal outcomes, and the control of communicable diseases, the nutritional and general health status of the rapidly expanding geriatric cohort has frequently failed to receive commensurate policy consideration [2]. Because an individual's nutritional status profoundly modulates cellular immunity and directly influences functional capacity, mobility, and structural autonomy, it represents a foundational pillar of geriatric care that demands rigorous investigation [3].

Demographic landscapes are shifting dramatically across the globe. Estimates indicate that the aggregate number of elderly individuals will cross the 1.2 billion thresholds, with an overwhelming 840 million residing within low- and middle-income nations [4]. This rapid demographic transition introduces an intricate array of public health, societal, and economic hurdles, including diminished or non-existent personal income streams to support daily living, a lack of institutionalized social security systems, a perceived erosion of social standing, and a deficit of structural avenues for meaningful engagement [5]. Consequently, the World Health Organization underscores that the health and physical resilience of the aging demographic will serve as a primary benchmark in defining the overall health index and development status of nations in the coming decades [6].

Older adults are inherently predisposed to nutritional vulnerabilities driven by an interplay of age-associated physiological reductions, progressive sensory and cognitive declines, restricted financial autonomy, and inconsistent physical access to balanced food options [7]. In developing countries like India, the true epidemiological magnitude of geriatric malnutrition remains significantly underreported. Because robust, region-specific data is often lacking, public health dietary interventions continue to be disproportionately oriented toward pediatric populations and pregnant or lactating women, inadvertently neglecting the unique physiological demands of the elderly [8]. Unmasking and documenting the localized burden of nutritional deficits is vital; identifying these gaps allows clinicians and policymakers to design targeted, easily implementable corrective strategies that can radically preserve functional capacity and elevate overall quality of life [9].
The Mini Nutritional Assessment (MNA) has proven to be a highly reliable, globally validated, and sensitive screening instrument specifically designed to identify malnutrition and latent risk states within community-dwelling geriatric populations [10]. Uncovering the exact sociodemographic, functional, and health-related risk profiles that undermine nutritional stability provides clinicians with actionable insights to deploy precise preventive countermeasures. While historical data from disparate zones highlights varying rates of nutritional depletion, substantial discrepancies persist between urban and rural cohorts due to differences in access, socio-cultural practices, and economic dependencies [11]. Accordingly, this community-based analytical study was designed to estimate, analyze, and contrast the precise prevalence and underlying risk factor distribution of geriatric malnutrition across the urban and rural field practice locations of Coimbatore, Tamil Nadu.

MATERIALS AND METHODS

Study Setting: This community-based analytical, cross-sectional study was undertaken to evaluate the nutritional status of the elderly population. The study was conducted across the urban and rural field practice areas attached to the Department of Community Medicine, Coimbatore Medical College, Coimbatore, Tamilnadu. The study was conducted from January 2026 to April 2026.

Study Participants: The study cohort comprised elderly individuals aged 60 years and above who were permanent residents of the selected urban wards and rural villages within the institutional field practice boundaries. Inclusion criteria were community-dwelling individuals aged more than 60 years who voluntarily provided written informed consent to participate in the study. Individuals who were untraceable or unavailable at their households across three distinct consecutive home visits were excluded from enrollment. Furthermore, individuals experiencing severe cognitive impairment, acute psychiatric illness, or critical medical emergencies that precluded a reliable face-to-face interview were excluded.

Sample Size: The sample size determination was done using historical epidemiological data from regional studies using standard hypothesis testing formulas for the difference between two independent proportions. Based on a documented geriatric malnutrition prevalence of 19.47% in urban Coimbatore [12] and an estimated rural prevalence of 28.4% in similar southern Indian settings [13], the minimum calculated sample size was determined to be 357 participants. To mitigate potential data loss from non-response, incomplete records, or dropouts, a 10% non-response buffer was integrated, establishing a target of 400 elderly participants with 200 in urban, and another 200 in rural settings.

Sampling Technique: A systematic, multistage random sampling technique was deployed to select eligible respondents. In the first stage, simple random sampling via a lottery method without replacement was utilized to select four distinct

wards from the urban field practice registry and four distinct villages from the rural field practice registry. In the second stage, a comprehensive sampling frame of geriatric residents within these selected clusters was extracted from the localized Auxiliary Nurse Midwife (ANM) records. Eligible participants were then allocated across the chosen urban and rural sectors utilizing the population proportionate to size (PPS) method, followed by simple random sampling within each cluster to pinpoint individual households for enrollment.

Study Tools: Data collection was facilitated through a comprehensive, structured, and pre-tested interviewer-administered questionnaire consisting of distinct, standardized modules:

- **Sociodemographic and Clinical Profile:** This component captured descriptive details including unique identification tracking numbers, chronological age, biological gender, formal literacy status, occupational history, primary income sources, monthly household income, total family size, structural living arrangements, marital status, and long-term financial dependency profiles.
- **Morbidity and Lifestyle Inventory:** This section documented verified medical histories and chronic co-morbidities based on formal clinical diagnoses made by registered medical practitioners. It also tracked active daily oral medication usage, tobacco consumption patterns, and sensory impairments.
- **Mini Nutritional Assessment (MNA):** A validated, standardized screening instrument specifically optimized for geriatric cohorts. The tool comprehensively evaluated dietary habits, mobility variations, psychological distress, body mass index (BMI), and basic anthropometric indicators to categorize nutritional standing.

Study Procedure: Data collection was done through systematically conducted face-to-face personal interviews held within the private households of the selected participants. Each targeted household was visited up to a maximum of three separate occasions before classifying a resident as a non-respondent. The interviews were conducted in an empathetic, unhurried manner, typically requiring 15 to 20 minutes per individual.

Following the interview, standard anthropometric evaluations were carried out using meticulously calibrated equipment. Body weight was recorded twice using a standardized digital weighing scale, and the average value was utilized for final calculations. In individuals where direct standing height could not be optimally measured, arm span measurements were taken twice to ensure precision. Additional metrics—including Mid-Arm Circumference (MAC), Mid-Calf Circumference (MCC), waist circumference, and hip circumference—were assessed to the nearest 0.1 cm using a high-quality, non-stretchable measuring tape, taking the average of the right and left sides for analytical integration. A body mass index (BMI) threshold of <19 kg/m^2 was utilized as an auxiliary marker for undernutrition.

Ethical Issues: The study was conducted after getting approval from the Institutional Ethical Committee. Prior to data collection, the clear objective, confidentiality, and voluntary nature of the study were explicitly explained to the participants in their vernacular language. Written informed consent was obtained from every willing participant.

Statistical Analysis: Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 27. Descriptive parameters were expressed as means accompanied by standard deviations for continuous metrics, and as absolute frequencies with corresponding percentages for categorical parameters. Nutritional status derived from the MNA scores was dichotomized into distinct classifications (possible malnourished vs. well-nourished) to enhance analytical power. Bivariate associations between the independent socioeconomic, somatic, and behavioral factors and the primary outcome were evaluated using the Chi-square test. To control for potential confounding variables and isolate true independent associations, factors exhibiting statistical significance in the univariate screening were entered into a robust binary logistic regression model. The results are presented as unadjusted prevalence ratios (PR) and adjusted prevalence ratios alongside their corresponding 95% confidence intervals (CI). A two-tailed p-value of <0.05 was considered as statistical significance.

RESULTS

The overall mean age of the composite sample was 69.42 ± 6.38 years. The mean age of the urban cohort was 68.91 ± 6.12 years, which did not differ significantly from the rural cohort mean age of 69.93 ± 6.60 years ($t(398) = -1.60$, $p = .110$). Socioeconomic and demographic variations between the two cohorts were pronounced. Females represented 53.0% ($n = 106$) of the urban population and 57.5% ($n = 115$) of the rural population. Illiteracy was substantially more prevalent in the rural sector (58.5%, $n = 117$) than in the urban sector (33.5%, $n = 67$), a disparity that was highly significant ($\chi^2(1) = 25.13$, $p < .001$). The comprehensive distribution of baseline profiles across both study arms is presented in Table 1.

Table 1. Socio-Demographic and Socioeconomic Distribution of the Study Participants ($N = 400$)

Variable	Urban Sector (n = 200)		Rural Sector (n = 200)	
	N	%	N	%
Age Group (Years)				
60–69	114	57.0	102	51.0

70–79	62	31.0	66	33.0
≥ 80	24	12.0	32	16.0
Mean ± SD (Years)	68.91 ± 6.12	-	69.93 ± 6.60	-
Gender				
Male	94	47.0	85	43.0
Female	106	53.0	115	57.5
Educational Status				
Literate	133	66.5	83	41.5
Illiterate	67	33.5	117	58.5
Employment Status				
Employed / Active	55	27.5	42	21.0
Unemployed / Retired	145	72.5	158	79.0
Socioeconomic Status				
Upper & Upper-Middle	44	22.0	21	10.5
Middle	77	38.5	54	27.0
Lower-Middle & Lower	79	39.5	125	62.5
Marital Status				
Married	148	74.0	132	66.0
Widowed / Separated / Single	52	26.0	68	34.0
Living Arrangement				
With Spouse / Family	177	88.5	162	81.0
Alone	23	11.5	38	19.0
Financial Dependency				
Independent	122	61.0	74	37.0
Partially / Fully Dependent	78	39.0	126	63.0

Somatic health metrics, sensory profiles, and medication trends are comprehensively detailed in Table 2. Chronic co-morbidities were highly prevalent across the geographic cohorts; the presence of two or more diagnosed clinical conditions was observed in 34.5% ($n = 69$) of urban participants and 41.5% ($n = 83$) of rural participants. Polypharmacy, characterized by the active daily consumption of three or more oral medications, was present in 19.5% ($n = 39$) of urban and 24.0% ($n = 48$) of rural subjects.

Objective physical examination parameters showed that the mean Body Mass Index (BMI) for the urban elderly was 22.45 ± 3.82 kg/m², whereas the rural elderly exhibited a significantly lower mean BMI of 20.88 ± 4.11 kg/m² ($t(398) = 3.96$, $p < .001$). The mean Mid-Arm Circumference (MAC) was significantly lower in rural participants (23.14 ± 2.88 cm) than in urban participants (24.81 ± 3.12 cm; $p < .001$), and the mean Mid-Calf Circumference (MCC) followed an identical significant reduction in the rural cohort (28.92 ± 3.05 cm vs. 30.65 ± 3.41 cm; $p < .001$).

Sensory and mechanical structural impairments were widely reported. Visual impairment was present in 48.5% ($n = 97$) of urban and 56.0% ($n = 112$) of rural elderly. Functional dependency was twice as high in rural areas (26.5%, $n = 53$) compared to urban sectors (13.0%, $n = 26$; $p < .001$).

Table 2. Somatic, Lifestyle, and Anthropometric Profiles of the Study Participants ($N = 400$)

Variable	**Urban (n = 200)**		**Rural (n = 200)**	
	n	%	n	%
Chronic Co-morbidities				
Nil	56	28.0	41	20.5
1 Condition	75	37.5	76	38.0
≥ 2 Conditions	69	34.5	83	41.5
Daily Oral Medications				
< 3 Medications	161	80.5	152	76.0
≥ 3 Medications	39	19.5	48	24.0
Tobacco Use				
Never User	158	79.0	122	61.0
Past / Current User	42	21.0	78	39.0
Visual Impairment				
No	103	51.5	88	44.0
Yes	97	48.5	112	56.0

Dental / Masticatory Problems				
No	124	62.0	91	45.5
Yes	76	38.0	109	54.5
Household Activity Autonomy				
Independent	174	87.0	147	73.5
Dependent / Restricted	26	13.0	53	26.5
Dietary Salt Reduction Due to Illness				
No	146	73.0	121	60.5
Yes	54	27.0	79	39.5
Loss of Taste/Smell Sensation Affecting Diet				
No	178	89.0	154	77.0
Yes	22	11.0	46	23.0
Anthropometric Summary Metric	Mean ± SD	-	Mean ± SD	-
Body Mass Index (kg/m²)	22.45 ± 3.82	-	20.88 ± 4.11	-
Mid-Arm Circumference (cm)	24.81 ± 3.12	-	23.14 ± 2.88	-
Mid-Calf Circumference (cm)	30.65 ± 3.41	-	28.92 ± 3.05	-

The primary nutritional outcome was dichotomized into "Possible Malnutrition" (malnourished + at risk) and "Well-Nourished". The aggregate prevalence of possible malnutrition was 40.0% ($n = 80$) in the urban sector and 61.0% ($n = 122$) in the rural sector, revealing a highly significant operational disparity ($\chi^2(1) = 17.64$, $p < .001$). This operational comparison is detailed in Table 3.

Table 3. Comparison of Nutritional Status and Dichotomized MNA Profiles ($N = 400$)

Nutritional Framework Class	**Urban (n = 200)**		**Rural (n = 200)**		**p-value**
	n	%	n	%	
Standard MNA Classification					
Normal Nutritional Status	120	60.0	78	39.0	
At Risk of Malnutrition	52	26.0	73	36.5	
Malnourished	28	14.0	49	24.5	
Dichotomized Analytical Grouping					<.001*
Well-Nourished	120	60.0	78	39.0	-
Possible Malnutrition	80	40.0	122	61.0	-

Note. Possible Malnutrition = At Risk + Malnourished. $p < .05$.

Univariate screening using the Chi-square test explored the associations between covariates and the dichotomized nutritional outcome separately within each setting (details provided in the original text). All significant factors ($p < .05$) from bivariate analysis were entered into separate multivariate binary logistic regression models for urban and rural cohorts. The unadjusted prevalence ratios (PR) and adjusted prevalence ratios (aPR) with 95% confidence intervals are displayed in Table 4 (Urban) and Table 5 (Rural).

Table 4. Predictors of Possible Malnutrition Among Urban Geriatric Participants (n = 200): Logistic Regression

Predictor Variable	**Unadjusted PR (95% CI)**	**Adjusted PR (95% CI)**
Age Group (Years)		
60–69	1.00 [Reference]	1.00 [Reference]
70–79	2.12 [1.28, 3.51]*	1.78 [1.02, 3.11]*
≥ 80	4.65 [2.55, 8.48]*	3.42 [1.74, 6.72]*
Gender		
Male	1.00 [Reference]	-
Female	1.74 [1.11, 2.73]*	1.32 [0.81, 2.15]
Educational Status		
Illiterate	1.00 [Reference]	1.00 [Reference]
Literate	0.28 [0.16, 0.49]*	0.38 [0.18, 0.80]*
Socioeconomic Status		
Upper & Upper-Middle	1.00 [Reference]	1.00 [Reference]
Middle	1.82 [1.05, 3.15]*	1.48 [0.82, 2.67]
Lower-Middle & Lower	3.14 [1.88, 5.24]*	2.65 [1.44, 4.88]*
Living Arrangement		
With Spouse / Family	1.00 [Reference]	1.00 [Reference]

Alone	4.52 [2.40, 8.52]*	3.10 [1.55, 6.20]*
Chronic Co-morbidities		
Nil / 1 Condition	1.00 [Reference]	1.00 [Reference]
≥ 2 Conditions	2.88 [1.72, 4.82]*	2.11 [1.18, 3.77]*
Daily Oral Medications		
< 3 Medications	1.00 [Reference]	-
≥ 3 Medications	2.44 [1.38, 4.31]*	1.54 [0.80, 2.96]
Visual Impairment		
No	1.00 [Reference]	1.00 [Reference]
Yes	2.10 [1.32, 3.34]*	1.82 [1.03, 3.22]*
Dental / Masticatory Problems		
No	1.00 [Reference]	-
Yes	1.84 [1.14, 2.97]*	1.28 [0.74, 2.22]
Dietary Salt Reduction Due to Illness		
No	1.00 [Reference]	1.00 [Reference]
Yes	2.28 [1.41, 3.68]*	1.95 [1.08, 3.52]*

Note. PR = Prevalence Ratio. $p < .05$.

Table 5. Predictors of Possible Malnutrition Among Rural Geriatric Participants (n = 200): Logistic Regression

Predictor Variable	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Age Group (Years)		
60–69	1.00 [Reference]	1.00 [Reference]
70–79	2.34 [1.44, 3.80]*	1.92 [1.11, 3.32]*
≥ 80	3.88 [1.92, 7.84]*	2.68 [1.33, 5.40]*
Educational Status		
Illiterate	1.00 [Reference]	1.00 [Reference]
Literate	0.31 [0.18, 0.53]*	0.48 [0.24, 0.96]*
Socioeconomic Status		
Upper & Upper-Middle	1.00 [Reference]	1.00 [Reference]
Middle	2.84 [1.32, 6.11]*	2.14 [0.94, 4.88]
Lower-Middle & Lower	5.12 [2.54, 10.32]*	3.91 [2.12, 7.21]*
Living Arrangement		
With Spouse / Family	1.00 [Reference]	1.00 [Reference]
Alone	3.54 [1.74, 7.21]*	2.45 [1.26, 4.77]*
Financial Dependency		
Independent	1.00 [Reference]	1.00 [Reference]
Partially / Fully Dependent	3.82 [2.21, 6.60]*	2.78 [1.48, 5.22]*
Chronic Co-morbidities		
Nil / 1 Condition	1.00 [Reference]	1.00 [Reference]
≥ 2 Conditions	2.62 [1.58, 4.34]*	2.04 [1.14, 3.65]*
Daily Oral Medications		
< 3 Medications	1.00 [Reference]	-
≥ 3 Medications	2.94 [1.52, 5.68]*	1.62 [0.77, 3.41]
Visual Impairment		
No	1.00 [Reference]	1.00 [Reference]
Yes	2.54 [1.58, 4.08]*	1.94 [1.11, 3.39]*
Dental / Masticatory Problems		
No	1.00 [Reference]	1.00 [Reference]
Yes	3.12 [1.94, 5.02]*	2.54 [1.38, 4.67]*
Household Activity Autonomy		
Independent	1.00 [Reference]	-
Dependent / Restricted	2.68 [1.44, 4.99]*	1.41 [0.70, 2.84]
Dietary Salt Reduction Due to Illness		
No	1.00 [Reference]	-
Yes	2.14 [1.32, 3.47]*	1.38 [0.79, 2.41]
Loss of Taste/Smell Sensation Affecting Diet		
No	1.00 [Reference]	1.00 [Reference]
Yes	3.10 [1.60, 6.01]*	2.30 [1.08, 4.90]*

Note. PR = Prevalence Ratio. $p < .05$.

DISCUSSION

This community-based cross-sectional analytical study reveals a high burden of geriatric malnutrition and illuminates the distinct public health imbalances between urban and rural field practice locations in Coimbatore, Tamil Nadu. By utilizing the validated Mini Nutritional Assessment (MNA) tool, this investigation found that the aggregate prevalence of explicit malnutrition was significantly higher among rural elderly participants (24.5%) than among urban participants (14.0%), while the broader operational classification of "possible malnutrition" encompassing both overt depletion and latent risk reached a striking 61.0% in rural environments compared to 40.0% in urban configurations.

The observed rural-urban cleavage in nutritional status aligns with previous national and regional epidemiological assessments. The higher vulnerability of the rural elderly can be tied to a cluster of socio-demographic and economic disadvantages documented during field profiling. For instance, illiteracy was remarkably higher in the rural sector (58.5%) than in the urban areas (33.5%). Similarly, lower or lower-middle socioeconomic standing gripped 62.5% of rural participants compared to 39.5% of the urban sample [14].

Lower formal education limits personal understanding of balanced macro- and micronutrient selections, while constrained household incomes prevent individuals from purchasing high-quality, protein-dense food items, fresh fruits, and essential vegetables. The resulting reliance on monotonous, carbohydrate-heavy, low-cost staple items frequently accelerates progress from subclinical micro-depletions to overt clinical malnutrition [15].

When subjected to multi-variable binary logistic regression modeling, several factors remained independently associated with poor nutritional outcomes, though their exact impact varied by geographic setting. Advanced chronological age emerged as a universal, non-modifiable risk driver. In urban models, individuals aged ≥ 80 years exhibited a more than three-fold higher likelihood of possible malnutrition (aPR = 3.42, 95% CI [1.74, 6.72]), an effect tracking closely with the elevated risk seen in the rural cohort (aPR = 2.68). This uniform decline across the age continuum reflects progressive physiological shifts, including gastric atrophy, reduced secretion of digestive enzymes, dentition loss, and an altered basal metabolic rate [16].

Socioeconomic status acted as the single most critical independent risk driver in rural areas, where lower/lower-middle class status increased the probability of possible malnutrition nearly four-fold (aPR = 3.91, 95% CI [2.12, 7.21]). This powerful association highlights the impact of financial instability in rural settings, which are often characterized by seasonal agricultural work, minimal personal savings, and limited access to institutionalized welfare or social security programs [17].

This financial vulnerability is further compounded by absolute financial dependency, which stood as a powerful independent predictor among rural participants (aPR = 2.78, 95% CI [1.48, 5.22]). When an older adult relies entirely on family members for financial support, their personal dietary and medical needs are frequently sidelined, especially within households facing deep financial constraints. Conversely, achieving or maintaining formal literacy served as a strong protective factor against nutritional decline in both urban (aPR = 0.38) and rural (aPR = 0.48) groups, confirming that formal education supports nutritional autonomy [18].

Social architecture and domestic living arrangements also heavily influenced nutritional health. Living alone was strongly associated with possible malnutrition in both urban (aPR = 3.10, 95% CI [1.55, 6.20]) and rural (aPR = 2.45, 95% CI [1.26, 4.77]) settings. This highlights the psychological and mechanical toll of social isolation [19].

Older individuals living alone often struggle with logistically demanding tasks like sourcing raw ingredients and preparing balanced meals daily. Additionally, the lack of family social interaction can lead to depressive symptoms and loneliness, which naturally lower appetite and interest in food. This breakdown of the traditional multi-generational family structure, a trend increasingly noted across both urban and rural India, removes a key protective shield for geriatric health [20].

Clinical and somatic health variables also showed a strong independent relationship with nutritional decline. The presence of multiple chronic co-morbidities (≥ 2 conditions) significantly increased the risk of malnutrition in both urban (aPR = 2.11) and rural (aPR = 2.04) settings. Chronic diseases like diabetes, hypertension, cardiovascular disease, osteoarthritic conditions, and respiratory illnesses trigger systemic, low-grade inflammatory states that alter metabolic path-dynamics, boost protein breakdown, and disrupt normal nutrient absorption [21].

Furthermore, handling multiple chronic illnesses often leads to polypharmacy, which can cause drug-nutrient interactions, chronic nausea, altered bowel habits, and a suppressed appetite. In urban participants, an independent association was also

found with mandatory dietary salt restrictions (aPR = 1.95, 95% CI [1.08, 3.52]). This finding shows that strict, unpalatable therapeutic diets can inadvertently reduce overall food intake by making meals less enjoyable [22].

Sensory and mechanical structural impairments acted as critical physical barriers to maintaining sound nutritional status. Visual impairment remained significantly associated with possible malnutrition across both urban (aPR = 1.82) and rural (aPR = 1.94) populations. Vision loss compromises a person's physical autonomy, making it difficult to safely navigate kitchens, cook meals, or independently shop for groceries [23].

Additionally, structural dental and masticatory issues were a strong independent predictor for the rural elderly (aPR = 2.54, 95% CI [1.38, 4.67]). Severe tooth loss, poorly fitting dentures, or untreated periodontal diseases limit an individual's mechanical ability to chew firm, nutrient-dense foods like meats, raw vegetables, and fruits. This physical limitation often forces a shift toward soft, easily swallowable carbohydrate alternatives that lack essential micronutrients. This mechanical barrier was further aggravated in rural cohorts by a self-reported loss of taste or smell sensations (aPR = 2.30, 95% CI [1.08, 4.90]), which blunts the sensory appeal of food and reduces the hedonic drive to eat [24].

Anthropometric measurements confirmed the trends seen in the MNA profiling. The mean BMI of the rural cohort (20.88 ± 4.11 kg/m²) was significantly lower than that of the urban sample (22.45 ± 3.82 kg/m²). Auxiliary metrics like Mid-Arm Circumference (MAC) and Mid-Calf Circumference (MCC) also dropped significantly within the rural arm. These patterns validate the MNA results and show that low body mass, skeletal muscle wasting, and subcutaneous fat depletion are widespread among the rural elderly [25].

This study possesses notable institutional strengths, including a community-based design, a comparative urban-rural framework, and the use of the internationally validated MNA screening tool. However, certain limitations must be acknowledged. The cross-sectional design prevents the drawing of direct causal conclusions regarding the identified risk factors. Additionally, data regarding medical histories, financial status, and dietary variations relied partly on self-reported answers, introducing potential recall or social desirability bias.

CONCLUSION

The study findings highlight the urgent need to look beyond child- and maternal-focused nutrition programs and establish comprehensive, targeted geriatric nutritional policies. Integrating the MNA tool into routine primary healthcare assessments via auxiliary nurse midwives (ANMs) and primary health centers could enable early detection and timely support for at-risk older adults.

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