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Systematic Review

Estimation of over nutrition among the elderly population of India: a systematic review

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ABSTRACT

India is undergoing a demographic transition where the unprecedented increase in percentage of elderly population is posing new public health challenges. Malnutrition increases health risks in the older population but the majority of research in elderly nutrition focuses on the aspect of under nutrition while over nutrition remains largely ignored. Over nutrition comprising over weight and obesity substantially reduces the likelihood of healthy ageing. Therefore, the aim of this systematic review is to estimate the status of over nutrition among elderly population of India. A systematic search was conducted in PubMed, Scopus and Google Scholar to identify relevant articles published during 2012 to 2022 following standard protocol and search terms. A total of 26 articles which were found to be relevant were analysed. Body mass index (BMI) based over nutrition is becoming a prevalent condition among the elderly of India. It was found more prevalent among elderly women compared to their male counterparts. Higher prevalence of over nutrition was found among urban dwelling elderly but its incidence is on rise among rural geriatric population. Overweight and obesity among older adults is a complex nutritional concern. So a holistic approach is needed to address this challenge.

Keywords: Elderly, India, Obesity, Older adults, Overweight, Over nutrition

INTRODUCTION

According to the World Population Ageing 2019 report by the Population Division of the United Nations Department of Economic and Social Affairs (UNDESA), 703 million people were aged 65 or above in the global population and the 2017 report highlights an estimated 962 million people aged 60 or above. India is considered a young country but the United Nations projects that Indians over the age of 60 years will constitute almost 19.6 per cent of the total population by 2050. While the relative share of the older population is higher in Western countries, the pace of population ageing and the absolute number of older adults are higher in Asian countries.[1]

According to the National Statistical Office (NSO)'s elderly in India 2021 report, the percentage share of the elderly population in the total population is said to have risen from 8.6 per cent in 2011 to 10.1 per cent in 2021 and projected to touch 13.1 per cent in 2031. It projected that India's elderly population (aged 60 and above) will touch 194 million in 2031 from 138 million in 2021, a 41 per cent increase over a decade. Advancement of public health and medical science along with social and economic development has led to an increase in life expectancy of people in India but healthy ageing is still a concern.

Obesity and overweight prevalence has been rising faster in India compared to the world average.[2] Obesity has direct association with disability status, cognitive abilities, mental health, chronic conditions and multi-morbidities in the older population.[3-7] In addition to an increase in morbidities, obesity also increases the likelihood of mortality and decreases the quality of life years.[8] Thus

years of life gained through increase in life expectancy may become unhealthy years.

According to India Ageing report, United Nations Population Fund (UNFPA) 2017, most of the nutritional programs in India are directed towards the child, adolescent or maternal health and there is limited study on nutrition among the elderly. Even the research and programs addressing malnutrition among India's elderly primarily focus on under nutrition and there are a limited number of studies available on the epidemiology of overweight and obesity in older adults. Malnutrition, encompassing both under and over nutrition increases health risks in the older population but the majority of research in elderly nutrition focuses on the aspect of under nutrition which no doubt is an important risk factor detrimental to healthy ageing but the problem of over nutrition (overweight and obesity) is largely ignored. Some of the most important age-dependent physiological alterations in the body composition of older adults are elevated body fat mass, obesity and overweight.[9,10] Obesity or overweight is associated with a substantially reduced likelihood of successful ageing.[11] Thus there is a need to work on this research gap to promote healthy ageing among India's greying cohort and estimation of over nutrition among the elderly population of the country would be the first step. Therefore, the aim of the present study is to estimate the status of over nutrition among elderly population in India via systematic review.

METHODS

This systematic review was reported according to the preferred reporting items for systematic reviews and meta-analysis (PRISMA) guidelines (Figure 1) and registered at prospero registry for systematic review (reg. no. CRD42023392152).

Study selection and search strategy

The search strategy involved a series of complementary search methods. A systematic and comprehensive search was conducted in PubMed, Scopus and Google Scholar to identify relevant articles published during the last decade (2012-2022). The search was conducted from 13 July 2022 to 15 August 2022.

Electronic search on Pubmed was conducted using advanced filters and following search terms: [All fields (over nutrition OR malnutrition OR obesity AND elderly OR geriatric AND India AND publication date 01 January 2012 to 01 January 2022]. Additional filters (human, English language, age 45-64, aged 65+, 80 and above, free full text available) were also applied.

Electronic search on Scopus database was conducted using advanced search setting and filters with following search terms: [over nutrition (TAK) OR obesity (TAK) OR malnutrition (TAK) AND elderly (TAK) OR aged (TAK) OR geriatric (TAK) AND India (AF) OR India (TAK)]. Additional filters: time range 2012 to present + filter article + Country India + English + open access were also applied. Here, TAK stands for Title, Abstract, Key in the search term field.

Electronic search on Google Scholar was conducted using advanced search settings with the following search term: over nutrition obesity elderly India (anywhere in article, 2012 to present, without review). Here "present" corresponds to the date of search that was 02 August 2022.

After the systematic electronic search on the above mentioned databases, articles relevant by title and abstract were accessed in full text to check for eligibility criteria. Manual search via cross-referencing from the selected articles was done to check for other relevant articles.

Inclusion and exclusion criteria for the study

Inclusion criteria

Based on the Indian population, cross-sectional and prevalence-based studies, study among all types of settings (hospitals, old age homes or community dwelling), participants having age ≥60 years, BMI as a study tool to measure over nutrition (overweight and obesity), published during the year 2012-2022, and studies published in English were included.

Those studies which included the adult population in general but provided age disaggregated data on over nutrition for the target population (age ≥60 years) can also be included provided it fulfils other criteria.

Exclusion criteria

Studies with the following criteria were excluded: if unresolved discrepancies in data, the studies in which BMI measures for over nutrition are not given, studies lacking target age group (≥60 years) data on over nutrition, studies based on chronic diseased population, data repeated in different studies, and review studies.

Data extraction and quality assessment

After initial search and separation of articles, a list of abstracts of selected articles post title screening was prepared and then these abstracts were screened to obtain a list of articles eligible for full assessment by author ST. The articles thus selected for full length assessment were reviewed independently by authors ST and DB by full length paper assessment. If the data was not clear or not fitting the criteria of the present study, then the article was excluded after a review of the full text by ST and DB. If the article was rejected by them, they expressed the reason, and if there was any disagreement between the reviewers, the article was reviewed by author BM whose opinion was considered as the final decision. From the articles finally selected after full length assessment for inclusion in the review, data extraction was done by authors ST and DB.

The extracted data was maintained in Google Sheets under column headings: author's name, year of publication, database, study location/state, geographical region of the study, population/ community, study setting (hospitals, old age homes or community dwelling), study area (rural or urban), estimation tool, measurement Index standard, age group, sample size, population aged ≥60, age and sex distribution, number of elderly overweight, number of elderly obese and total number and percentage for combined over nutrition.

To check the quality of studies included in this review, appraisal tool for cross-sectional studies (AXIS) was used. AXIS is a descriptive quality assessment tool designed for critical assessment of cross-sectional survey studies.[12] Using AXIS, the studies were appraised based on five main components: objective, methods, results, discussion and ethics and funding, distributed in total 20 questions. Authors ST and DB were involved in quality appraisal and score assignment after full text assessment of the eligible studies. In case of any disagreement between the two, author BM made the final decision.

RESULTS

A total of 26 studies were included in this review after a full length assessment (Table 1). Most of the included studies fared good in quality assessment with only two scoring ≤10 out of 20 as per AXIS score. Most of the studies scored ≥15.

The total number of elderly participants in this review was 43,619, ranging from 36 to 31464 participants in individual studies. On the basis of geographical region, most of the studies (11) were from northern India followed by southern (6), central (3), north eastern (2) and least (1) from eastern India (Figure 2). Three studies had nationally representative samples (multiregional data). 13 studies were based on rural areas, 9 on urban areas and 4 on both rural and urban areas. Majority of the studies (23) were conducted in the community setting followed by one each in OAH, both OAH and community setting and hospital setting. Most of the studies had target age group ≥60 years except six, but they were included in the review as BMI data for the ≥60 age group was given in these studies and it was extracted for analysis.

Gender and elderly over nutrition

Nine out of twenty-seven studies provided gender disaggregated BMI data (Table 2). All of them reported higher prevalence of overweight or obesity among female elderly compared to elderly male. Among these nine studies, four found it to be statistically significant. Therefore, it may be deduced that in India, there are more number of elderly women in overweight categories compared to males. A latest study based on national longitudinal ageing study in India (LASI) data also reported that BMI based-obesity is more prevalent among older women than men (26.3% versus 17.6%).[39]

Place of residence and elderly over nutrition

Four out of the total selected studies were conducted in both rural and urban areas and all of them reported higher prevalence of overweight/obesity among elderly residing in urban areas compared to their rural counterparts. Out of these four, two studies found urban residence as an important and significant determinant of excess weight among the elderly. This was also observed by a most recent study based on national LASI data, it reported total overweight/ obesity (BMI ≥25) prevalence as 13.8% in rural areas and 33.3% in urban areas.[40] But it would be misleading to conclude that over nutrition is an urban feature. Obesity risk has begun to move into the rural hinterland and the rise in the incidence of rural obesity can be associated with the process of structural transformation within rural spaces.[41] It is forecasted that in India there will be a larger relative increase in overweight and obesity in rural areas compared to urban areas.[2] This forecast is manifested in the studies conducted in rural areas. High prevalence of over nutrition reported among most of them barring Reddy et al, Shankar et al, (3.3%), Deo et al, (8.33%) and Sarmah et al (10.5%). Even 10.6% in Sarmah et al can be said to be high considering the fact that it is based on rural tribal population. Other studies in the review that are based on rural tribal population are by Reddy et al and Deo et al. Rest rural area based studies reported over nutrition prevalence (overweight and obesity combined) ranging from 22.5% to as high as 61.8%. Though this 61.8% is quite high, it could be because of the small effective sample size of 68 and low BMI cut off of ≥23 for overweight used in that study. Among them study by Meshram et al reported 28.2% prevalence based on rural area data from nationally representative data spanning multiple regions across India.

Among the urban area based studies in this review, two were specifically conducted in urban slums that reported over nutrition prevalence of 12.5% and 55.7%. High prevalence of over nutrition could be attributed to lifestyle and dietary factors of urban slum.[15]

Although the under nutrition of elderly population of urban slums has always been a major concern, over nutrition which previously thought to be a problem of the privileged group, has now become prevalent even in the under-privileged group.[15] Thus it can be assumed that elderly residing in rural areas and urban slums are also at high risk of suffering from overweight /obesity and not just those living in urban and privileged spaces.

Older adult age groups and over nutrition

Seven out of the selected studies gave age disaggregated data for overweight/obesity among elderly by making sub groups within the old age group (Table 3).

Irrespective of how the age category within the old age group was classified, all of them reported more overweight /obesity among young-old compared to older old. The

observation that the tendency of obesity and overweight decreases as the age advances among elderly age groups was found significant in three out of the above seven studies. This observation is also supported by the latest national survey based study which found the older age group (≥70 years) (adjusted relative risk ratio [ARRR]: 0.44, confidence interval [CI]: 0.39–0.49) negatively associated with overweight/obesity.[42]

Study setting and elderly over nutrition

23 out of 26 studies were conducted in the community setting followed by one each in OAH, both OAH and community setting and hospital setting. Due to lack of more studies in study setting categories other than community dwelling, any generalized observation on the effect of this factor cannot be made.

Table 1: Characteristics summary of the 26 selected studies.

Study	Location	Geo-grap-hical regi-on of India	Study setting	Study area	BMI stand-ard[e]	Age gro-up	Sample size (of ≥60 years age group)	Over nutrition among elderly (≥60 years age group)			Qual-ity score (AXIS) out of 20
								Overw-eight N (%)	Obesi-ty N (%)	Total over nutrit-ion N (%)	
Shankar et al[13]	Tamil Nadu	South	C.D	Rural	a	≥60	400	27	13	40	16
Kandpal et al[14]	Uttarakhand	North	C.D	Both	a	≥60	244	49 (21.4)	23 (10.0)	29.5	17
Saikia et al[15]	Guwahati, Assam	North East	C.D.	Urban slum	a	≥60	72	7 (9.72)	2 (2.77)	9 (12.5)	9
Sarmah et al[16]	Assam	North East	C.D	Rural	a	≥30	236	25 (10.6)	0	25 (10.6)	12
Singh et al[17]	Lucknow, Uttar Pradesh	North	OAH, C.D	Urban	a	≥60	120	-	-	46 (38.33)	10
Kritika et al[18]	Dehradun, Uttarakhand	North	C.D	Rural	a	≥60	192	15.4	7.4	22.8	18
Rajkamal et al[19]	Puducherry	South	C.D	Urban	b	≥60	682	282 (41.4)	31 (4.5)	313 (45.9)	17
Walia et al[20]	Chandigarh	North	C.D	Urban	b	≥20	348	-	-	280 (80.5)	13
Kalia et al[21]	Punjab	North	C.D	Rural	a	≥60	566	24.4	8.7	33	18
Shankar et al[22]	Varanasi, Uttar Pradesh	North	C.D	Rural	a	≥60	240	-	-	8 (3.33)	15
Samal et al[23]	National	Multi regio n-nal	C.D	Both	a	≥50	4039	-	-	399 (9.9)	17
Ratnapr-abha et al[24]	Karnataka	South	C.D	Rural	b	≥60	68	17 (25.0)	25 (36.8)	42 (61.8)	15
Singh et al[25]	Uttar Pradesh	North	C.D	Rural	a	≥60	121	27 (22.3)	10 (8.3)	37 (31)	15
Keshari et al[26]	Varanasi, Uttar Pradesh	North	C.D	Urban	a	≥60	616	54 (8.8)	17 (2.8)	71 (11.6)	18
Bartwal et al[27]	Haldwani, Uttarakhand	North	C.D	Rural	a	≥60	440	80 (18.18)	19 (4.32)	99 (22.5)	17
Meshr-am et al[28]	National	Multi regio n-nal	C.D	Rural	c	≥18	941	-	-	28.2	17
Rani et	Jammu city,	North	C.D	Urban	a	≥30	474	-	-	311	15

Continued.

Study	Location	Geo-grap-hical regi-on of India	Study setting	Study area	BMI stand-ard[e]	Age gro-up	Sample size (of ≥60 years age group)	Over nutrition among elderly (≥60 years age group)			Qual-ity score (AXIS) out of 20
								Overw-eight N (%)	Obesi-ty N (%)	Total over nutrit-ion N (%)	
al[29]	J&K									(65.6)	
Ananthe-sh et al[30]	Karnataka	South	C.D	Both	a	≥60	204	46 (22.5)	21 (10.3)	32.8%	18
Deo et al[31]	Maharashtra	Centr-al	C.D	Rural	a	≥18	36	2 (5.6)	1 (2.7)	3 (8.33)	12
Garg et al[32]	West Bengal	Easte-rn	C.D	Rural	b	≥60	335	175 (52.2)	14 (4.2)	189 (56.4)	16
Khole et al[33]	Pune, Maharashtra	Centr-al	OAH	Urban	a	≥60	131	34 (26.1)	10 (7.7)	44 (33.6)	16
Krishna-moorthy et al[34]	Puducherry	South	C.D	Rural	b	≥60	279	44 (15.8)	91 (32.6)	135 (48.4)	18
Reddy et al[35]	Andhra Pradesh	South	C.D	Rural	a	≥60	594	0	0	0	15
Khole[36]	Pune, Maharashtra	Centr-al	C.D	Urban slum	a	≥60	427	140 (32.8)	98 (22.9)	238 (55.7)	12
Prabhak ar et al[37]	New Delhi	North	Hl	Urban	b	≥60	350	-	96 (26.9	96 (26.9)	13
Banerjee et al[38]	National	Multi regio-nal	C.D	Both	a	≥60	31,464	-	-	6217 (22.2)	20

BMI standard cut off for over nutrition used in respective studies (e) with codes - 25-29.9: overweight, ≥30: obesity [a]; 23-24.9: overweight, ≥25: obese [b]; 23–27.49: overweight, ≥27.5: obese [c]; CD: community dwelling, OAH: old age homes, Hl: hospital

Table 2: Studies including gender disaggregated BMI data.

Study	BMI standard[e]	Total over nutrition reported (%)		Significant association reported
		Elderly male	Elderly female	
Shankar et al[13]	a	37	42	No
Kalia et al[21]	a	19.7	43	Yes (χ^2=35.01, df=3)
Samal et al[23]	a	10.5	18	Yes (p<0.0001)
Ratnaprabha et al[24]	b	61.5	61.9	No
Singh et al[17]	a	30.43	69.57	No
Singh et al[25]	a	22.2	38	No
Bartwal et al[27]	a	21	23.7	Yes (χ^2=10.0, p=0.019)
Khole et al[33]	a	24.1	27.8	No
Khole[36]	a	49.7	59.3	Yes (χ^2=20.062, p=0.00)

Table 3: Studies including age disaggregated over nutrition data for elder age groups.

Study	Age group wise result for over nutrition		Significant association reported
	Age Cohort (in years)	Frequency (%)	
Shankar et al[13]	60-69	3.6	No
	70-79	3.5	
	≥80	Nil	
Kalia et al[21]	**Overweight**		Yes (χ^2=143.45, df=9)
	61-65	24.8	
	66-70	40.6	
	71-75	12.4	

Continued.

Study	Age group wise result for over nutrition		Significant association reported
	Age Cohort (in years)	Frequency (%)	
	>75	16.2	
	Obese		
	61-65	9.2	
	66-70	10.9	
	71-75	5.2	
	>75	8.1	
Samal et al[23]	60-80	12.1	No
	>80	9	
Ratnaprabha et al[24]	60- 69	63.8	No
	≥70	57.1	
Keshari et al[26]	60-64	18.8	Yes (χ^2=63.12; df=2; p<0.01)
	65-69	10.9	
	70-74	5.6	
	77-79	9.8	
	≥80	Nil	
Bartwal et al[27]	**Overweight**		Yes (χ^2=13.6, p=0.034)
	60-69	20.2	
	70-79	17.8	
	≥80	8.1	
	Obese		
	60-69	5.7	
	70-79	2.3	
	≥80	2.04	
Rani et al[29]	60-69	74.5	No
	≥70	53	

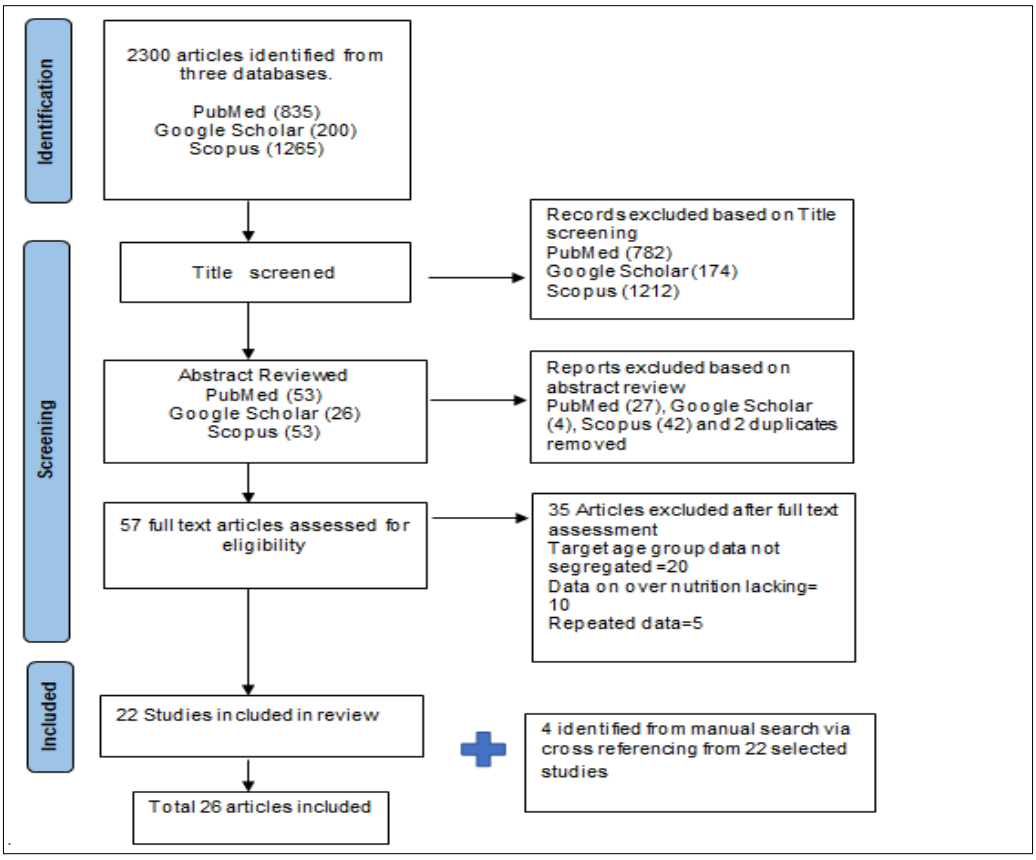

Figure 1: PRISMA flow chart for study selection.

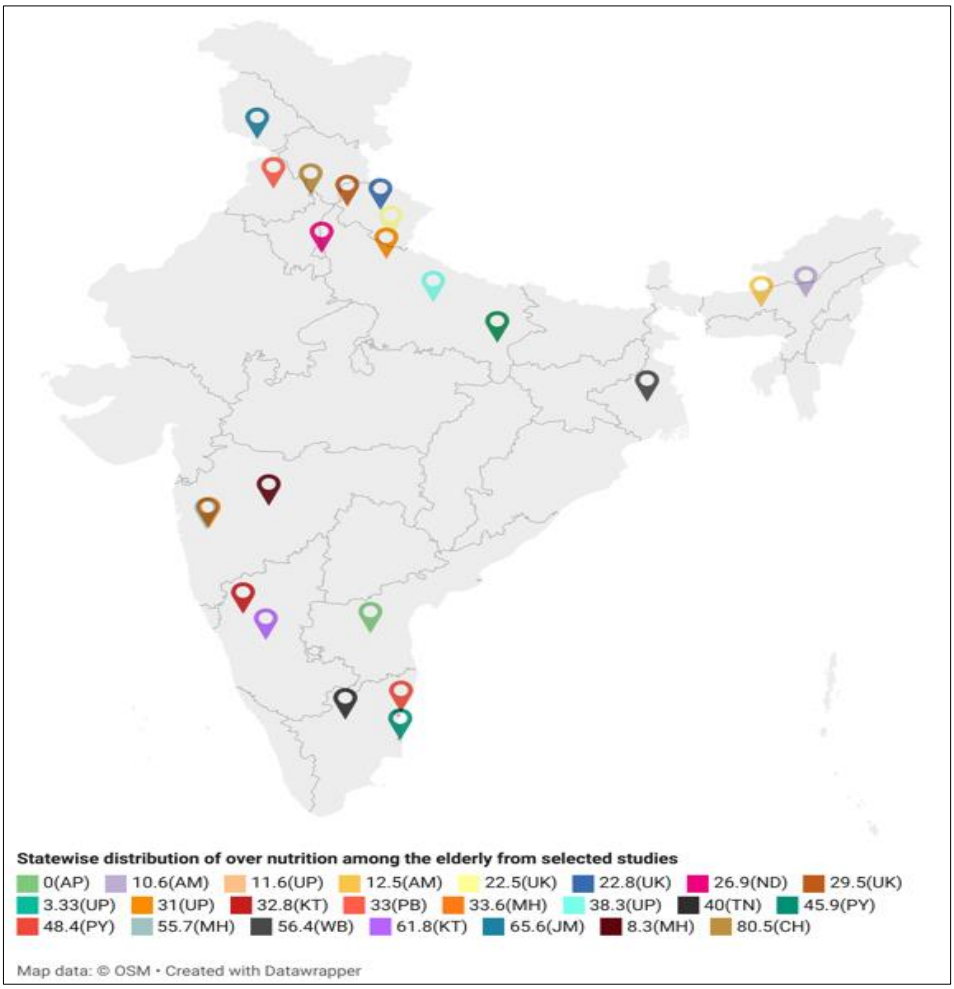

Figure 2: State wise distribution of over nutrition prevalence among elderly from the selected studies.
AP- Andhra Pradesh, AM- Assam, UP- Uttar Pradesh, UK- Uttarakhand, ND- New Delhi, KT- Karnataka, PB-Punjab, MH- Maharashtra, TN- Tamil Nadu, PY- Puducherry, WB- West Bengal, JM- Jammu & Kashmir, CH- Chandigarh

DISCUSSION

Population ageing is a dominant demographic trend of the twenty-first century, a reflection of increasing longevity, declining fertility, and the progression of large cohorts to older ages.[43] India is also experiencing this trend. The United Nations projects that Indians over the age of 60 years will constitute almost 19.6 per cent of the total population by 2050. If converted into absolute numbers, it would be enormous as India is also one of the most populous countries.

The demographic transition accompanied by the epidemiological transition in India has not only led to an increase in the geriatric population but also a shift from communicable diseases to non-communicable diseases.[44] Raised BMI (signifying overweight and obesity) is a major risk factor for non-communicable diseases.[45] Obesity itself is associated with greater limitations in activities of daily living and a larger increase in functional impairments for the geriatric population.[46] Therefore there is a necessity to study over nutrition among India's elderly population which is rising rapidly and the country's health infrastructure needs to be ready for this upcoming challenge. Thus research on different aspects of this topic and its implications is crucial. Hence this study attempted a systematic review of literature to understand the estimates of over nutrition (overweight and obesity) among India's greying cohort.

Over nutrition can give rise to multi morbidities which results in substantial life years lost. For increased quality life years in the older ages it is important to address this issue comprehensively. Focus should be on increasing age suitable physical exercise, accessibility to affordable healthy and nutritious food as lack of physical activity and easy access to low cost calorie rich food are prime contributors of geriatric obesity.[38] In general, lack of affordability of diverse and nutritious diets increases obesity risk.[47-49]

High socioeconomic status and urban residence have been traditionally known as predictors of over nutrition but now it is affecting even poor and rural people. This review found that overweight/obesity prevalence is rising among older adults residing in rural areas, those belonging to poor

socioeconomic strata and elderly women. This can be seen in light of the fact that India is facing a dual burden of malnutrition, suffering from both under and over nutrition.[50] Rising geriatric obesity is not simply a result of sedentary lifestyle and caloric over-consumption, but rather a multitude of risk factors including limited access to healthy, affordable foods, few community resources targeted towards older adults and food insecurity.[51,52]

Overweight and obesity among older adults is a complex nutritional concern. Despite the negative health influences of obesity in older adults, intentional weight loss has not been widely advocated for this age group by health care providers due to the uncertainty of whether the benefits outweigh the risks.[53] This caution is supported by theory of "obesity paradox", that adiposity might have a "protective" effect in older adults.[54] Excess body fat reserve comes to rescue from end stage diseases led unintentional weight loss. Although the presence of obesity increases the risk of developing chronic conditions, once present, patients with obesity tend to have higher survival rates.[55] Hence the weight management strategy for this age group requires expert supervision and carefully designed guidelines. It can be deduced that weight maintenance rather than weight reduction seems more appropriate for the elderly.

CONCLUSION

Overweight and obesity among older adults is a complex nutritional concern. Largest increase in the prevalence of overweight and obesity in India is expected to be in older ages. Special focuses on this age group must be given while planning nutritional programmes so that there would be lesser burden on health systems and reduction in the economic cost of ageing. It can be suggested that the existing nutritional programs should also accommodate approaches to tackle over nutrition. Going forward, more new research should explore structural determinants of the rise in geriatric obesity across geography, gender, residence, socioeconomic status and time in India.

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