Original Article

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Community Section

Underweight, Overweight and Anaemia among Persons Aged 60 Years or Older Residing in an Urban Resettlement Colony of Delhi: A Cross-sectional Study

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ABSTRACT

Introduction: Nutritional deficiencies are common among elderly person aged 60 years or older. Elderly persons suffer the dual burden of overnutrition and undernutrition. These nutritional disorders can be corrected if diagnosed and managed at the earliest.

Aim: To estimate the prevalence and factors associated with underweight, overweight, obesity and anaemia among elderly persons in an urban resettlement colony of Delhi, India.

Materials and Methods: The present study was a cross-sectional survey in which elderly persons who were residents of Dr. Ambedkar Nagar, an urban resettlement colony in Dakshinpuri Extension of Delhi were recruited. The study period was from December 2019 to March 2020. A pretested semi-structured interview schedule was used to collect socio-demographic details. The anthropometric measurements, namely, height and weight were carried out as per standard practice. Capillary blood haemoglobin level was measured by a digital haemoglobinometer. Chi-square test for distribution and multivariable logistic regression for association were performed.

Results: Data was collected from 959 participants, with a response rate of 91.2%. The prevalence (95%CI) of underweight, overweight and obesity were 15.5% (13.3-18.0), 21.9% (19.3-24.6) and 9.6% (7.7-11.6), respectively. Persons aged 70 years or older and illiterate persons had increased chance of being underweight. Women had increased chance of being overweight or obese. The prevalence of anaemia among participants was 72.1% (95% CI (69.2-74.9), using the cut-off of anaemia as haemoglobin levels <13 gm/dL in men, and <12 gm/dL in women.

Conclusion: The prevalence of underweight, overweight, obesity and anaemia among elderly persons in the study population was high. Community-based measures need to be taken to address them.

Keywords: Body mass index, Elderly, Malnutrition, Prevalence, Thinness

INTRODUCTION

Malnutrition is a significant public health problem among elderly persons in low-and-middle income countries. It is negatively impacted by physiological changes due to ageing [1]. In India, various studies report a high prevalence of underweight, overweight and obesity among elderly persons [2-5]. As per the National Census 2011, 8.6% of the population were aged 60 years and above [6]. Aged individuals have increased risk for nutritional imbalance [7]. A systematic review on risk factors for malnutrition reported that poor appetite, loss of interest in life, eating dependencies, dementia, cognitive decline, excessive polypharmacy, and general decline in physical health were significantly associated with malnutrition [8-10]. Poor economic capacity and abuse of elderly persons were associated with dietary deficiency of nutrients [11].

Anaemia among elderly is often overlooked in routine clinical and laboratory evaluation, as the presenting symptoms are usually fatigue, weakness and exhaustion [12]. These symptoms are frequently thought to be associated with physiological changes due to ageing.Anaemia among elderly persons is due to nutritional deficiencies in two-thirds of the cases, which can be corrected easily if diagnosed early [13]. Other reasons are anaemia of chronic disease including chronic kidney disease, or underlying malignancy or parasitic infections or unexplained cause [14]. Elderly persons that are residents of urban resettlement colonies are more vulnerable to nutritional anaemia [15,16]. Evidence to this effect of nutritional conditions of the elderly persons in urban slums are insufficient. The associated socio-demographic factors with nutritional problems also require a close investigation.

The study was conducted to estimate the prevalence and socio-demographic factors associated with underweight, overweight, obesity, and anaemia among person aged 60 years or older who were residents of Dr. Ambedkar Nagar, an urban resettlement colony in Dakshinpuri Extension of Delhi, India.

MATERIALS AND METHODS

This study was a cross-sectional survey conducted from December 2019 to March 2020. The study site was an urban resettlement colony in Dakshinpuri Extension, Delhi where approximately 2,900 elderly persons resided [17]. The ethical approval for the study was accorded by the Institute Ethics Committee (IEC) of All India Institute of Medical Sciences, New Delhi, vide memorandum no. IEC-671/6.09.2019, RP-37/2019. The study was also approved by the Centre for Community Medicine which maintains the computerised Health Management Information System.

Inclusion criteria: Persons aged 60 years and above, and those residing in the study area for atleast six preceding months were included in the study.

Exclusion criteria: Elderly persons who were unable to comprehend or communicate were excluded from the study.

Demographic details of the population were maintained by healthcare workers in a computerised Health Management Information System. This is an in-house health management system by the Centre for Community Medicine authorities. This consists of basic socio-demographic and health details of all the individuals in the urban filed practice area and this was updated annually. The lowest reported prevalence among the three health problems under investigation

was for anaemia (20.6%), and the same was used for calculation of required sample size [18-20]. With the assumed absolute precision of 2.5%, and alpha of 5%, the required sample size was 1,047. An allowance for death and migration (15%), and for non response (5%) from previous experience of conducting research in the study area were made. The resulting required final sample size was 1,308 elderly persons. From the sampling frame, through simple random sampling, 1,308 participants were selected.

Socio-demographic details were collected through a self-developed semi-structured interview schedule. It included their age, education, current occupation, type of family, marital status, and economic dependency. Selected participants were paid a house visit by trained non specialist graduate interviewers. The interviewers were trained in administering the interview schedule, measurement of anthropometry, and haemoglobin estimation. Upto a maximum of three home visits were made to contact the participants. After explaining the purpose and procedure of the study, written informed consent was sought from the participants.

Age of the participant was recorded as stated by the participant or based on any valid document, if available. If the source of personal income or any monetary benefit from the social welfare scheme was perceived to be sufficient to maintain himself/herself, then the participant was classified as economically independent. If the same was considered insufficient, then the participant was considered to be economically partially dependent. An economically dependent participant was a person with no personal income or monetary benefit from any social welfare scheme [21].

The body weight and arm span were measured as per standard practice [22]. The formula for calculating Body Mass Index (BMI) was: BMI=Weight (kg)/Arm span (m^2). In elderly persons, arm span is considered better than height for calculating body mass height as the progression in age causes gradual loss in height due to degenerative osteoporotic changes in bones and decrease in the disc space [23]. The BMI was classified as underweight (<18.5 kg/m^2), normal (18.5-24.9 kg/m^2), overweight (25-29.9 kg/m^2), and obese (≥30 kg/m^2) as per World Health Organisation (WHO) classification [24].

Haemoglobin was estimated in the capillary blood by using the HemoCue® Hb 201 DM system (HemoCue AB, Sweden). HemoCue was recommended for point-of-care estimation of haemoglobin, and it was reported to be comparable with other methods of estimation [25]. A finger-prick was made and the first two drops of blood was discarded. The subsequent blood drop was collected in a micro-cuvette, and placed in the slot for measurement. The results were available within 80 seconds. The cut-off value of haemoglobin in elderly persons for anaemia was <13 gm/dL in men, and <12 gm/dL in women. Sub-categories of anaemia were as per WHO classification [26]. The haemoglobin test results were provided to the participant, and those found anaemic were provided appropriate treatment and referral.

STATISTICAL ANALYSIS

Data collected on paper were scrutinised for completeness and coherence prior to the data entry. Epi Info Version 7.2 (CDC Atlanta Georgia) was used for data entry. The socio-demographic characteristics were reported as proportion or mean. Multivariable logistic regression model was used to assess the association between nutritional status and socio-demographic variables. The p-value <0.05 was considered statistically significant. Stata software version 12.0 was used for analysis. The statistical tests used were Chi-square test and multivariable logistic regression.

RESULTS

Out of 1,308 elderly persons selected for the study, 87 were dead, and 169 had migrated. Of the remaining 1,052 participants, 75 refused to participate, and 18 were non contactable even after three home visits. Hence, data were collected from 959 participants, with a response rate of 91.2%. A total of 329 (34.3%) participants were in the age group of 60-64 years. Mean±SD age of the participants were 67.8±6.5 years. Mean±SD age of men was 68.7±6.0 years, and that of women 67.2±6.7 years. There were 576 (60.1%) women and 383 (39.9%) men. Among them, 597 (62.3%) participants were illiterate, while 362 (37.7%) participants were literate [Table/Fig-1]. The number of participants that were currently married was 592 (61.7%), and number of participants belonging to extended family was 857 (89.4%). A total of 823 (85.8%) participants were homemakers. Partially economically dependent participants were 567 (59.1%).

Characteristics	Categories	Men n=383 (39.9%)	Women n=576 (60.1%)	Total n=959 (100%)
Age group (in years)	60-64	103 (26.9)	226 (39.2)	329 (34.3)
	65-69	116 (30.3)	153 (26.6)	269 (28.1)
	70 and above	164 (42.8)	197 (34.2)	361 (37.6)
Education	Literate	257 (67.1)	105 (18.2)	362 (37.7)
	Illiterate	126 (32.9)	471 (81.8)	597 (62.3)
Current occupation	Homemaker	307 (80.2)	516 (89.6)	823 (85.8)
	Others	76 (19.8)	60 (10.4)	136 (14.2)
Type of family	Extended	337 (88.0)	520 (90.3)	857 (89.4)
	Nuclear	46 (12.0)	56 (9.7)	102 (10.6)
Marital status	Married	329 (85.9)	263 (45.7)	592 (61.7)
	Widow(er)	54 (14.1)	313 (54.3)	367 (38.3)
Economic dependence	Independent	112 (29.3)	69 (12.0)	181 (18.9)
	Partially dependent	210 (54.8)	357 (62.0)	567 (59.1)
	Dependent	61 (15.9)	150 (26.0)	211 (22.0)

[Table/Fig-1]: Distribution of participants by socio-demographic characteristics.

Of the 959 participants, anthropometric measurements were completed for 952 (99.3%) participants. Weight and/or arms span could not be measured in seven participants, as they were bedridden due to sickness (three), handicapped (two), paralysed (one), or had an arm in a plaster cast (one). Haemoglobin was measured in 958 participants, as one refused. The prevalence of underweight, overweight and obesity was 15.5% (95% CI 13.3%-18.0%), 21.9% (95% CI 19.3%-24.6%) and 9.6% (95% CI 7.7%-11.6%), respectively. Among women, 28.7% and 13.6% were overweight and obese, respectively [Table/Fig-2].

Nutrition status	Men n=380 (%)	Women n=572 (%)	Total n=952 (%)
Normal	240 (63.2)	265 (46.3)	505 (53.0)
Underweight	83 (21.8)	65 (11.4)	148 (15.5)
Overweight	44 (11.6)	164 (28.7)	208 (21.9)
Obese	13 (3.4)	78 (13.6)	91 (9.6)

[Table/Fig-2]: Prevalence of underweight, overweight and obesity among participants.
952 participants anthropometric details were recorded. BMI cut-offs (kg/m^2) were defined as per World Health Organisation: Underweight <18.5 kg/m^2; Normal 18.5 to 24.9 kg/m^2; Overweight 25.0 to 29.9 kg/m^2; Obese ≥30.0 kg/m^2

Two regression models were constructed. In the first model, underweight category was the dependent variable and socio-demographic characteristics were the independent variables [Table/Fig-3]. Elderly persons aged ≥70 years had 1.9 (95% CI 1.2-3.0) times increased chance of underweight than 60-64 years in the crude model. In the multivariable model, women had 40% decreased chance of underweight compared to men. Illiterate had 1.7 (95% CI 1.1-2.6) times and ≥70 years had 2.0 (95% CI 1.2-3.3) times increased chance of underweight compared to literate and 60-64 years respectively. All these associations were statistically significant.

Characteristics	Number of participants N=653	Underweight present n=148 (%)	Unadjusted odds ratio (95% CI)	p-value	Adjusted odds ratio (95% CI)	p-value
Gender						
Men	323	83 (25.7)	Reference		Reference	
Women	330	65 (19.7)	0.7 (0.5-1.0)	0.068	**0.6 (0.3-0.9)**	**0.018**
Age-group (years)						
60-64	188	32 (17.0)	Reference		Reference	
65-69	175	34 (19.4)	1.2 (0.7-2.0)	0.553	1.1 (0.7-2.0)	0.636
≥70	290	82 (28.3)	**1.9 (1.2-3.0)**	**0.005**	2.0 (1.2-3.3)	0.008
Education						
Literate	263	53 (20.2)	Reference		Reference	
Illiterate	390	95 (24.4)	1.3 (0.9-1.8)	0.208	**1.7 (1.1-2.6)**	**0.022**
Current occupation						
Homemaker	554	131 (23.6)	Reference		Reference	
Others	99	17 (17.2)	0.7 (0.4-1.2)	0.159	0.8 (0.4-1.5)	0.462
Type of family						
Nuclear	74	17 (23.0)	Reference		Reference	
Extended	579	131 (22.6)	1.0 (0.6-1.7)	0.946	0.9 (0.5-1.7)	0.747
Marital status						
Married	417	99 (23.7)	Reference		Reference	
Widow(er)	236	49 (20.8)	1.2 (0.8-1.8)	0.383	1.1 (0.7-1.8)	0.658
Economic dependence						
Independent	131	26 (19.9)	Reference		Reference	
Partially dependent	400	91 (22.8)	1.2 (0.7-1.9)	0.487	1.2 (0.7-2.0)	0.559
Fully dependent	122	31 (25.4)	1.4 (0.8-2.5)	0.291	1.6 (0.9-3.2)	0.142

[Table/Fig-3]: Association of underweight with socio-demographic variables.
*Of the total 952 participants, the 299 who were overweight/obese were not included in this analysis; p-value <0.05 considered significant

In the second model, overweight and obese categories were combined as dependent variable and sociodemographic characteristics as the independent variables [Table/Fig-4]. In the crude model, overweight/obese was higher among women; elderly persons aged ≥70 years; illiterates; and economically dependent elderly persons. In the multivariable model, women had four times AOR=4.0, 95% CI 2.6-6.1) increased chance of being overweight/obese. Elderly persons aged ≥70 years had 60% decreased risk

Characteristics	Number of participants N=804	Overweight present n=299 (%)	Unadjusted odds ratio (95% CI)	p-value	Adjusted odds ratio (95% CI)	p-value
Gender						
Men	297	57 (19.2)	Reference		Reference	
Women	507	242 (47.7)	**3.9 (2.7-5.4)**	**<0.001**	4.0 (2.6-6.1)	<0.001
Age-group (years)						
60-64	296	140 (47.3)	Reference		Reference	
65-69	232	91 (39.2)	0.7 (0.5-1.0)	0.064	0.9 (0.6-1.3)	0.467
≥70	276	68 (24.6)	**0.4 (0.3-0.5)**	**<0.001**	0.4 (0.3-0.7)	<0.001
Education						
Literate	305	95 (31.2)	Reference		Reference	
Illiterate	499	204 (40.9)	**1.5 (1.1-2.1)**	**0.006**	0.8 (0.6-1.2)	0.290
Current occupation						
Homemaker	685	262 (38.3)	Reference		Reference	
Others	119	37 (31.1)	0.7 (0.5-1.1)	0.137	0.8 (0.5-1.3)	0.377
Type of family						
Nuclear	85	28 (32.9)	Reference		Reference	
Extended	719	271 (37.7)	1.2 (0.8-2.0)	0.392	1.2 (0.7-2.1)	0.454
Marital status						
Married	489	171 (35.0)	Reference		Reference	
Widow(er)	315	128 (40.6)	0.8 (0.6-1.1)	0.105	1.0 (0.7-1.5)	0.961
Economic dependence						
Independent	154	49 (31.8)	Reference		Reference	
Partially dependent	470	161 (34.3)	1.1 (0.8-1.6)	0.579	0.9 (0.6-1.3)	0.494
Fully dependent	180	89 (49.4)	**2.1 (1.3-3.3)**	**0.001**	1.2 (0.7-2.0)	0.555

[Table/Fig-4]: Association of overweight/obesity with socio-demographic variables.
*Of the total 952 participants, the 148 who were underweight were not included in this analysis; p-value <0.05 considered significant

(AOR=0.4, 95% CI 0.3-0.7) of being overweight/obese. All these associations were statistically significant. No significant association was found for education, current occupation, type of family, marital status and economic dependency.

Of the 959 participants, haemoglobin was measured for 958 (99.9%) participants. The prevalence of anaemia (95% CI) was 72.1% (69.2%-74.9%). The prevalence of mild, moderate and severe anaemia were 26.9%, 37.7% and 7.5%, respectively [Table/Fig-5]. The mean±SD of haemoglobin levels among the study participants was 11.1±2.2 g/dL [Table/Fig-6].

Logistic regression analyses were conducted to determine the association of anaemia with socio-demographic and anthropometric variables [Table/Fig-7]. None of the socio-demographic or anthropometric variables showed a significant association with anaemia in the crude or multivariable model. There was no significant association between BMI, and anaemia in the crude and multivariable model.

Anaemia status	Men n=382 (%)	Women n=576 (%)	Total n=958* (%)
Anaemia absent	114 (29.8)	153 (26.6)	267 (27.9)
*Anaemia present	268 (70.2)	423 (73.4)	691 (72.1)
Mild (Men 11-12.9 gm/dL, Women 11-11.9 gm/dL)	148 (38.7)	110 (19.1)	258 (26.9)
Moderate (8-10.9 gm/dL)	97 (25.4)	264 (45.8)	361 (37.7)
Severe (<8 gm/dL)	23 (6.0)	49 (8.5)	72 (7.5)

[Table/Fig-5]: Prevalence of anaemia among participants.
*Of the total 959 participants, one refused for haemoglobin estimation

Characteristics	Categories	Frequency N=958*	Mean (11.1 gm/dL)	Standard deviation (2.2 gm/dL)
Gender	Men	382	11.8	2.3
	Women	576	10.6	1.9
Age-group (in years)	60-64	329	11.0	2.1
	65-69	268	11.3	2.2
	70 and above	361	11.0	2.2
Education	Literate	361	11.4	2.2
	Illiterate	597	10.9	2.1
Current occupation	Homemaker	822	11.0	2.2
	Others	136	11.5	2.1
Type of family	Extended	856	11.1	2.2
	Nuclear	102	11.3	2.2
Marital status	Married	591	11.3	2.2
	Widow(er)	367	10.8	2.0
Economic dependence	Independent	180	11.5	2.4
	Partially dependent	567	11.0	2.1
	Dependent	211	11.0	2.1
Body mass index	Normal	505	11.3	2.2
	Underweight	148	11.0	2.3
	Overweight/ Obesity	298	10.8	2.1

[Table/Fig-6]: Description of haemoglobin level by socio-demographic factors and body mass index among the study participants.
*Of the total 959 participants, one refused for haemoglobin estimation

Variables	Number of participants N=958	Anemia present n=691 (%)	Unadjusted odds ratio (95% CI)	p-value	Adjusted odds ratio (95% CI)	p-value
Gender						
Men	382	268 (70.2)	Reference		Reference	
Women	576	423 (73.4)	1.2 (0.9-1.6)	0.268	1.1 (0.7-1.6)	0.704
Age-group (years)						
60-64	329	240 (34.7)	Reference		Reference	
65-69	268	184 (68.7)	0.8 (0.6-1.2)	0.251	0.8 (0.5-1.1)	0.199
≥70	361	267 (74.0)	1.1 (0.8-1.5)	0.763	1.0 (0.7-1.4)	0.839
Education						
Literate	361	257 (71.2)	Reference		Reference	
Illiterate	597	434 (72.7)	1.1 (0.8-1.4)	0.615	1.0 (0.7-1.4)	0.860
Current occupation						
Homemaker	822	594 (72.3)	Reference		Reference	
Others	136	97 (71.3)	1.0 (0.6-1.4)	0.821	1.0 (0.7-1.6)	0.855
Type of family						
Nuclear	102	71 (69.6)	Reference		Reference	
Extended	856	620 (72.4)	1.1 (0.7-1.8)	0.548	1.0 (0.7-1.7)	0.863
Marital status						
Married	591	416 (70.4)	Reference		Reference	
Widow(er)	367	275 (74.9)	0.8 (0.6-1.1)	0.128	0.9 (0.6-1.2)	0.420
Economic dependence						
Independent	180	122 (67.8)	Reference		Reference	
Partially dependent	567	422 (74.4)	1.4 (1.1-2.0)	0.081	1.3 (0.9-2.0)	0.150
Fully dependent	211	147 (69.7)	1.1 (0.7-1.7)	0.688	1.1 (0.7-1.8)	0.761
Body mass index (kg/m^2) n=951						
Normal	505	351 (69.5)	Reference		Reference	
Underweight	148	114 (77.0)	1.5 (1.0-2.3)	0.077	1.5 (1.1-2.3)	0.074
Overweight/Obese	298	219 (73.5)	1.2 (0.9-1.7)	0.230	1.2 (0.9-1.7)	0.297

[Table/Fig-7]: Association of anaemia with socio-demographic and body mass index.

DISCUSSION

The prevalence and socio-demographic factors associated with underweight, overweight/obese, anaemia were estimated among elderly persons residing in an urban resettlement colony of Delhi. This study found that the prevalence of underweight, overweight and obesity were 15.5%, 21.9% and 9.6%, respectively.

In a study by Rajkamal R et al., among elderly population in an urban area of Puducherry, the reported prevalence of overweight and obesity were 41.4% and 4.5%, respectively [2]. In their study, religion, occupation, smoking and alcohol consumption were found to be significantly associated with overweight/obesity. In present study, women had four times increased risk being overweight/obesity and elderly persons aged 70 years and above had 40% decreased chance of being overweight/obese.

A community-based cross-sectional study conducted among elderly persons in Chandigarh city by Swami HM et al., found that the prevalence of underweight, overweight and obesity were 14.4%, 33.4% and 7.5%, respectively [3]. Their observation that overweight/obesity was higher among women, was similar to present study. A study in the same setting in 2015 reported the prevalence of underweight, overweight and obesity as 20.8%, 19.4% and 6.6%, respectively [4]. Elderly women had lower risk of being underweight, which was similar to the findings of present study.

Mathew AC et al., in a study on elderly persons living in urban Coimbatore reported that 19.5% were malnourished, and 24.7% were at risk of malnutrition [5]. They found no association of malnutrition with lifestyle, somatic or functional characteristics. Of the total participants, 55.8% were normal for nutritional status using Mini Nutritional Assessment questionnaire.

In present study, the overall prevalence of anaemia was 72.1%. A study conducted by Vadakattu SS et al., among urban elderly persons in Hyderabad, the reported prevalence of anaemia was 20.6%; and it increased with age. The haemoglobin was estimated using Cyanmethemoglobin method [20]. In the present study, there was no association between anaemia and age of the participants. In a study by Kant S et al., among adult men of rural Haryana, the prevalence of anaemia among adults aged 60 years and above was 46.8%. They found a positive association with age and chronic diseases. HemoCue® was used in the estimation of haemoglobin [27].

A study conducted by Malhotra VM et al., among elderly persons of rural Nalgonda, Telangana, reported that the prevalence of anaemia among adults aged 50 years and above was 27.8%. The study found a significant association with females, increasing age, non use of footwear, excessive alcohol consumption and history of chronic blood loss. Haemoglobin levels were measured by Sahli's technique. The low prevalence of anaemia could be due to low sensitivity of the method used for haemoglobin estimation [28].

Agarwalla R et al., Kamrup, Assam reported that the prevalence of anaemia among elderly persons was 45.5%. The study found a significant association with age, gender, calorie intake, type of diet, iron supplementation, and worm infestation. Sahli's technique was used for the estimation of haemoglobin level [29]. A study conducted by Gonmei Z et al., in slums of West Delhi reported that the prevalence of anemia among elderly persons aged 60 years and above was 57.8%. They had estimated the haemoglobin level by direct cyanmethaemoglobin method [30].

Sudarshan BP and Chethan TK conducted a study in rural Puducherry. The reported prevalence of anaemia among elderly persons was 96.0%. They found a significant association with females and dependent elderly persons. Method used for haemoglobin estimation was not mentioned in the study [31]. A study conducted in urban slums of Kochi, Kerala by Retnakumar C et al., that reported the prevalence of anaemia among elderly persons was 60.6%, and women had higher chance of having anaemia. HemoCue® was used for the estimation of haemoglobin [15].

Another study conducted by Lamba R et al., in the urban slums of Meerut, Uttar Pradesh reported that the prevalence of anaemia among elderly persons was 49.5%. They found a significant association with lower socio-economic status, unemployed and chronic diseases like chronic obstructive pulmonary disease. In this study, haemoglobin was estimated using paper chromatography method (sensitivity 56%) using the Haemo Check Rapid Diagnostic Kit. Low prevalence of anaemia in this study could be due to method used for haemoglobin estimation [16].

A study conducted by Gupta A et al., in Nainital, Uttarkhand reported the prevalence of anaemia among elderly persons as 92.1%. Anaemia was significantly associated with females, unemployed, illiterates, participants reporting hyperacidity, those who had not utilised health facility and lower intake of iron and vitamin C. They used cyanmethaemoglobin method for estimation of haemoglobin [32].

Overall, the prevalence of anaemia among community dwelling elderly persons, in various states of India, ranged from 20.6-96.0% [15,16,20,27-32]. High variation of prevalence of anaemia among different studies may be due to the method of haemoglobin estimation and study settings. A study conducted among elderly women in a resettlement colony of Delhi by Singh T et al., found a significant association between body mass index and anaemia [33]. The present study did not have any association between BMI and anaemia. These findings of high prevalence of anaemia suggest the need for a careful evaluation for this condition by primary care physicians in management of elderly persons. Also, there is an urgent need to assess the nutritional status of all elderly persons by the primary care physicians to rule out underweight, overweight or obesity.

The study design, i.e. cross-sectional community-based survey, and good response rate are some of the strengths of the study. The interviewers were trained in data collection which enhanced the reliability of information. Haemoglobin was measured using the standardised point-of-care test.

Limitation(s)

The limitation is that being a cross-sectional study, temporality of the findings could not be established. Whether the determinants that studied were the precursors/causative agents for the outcome of interest could not be demonstrated beyond doubt.

CONCLUSION(S)

There was a dual burden of underweight and overweight among the elderly persons residing in this resettlement colony. The prevalence of underweight increased with increasing age. Women had increased risk of being overweight/obese. In addition to the dual burden of malnutrition, the overall prevalence of anaemia among elderly persons was 72.1%. These findings recommend an effective primary care screening and management among elderly persons in urban resettlement areas.

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