

It's Time to Invest in Geriatric Nutrition: A Systematic Review

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ABSTRACT

Introduction: Nutrition in the elderly can affect immunity as well as functional abilities, making it a significant domain in this age group. The current study is designed with the objective of highlighting nutritional problems and their association with different factors among the elderly in India.

Methods: The literature search was conducted using PubMed, Medline, PubMed Central, and citation tracing, which provide access to full-text research articles published during the last 15 years.

Result: A total of 1040 studies were identified, and 19 studies were included in the review. Lifestyle (inadequate intake of food, including vegetables and fruits), somatic (presence of comorbidity, more than three medication uses, psychological stress, chewing problems), functional (ADL/IADL dependency), and social (low socio-economic status, low education, single living, unemployment, older age) risk factors were found to be associated with malnutrition among the elderly in India.

Conclusion: The burden of malnutrition and 'at risk of malnutrition' is very high, which may cover more than half of the elderly population and affect their quality of life. A multi-disciplinary approach, including nutritional screening, early diagnosis and treatment, and interventional dietary approaches, should be planned with sustainability assurance to ensure their healthy ageing.

Key words: Elderly, malnutrition, nutritional status, risk factors, healthy ageing

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INTRODUCTION

The world is witnessing the greying of society due to an increase in life expectancy and a low fertility rate. The WHO estimates that the number of elderly people will reach 1.2 billion by 2025.¹ India, too, facing the same situation, is seeing an increase in the number of elderly, with about 7.7% of the total population being elderly.² The high old-age dependency ratio reflects the high demand of care & support from working adults.³ As we all know, elderly is the most vulnerable group and depends on the young caretaker due to physical restriction & social restriction. A variety of factors influence their health and vulnerability, including nutritional consumption, chronic illness, social support, and so on.⁴ Therefore, we need to prepare society to tackle the fundamental problems of population ageing, mainly related to their psychological conditions & nutrition, to enhance their healthy ageing. Nutrition in the elderly can affect immunity as well as functional abilities, making it a significant domain in this age group.⁵ Malnutrition is always overlooked by the clinician even though mortality and morbidity rate is high in malnourished elderly.⁶ Malnutrition can lead to an increased rate of hospitalization & remain untreated.⁷

The nutritional status of the geriatric population is an important domain to evaluate their ageing status. The vicious cycle of malnutrition and chronic diseases in the elderly can affect their quality of life. Malnutrition can worsen the existing disease, while chronic disease affects the appetite, which can lead to malnutrition.⁸ Therefore, malnutrition affects the quality of life of elderly people by affecting physical activities and precipitating mental stress, which leads to socio-emotional distress.⁹ More research is needed to understand the ageing population and to provide opportunities for their betterment. Countries like the UK, China, Taiwan and European countries have done many studies on the geriatric population. In India, there are several domains in the subject of geriatrics that need more study.¹⁰ Different studies have been conducted in different parts of India and highlighted the burden of malnutrition among the elderly in India as well as the predictors. However, research on combined malnutrition, its predictors, and health outcomes has not been systematically examined. There is a need to understand and tackle this vulnerable group's medical and nutritional issues, as well as encourage healthy ageing. As time changes, we need more customized services to cope up with the demands of the ageing population. The current study is designed with the objective to highlight nutritional problems and its association with different factors among the elderly. The study will help to identify the facilitators and barriers of the nutrition of the elderly. There is a need to understand and tackle this vulnerable group's medical and socioeconomic issues, as well as encourage healthy ageing. This study will throw light on the nutritional deprivation of the elderly living in India.

This systematic review was conducted to assess the nutritional status of the elderly, estimate the prevalence of malnutrition among the elderly in India and, evaluate the risk factors and health outcomes associated with the malnutrition among the elderly in India.

METHODOLOGY

Study Design and search strategy: The literature search was conducted in PubMed, PubMed Central, Medline and manual search with citation tracing to identify relevant article published during last 15 years (2007-2022). Electronic search on PubMed/Medline database was conducted using advanced filters and we have used the following Medical Science Heading (MeSH) terms: ('aged' OR 'elderly' OR 'geriatric') AND ('malnutrition' OR 'nutrition' OR 'overweight' OR 'obesity' OR 'underweight') AND (India). Different combinations of above MeSH were used: (('aged' AND 'malnutrition') AND India), (('elderly' AND 'malnutrition') AND India), (('geriatric' AND 'malnutrition') AND India), (('geriatric' AND 'nutritional status') AND India), (('elderly' AND 'nutritional status') AND India) and so on.

The articles relevant by title and abstract were accessed in full text to check for eligibility criteria. Cross-referencing from all the selected articles were done to check for other similar articles. The search was conducted between 17/08/2022-05/05/2023 and the articles were managed using Mendeley software.

Population (P): Elderly aged ≥ 60 years of age

Outcome (O): Malnutrition including underweight, overweight and obesity

The electronic search engine was searched with keyword searching and using title and abstract word for each selected PO components. The keyword searching includes 'elderly, geriatric population, malnutrition, overweight, obesity, underweight, nutritional status, nutrition' with "AND" and "OR" were used to combine the searching terms as described above.

Study selection and inclusion criteria: This review included the studies that reported the prevalence of malnutrition of the elderly and its associated factors. Studies in English language and available full text were selected. The inclusion and exclusion criteria are given as follows (Fig 1):

Inclusion criteria: Studies with following characteristics were included in the review.

- Based on the Indian population
- Cross-sectional/ Prevalence-based studies
- MNA (Mini Nutritional Assessment), MNA-SF (Mini Nutritional Assessment- Short Form)¹¹ & Anthropometry tool for assessment of malnutrition and risk of malnutrition

- Study among all type of setting (hospital/clinic, community or old age homes)
- Studies published during the year 2007-2022 (15 years)

Exclusion criteria: Studies with following characteristics were excluded:

- The studies in which the nutritional assessment tool was not reported
- Data repeated in different studies
- Studies based on micronutrient deficiency/vitamin deficiency

Quality assessment and data extraction: After getting the findings from all the databases, the findings were exported to the Microsoft Excel sheet. The au-

thor independently extracted the data and reviewed the search studies. Any disagreement was handled by the third author. Two of the authors independently reviewed the studies for the inclusion and finally the agreement was reached through the discussion. The data extraction format primarily include: Authors name, publication year, study setting, sample size, study tool, prevalence and factors found in association with the nutritional status.

The outcome of interest: The primary outcome of the study was to assess the risk factors of the malnutrition among the elderly. The secondary outcome of interest was to identify the effects of malnutrition on their quality of life.

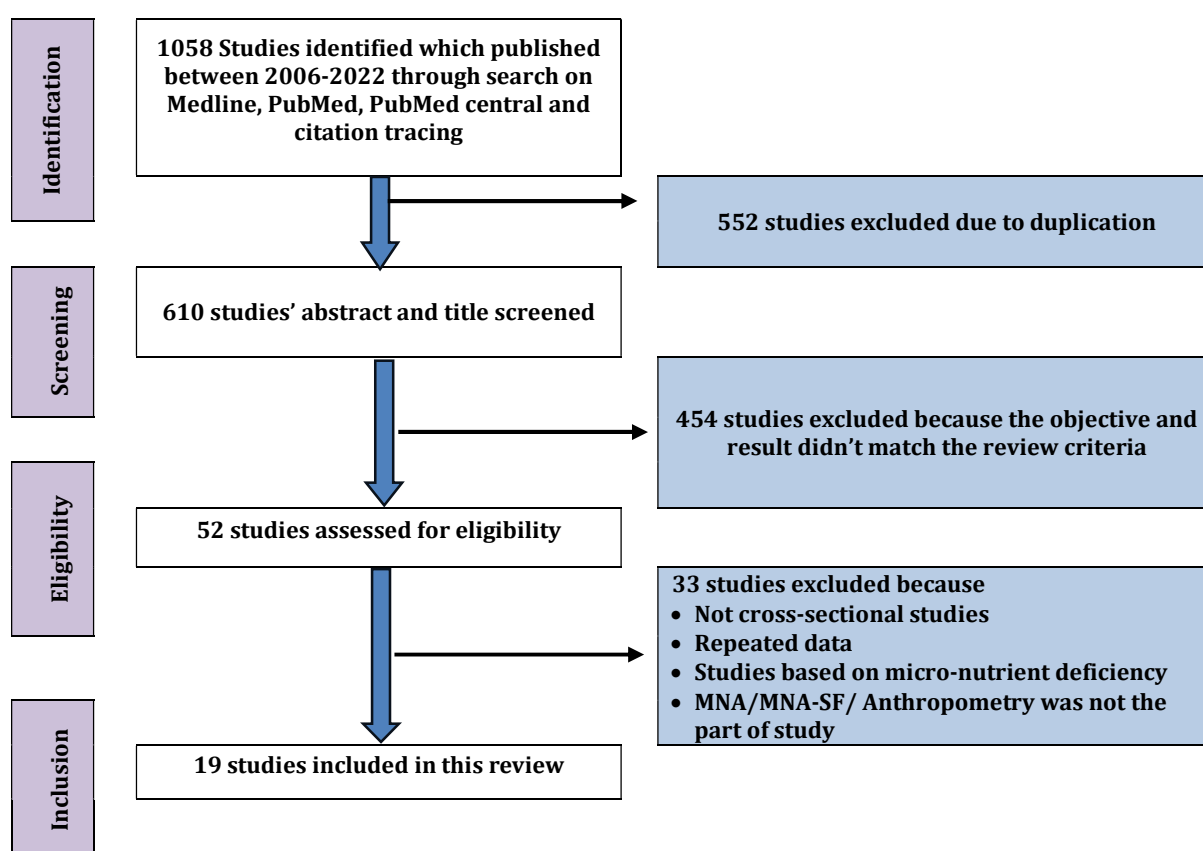


Figure 1: Flow diagram graphic selection of articles in review

RESULTS

Study Identification: 1058 studies were available using the search engines. Nearly half of the studies were identified as duplicates. Other half-studies were screened using titles and abstracts. 454 studies were excluded based on their titles and unmet objectives. 52 studies were found to be eligible, but 33 studies were excluded due to various reasons based on inclusion criteria. Finally, 19 studies were included in the review. (Figure 1)

Characteristics of included studies: All studies are taken from all over India, 3 from the east¹²⁻¹⁴, 4 from the west¹⁵⁻¹⁸, 7 from the south¹⁹⁻²⁵, 4 from the north²⁶⁻²⁹, 1 from central³⁰. The study settings were taken as an institution based (old-age homes^{13,15} or geriatric clinic²⁷ or geriatric ward in hospital²⁹ and community-based cross-sectional studies^{7,9,11-21,23}. While some studies were carried out in the rural area^{14,16,21-23,25,28} and some in the urban^{17,19,20,24,26,29} or suburban area¹³.

Table 1: Characteristics of included studies

Author name, Year	Study Setting	Study title	Sample	Tool	Prevalence			Associated factors
					Malnourished (%)	At risk of malnutrition (%)	Obese/Overweight (%)	
M. Majumdar, et. al ¹² 2014	Community	Assessment of Nutritional Risk in Community-Dwelling Older Adults (65 to 75 Years) in Kolkata, India	500	MNA-SF, MNA	6.8	25		Low education Financial dependence
Konda S, et. al ¹⁹ 2018	Community	Prevalence of malnutrition and its determinants in elderly people in South India	209	MNA	9.1	32.5		ADL/IADL dependence; Older age Low education; Single living Low SE status; Unemployed < 3 meals daily; Oral medication
Mathew, et. al ²⁰ 2016	Community	Prevalence and correlated of malnutrition among elderly in an urban area in Coimbatore	190	MNA	19.47	24.73		Low SE status Single/divorced/widowed IADL dependence Absence of pension
Krishnamoorthy, et.al ²¹ 2018	Community	Prevalence of malnutrition and its associated factors among elderly population in rural Puducherry using mini-nutritional assessment questionnaire	279	MNA	17.9	58.8	32.5	No formal Education Unemployed Older age Inadequate fruits/ vegetables intake
A Vedantam et. al ²² 2010	Community	Malnutrition in free-living elderly in rural south India: Prevalence and risk factors	227	MNA	14	49		Decreased food intake Older age Consuming fewer meals
A Gupta, et. al ²⁶ 2018	Community	Prevalence and risk factors of underweight, overweight, and obesity among geriatric population living in a high- altitude region of rural Uttarakhand, India	981	Anthropometry, 24-hr dietary recall	26.6 (underweight)		18 (overweight), 4.6 (obese)	Low education Low/ high income Consuming fewer meals Chewing problems Low age; Unskilled work
Santanu Saha, et. al ¹³ 2014	Old age homes	Assessment of nutritional risk and its associated factors among elderly women of old age homes of south sub-urban Kolkata, West Bengal, India	200	MNA	22	57		Presence of stress Presence of Depression
Patel, et. al ¹⁵ 2015	Old age homes	Association of oral health-related quality of life and nutritional status among elderly population of Satara district, Western Maharashtra, India	200	MNA	36.5	60		Oral health-related quality of life
Kansal, et.al ²³ 2016	Community	Nutritional assessment among elderly population of rural Belagavi: a cross-sectional study	190	MNA	22.6	43.6		No significant association with any factor

Table 1: Characteristics of included studies (continue....)

Author name, Year	Study Setting	Study title	Sample	Tool	Prevalence			Associated factors
					Malnourished (%)	At risk of malnutrition (%)	Obese/Overweight (%)	
Kritika, et.al ²⁸ 2014	Community	Nutritional status and associated comorbidities among the elderly in Doiwala Block, Dehradun	192	MNA, BMI analysis	20.83 21.8 (acc. BMI)	43.7	15.8 (overweight), 7.4 (obese)	Female gender; Illiteracy Unemployed; Low SE status Morbidity; Older age
Kutikuppala, et.al ²⁴ 2018	Community	Nutritional status of elderly people using mini-nutritional assessment tool in an urban slum of Hyderabad	200	MNA	14.5	43		Inadequate calorie intake
Gambhir, et.al ²⁷ 2017	Clinic	Nutritional status of elderly patients visiting the geriatric clinic—results from north India	225	MNA	32	47		No significant association with any factor.
Gandhi SJ, et. al ¹⁶ 2017	Community	Nutritional status of the geriatric population in the field practice area of a medical college in Rajasthan	152	MNA	7.3	48		No significant association with any factor.
Agarwalla, et.al ¹⁴ 2016	Community	Assessment of the nutritional status of the elderly and its correlates	360	MNA, 24-hr dietary recall	15	55		Older age; Female gender ADL/IADL dependence; Financial dependence; Inadequate calorie intake
Sonawane SS, et.al ¹⁷ 2019	Community	A cross-sectional study on malnutrition in elderly using mini nutrition assessment scores in an urban slum	120	MNA	33.3	54.17		>3 Medication use ADL/IADL Dependence Low SE status Single living
Shrivathsa DN, et. al ²⁵ 2019	Community	Assessment of nutritional status among geriatric population in rural Mangaluru: a cross sectional study	117	MNA	14.5	46.7		BMI <19
Banerjee, et.al ³⁰ 2018	Hospital	Evaluation of relationship between nutritional status and oral health related quality of life in complete denture wearers	200	MNA	19.5	70		OHRQOL (Oral Health related Quality of Life)
Khandhedia, et.al ¹⁸ 2015	Community	A study on the assessment of nutritional status among geriatric population in Jamnagar City	400	MNA-SF	6.75	30.25		Older age; Retired; Illiteracy Financial dependence Presence of comorbidity
Mukundan, et.al ²⁹ 2022	Hospital	Nutritional assessment in hospitalized elderly patients, its sociodemographic determinants and co-relation with activities of daily life	177	MNA	27.6	49.7		Older age Children as caretaker than spouse ADL dependence (Low ADL score)

Nutritional status assessment: The majority of the studies used only MNA (Mini Nutritional Assessment) tool. The MNA tool is useful for assessing malnutrition in the elderly. The MNA tool consists of 18 questions that are clustered into four sections: Anthropometric assessment (weight, height, and weight loss); general assessment (a living situation, medicine use, and mobility); dietary assessment (number of meals, food and fluid intake, and autonomy of feeding); and subjective assessment (self-perception of health and nutritional status). A maximum score of 30 can be obtained. A score below 17 indicates malnutrition; a score of 17–23.5 indicates a risk of malnutrition; and a score of 24 or higher indicates a satisfactory nutritional status. MNA-SF (Mini Nutritional Assessment-Short Form) is the short version of the MNA tool. A maximum score of 14 can be obtained. A score below 7 indicates malnutrition; a score of 8–11 indicates a risk of malnutrition; and a score of 12 or higher indicates a satisfactory nutritional status.

Some studies also used the 24-hour dietary recall method and were based on an interview during which the person recalled all food consumed in the previous 24 hours.^{14,24,26}

Anthropometry assessment includes weight (kg), height (m), mid-upper arm circumference, and calf circumference. The Quetelet index (kg/m²) enables the calculation of body mass index (BMI). All are required in the MNA tool, but some studies have carried out BMI analysis as a separate tool to classify even overweight and obesity.^{21,26,28} The (Asian) WHO categorises underweight as BMI < 18.5, normal 18.5–23, overweight 23–27.5, obese > 27.5.

Risk factors: There are possible covariates of malnutrition: 1) lifestyle factors like smoking and alcohol consumption; 2) somatic factors like medication, comorbidities, and use of walking aids; 3) functional factors like activities of daily living or instrumental activities of daily living; 4) social factors like socioeconomic status, marital status, education, and employment.

Lifestyle factors- A study in North India showed that 84% of study geriatric population consumes adequate fruits and vegetables.²⁷ Majumdar (2014) mentioned in his study that undernourished individuals were also found to consume fewer protein-rich foods like fish, chicken, and eggs, and only 29.7% consumed at least one serving of fruit daily.¹² While, the studies from an urban slum in Hyderabad and North-eastern showed a significant association of malnutrition with inadequate calorie intake.^{14,24} Less than three meals daily was also significantly associated with malnutrition in a few studies.^{19,22,26}

None of the studies included were able to establish the correlation between smoking or substance use with malnutrition.

Somatic factors- A factor such as more than three prescribed medications daily- are one of the important components of the MNA tool, the studies

from South India and an urban slum in Western Maharashtra was able to prove its association with malnutrition individually ($p < 0.05$).^{17,19} A study in North India showed 92.8% of the study population were taking >3 prescriptions.²⁷ In some studies, the presence of comorbidity among the study population was significantly associated with malnutrition.^{18,29}

A study in rural Dehradun showed statistical significance between morbidity and malnutrition. The study reveals a significant association between MNA scores and morbidity status (morbidity, multimorbidity, psychiatric illness, eyesight, and pallor) in the study population ($p < 0.05$). The same study showed a significant association of diseases like DM and HTN with BMI.²⁸ A study from Mangaluru found a significant correlation between MNA Score with BMI. BMI < 19 were found at risk of malnutrition.²⁵ Saha S. stated in his article that psychological stress was present among 44% of 'at risk of malnutrition' and 56% 'malnourished' population ($df=1$, $x^2= 28.852$, $p < 0.001$). About 77% of women having moderate depression were at risk of malnutrition whereas 52% of women having severe depression were malnourished ($df=2$, $x^2= 23.76$, $p < 0.001$).¹³

Functional factors- A study in Coimbatore showed a significant association between IADL (Instrumental Activities of Daily Living) dependency and malnutrition even after adjusting for age and sex ($p < 0.05$, $OR=12.789$).²⁰ Similarly, other studies also showed the strong association between functional dependency i.e. IADL/ADL (Activities of Daily living) dependency and malnutrition ($p < 0.001$).^{17,19}

Social factors- Several studies had shown a strong association between no/low education^{12,18,19,21,26,28}, old age^{14,18,19,21,22,29}, being unemployed^{19,28} or retired¹⁸ and nutritional status. Low socioeconomic status or financial dependency^{12,14,17–20,26,28} and single living^{17,19,20} are statistically associated with malnutrition too. A hospital-based study in Uttarakhand found that having a spouse as a caretaker plays a significant role in the optimal nutritional status of the elderly.²⁹

A study in rural Uttarakhand showed social factors like the highest age group (>80 years), male, illiteracy, unskilled workers, low income, chewing problems, and high prevalence of undernutrition are strongly associated, while social factors like age group 60–70 years, high school education, being unemployed, family income >13,874 rupees, and high prevalence of overweight are strongly associated ($p < 0.05$).²⁶

Studies from rural Assam and rural Dehradun, Kolkata showed undernutrition was more common in females with statistical significance.^{12,14,28} The involvement of the female participants was more in majority of the studies but there was no gender factor statistically associated with malnutrition except for above studies.

Outcomes of malnutrition: A study in Western Maharashtra was carried out to find out the association between OHRQOL (Oral Health-related Quality of Life) and malnutrition using GHAI (Geriatric Health Assessment Index) and MNA tool. This study shows a strong association found between mean GOHAI and MNA scores and nutrition status and OHRQOL ($p < 0.001$, $r = 0.36$). According to the study, >80% of the individuals' classified by MNA results as malnourished required dental care according to their GOHAI score.¹⁵

Banarjee R (2018) carried out a similar study aimed to show an effect of nutritional status and dietary intake on the OHRQOL. The study concluded that low nutritional status was associated with poor OHRQOL among the elderly. Pearson correlation results showed that there was a significant correlation between GOHAI and MNA scores ($P < 0.001$, $r = 0.36$).³⁰

A study from suburban Kolkata showed a strong association between nutritional risk and the presence of psychological stress. Findings showed that psychological stress was present among 44% of 'at risk of malnutrition' and 56% 'malnourished' population ($df = 1$, $\chi^2 = 28.852$, $p < 0.001$).¹³

DISCUSSION

Malnutrition is not only about undernutrition but also, overnutrition/overweight. But few studies in this article had thrown light on the prevalence of obesity/ overweight.^{21,26,28}

The prevalence of malnutrition assessed by MNA tool ranged from 6.75% to 36.5% while the prevalence of at risk of malnourished ranged from 25% to 70%. The prevalence of malnutrition was more in females but very few studies had proved its association with malnutrition statistically significant.^{12,14,28} Socioeconomic status was found to be the strongest risk factor of the malnutrition. The lack of assured income to support themselves, the absence of social security, loss of social status and lack of opportunities are the problems of the elderly.¹⁶ According to many studies, factors such as feeding difficulty, reduced mobility, psychological pain, widowhood, illiteracy, childcare expenses, poverty, and limited access to health and social services make the elderly more vulnerable to malnutrition.³¹⁻³⁴ By addressing such issues, we can make a good and safe place for the elderly to live and enjoy their elderhood.

Malnutrition and chronic diseases are part of a vicious cycle. Malnutrition can worsen the existing disease, while chronic diseases affect the appetite which can lead to malnutrition. The study found that malnutrition can be linked to the presence of comorbid conditions, more than three medication uses, psychological complaints, and poor diet intake.^{15,17-19,22,25-29} The presence of chronic disease, cognitive impairment, social isolation, and depression can be worsened by malnutrition.⁸ Malnutrition

in hospitalized elderly is another important aspect of geriatric vulnerability. The presence of malnutrition on admission, regardless of age, predicted a significant increase in the risk of infection or death during the hospital course.⁷ The elderly suffers from family abuse, physical abuse, and economic abuse with the burden of non-communicable disease. This population spends more income on medications than other needs which leads to a compromise in their meal. The nutritional problem is reversible and can be tackled by addressing the risk factors as well as frequent nutritional screening. As life longevity is adding extra years those should be spent in good health to do the things the elderly people value.

A study from North India stated >68% of the study population was unaware about their weight loss.²⁷ Decrease food intake results in weight loss, risk factors for decreased food intake include loss of appetite, mastication problems, swallowing difficulties, digestive disorders, inability to eat independently, episodes of fasting, chronic diseases and depression.²⁸ One major problem in the elderly is subclinical nutritional deficiency. Morbidity and disability can be associated with nutritional deficiencies.¹⁶ A study in rural Uttarakhand showed that underweight geriatric male subjects had a significantly lower amount of intakes of energy, Zn, Ca, P, thiamine, niacin, vitamin C, K, Cu (all $P < 0.05$), protein, riboflavin, folic acid, Mg and Mn (all $P < 0.01$) compared with overweight/obese geriatric subjects.²⁶

Thus, for the evaluation of nutritional status, biochemical and haematological support with clinical evaluation is required. None of the studies included biochemical or haematological assessment along with a screening (MNA) tool. The dietary 24-hr recall method was also used in some studies but this technique is not an accurate method for calculating calorie intake as it may vary from day to day.²⁴ MNA is a widely used international questionnaire to evaluate the nutritional state of seniors with high sensitivity (98.9%), specificity (94.3%), and diagnostic accuracy (97.2%) and it correlates with biochemical (albumin, prealbumin, transferrin levels, and lymphocyte numbers) and anthropometrical markers (measuring of subcuticular fat and arms circumference).²⁰ A study showed a strong correlation of MNA score and BMI <19 at risk of malnutrition ($p < 0.001$).^{24,25} Anthropometric measures are important indicators of elderly people's health as they reflect the balance between energy intake and expenditure, muscle mass, amount of body fat, and protein storage.²⁴

The geriatric population are not aware of their nutritional status and the clinician overlooks this issue due to subclinical nature of malnutrition. But the above studies (Table 1) showed that many factors are reversible which can improve and promote healthy ageing and raise the quality of life of the elderly. Proper health education to the caretaker, family and community can contribute to healthy ageing. Nutritional screening and proper intervention at clinician or physician-level can improve the condition.

Nutritional deficiencies should be treated to halt its progression, solved by counselling with family involvement. Geriatric clinics in rural India should be strengthened and enable different stakeholders to contribute in National programme for Healthcare of Elderly.

CONCLUSION

The prevalence of malnutrition is ranged from 6.75% to 33.3% in addition to that the burden of at risk of malnutrition is very high which may cover more than the half of the elderly population. Such elderly population are highly susceptible to morbidity and physical restriction which affect their quality of life. Nutritional deprivation in the elderly is found to be linked with common social problems such as a lack of education, financial stress, and a lack of social support as well as functional dependency and psychological stress. A multi-disciplinary approach, including nutritional screening, early diagnosis and treatment, and interventional dietary approaches, should be planned with sustainability assurance to ensure their healthy ageing.

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