Original Research Paper

Volume - 11 | Issue - 02 | February - 2021 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

General Medicine

ASSESSMENT OF NUTRITIONAL STATUS IN GERIATRIC AGE GROUP POPULATION

Dr Keerti Kori* PG 3rd year general medicine.*Corresponding Author

Dr Pranay Dhurvey Associate professor medicine.

ABSTRACT

Background- The study aimed to assess the nutritional status of geriatric age group and to assess its role with social status, co-morbidities and other parameters. The study also aimed to assess the correlation of MUST and SCALES with MNA for assessment of Malnutrition.

Methodology- The study was conducted as a facility based cross sectional study at Department of Medicine, Hamidia Hospital Bhopal on 250 individuals belonging to age group of ≥65 years. Detailed information regarding sociodemographic variables, and relevant history was obtained. All the participants were then subjected to detailed general and systemic examination. For screening of malnutrition, three tools were used i.e. MUST, MNA and SCALES.

Result- According to MNA, 23.6% were malnourished whereas according to MUST and SCALES, 23.2% and 47.2% respectively were at high risk. Malnutrition was significantly associated with low socioeconomic status, presence of comorbidities and non sedentary activities ($p<0.05$). Diagnostic accuracy of MUST was equivalent to MNA whereas moderate level of agreement was observed between MNA and SCALES for assessment of malnutrition.

Conclusion- Elderly group of population is vulnerable to malnutrition. Risk of Malnutrition is significantly higher in participants with lower socioeconomic status and engaged in non sedentary activity. Presence of comorbidities make the elderly patients vulnerable to malnutrition. MUST has similar diagnostic accuracy as MNA whereas SCALES is a less reliable test for assessing malnutrition.

KEYWORDS : MNA, elderly, MUST, SCALES, risk factors, malnutrition.

INTRODUCTION

Demographic transition with reduction in fertility rates and increase in life expectancy have resulted in increased proportions of older people in total population.[1] The "National Policy on Older Person" (1999) has defined "elderly" as an individual with age of 60 or more.[2] According to World Health Organization, the total number of population belonging to more than 60 years (elderly) is projected to increase to more than 1.2 billion by 2025 all over the world.[3] Health of elderly is an important issue in defining health status of the population. With increase in life expectancy of individual, associated comorbidities increase and thus the health needs also increase.[4,5] Health status of elderly is often ignored. One of the important determinant of health in elderly is nutritional status.[6] As nutrition status of elderly affects immunity and functional ability of an individual, nutritional status of the elderly must be paid due attention.[7-9] The importance of nutritional status amongst elderly have recently been increasingly emphasized especially in patients with morbid conditions such as cancer, heart disease, and dementia.[10,11]

Malnutrition among elderly is associated with a decline in functional status, immune dysfunction, anemia, impaired muscle function, decreased bone mass, reduced cognitive function, poor wound healing, delayed recovering from surgery, long duration of hospital stay, higher readmission rate, and mortality.[12] In India, malnutrition among elderly is often under reported. However, literature suggests that underweight is prevalent in approximately 50% of the older population whereas intake much lower than the recommended allowance have been documented in >90% elderly population.[13,14]

Various tools have been used for assessing nutritional status in elderly. Body mass index (BMI) is one of the most common criteria to assess the nutritional status amongst individuals of all age groups. However, in older individuals, the utility of BMI in assessing nutritional status is much low due to certain changes related to ageing such as loss of height due to vertebral collapse, change in posture and loss of muscle tone.[15] Another important tool which has been proposed for assessment of malnutrition among elderly include "Malnutrition Universal Screening Tool" (MUST) which can help in finding the correlation between malnutrition statuses and impaired.[16] Mini Nutritional Assessment (MNA) scale is another well-validated common tool for assessing malnutrition in the elderly. This tool helps in predicting adverse health outcomes, social functioning, hospital admission and readmission rates, length of stay and mortality.[17,18]

The SCALES (S-sadness C-Cholesterol A-Albumin L-Loss of weight E-Eating problem physical/cognitive S-Shopping problems) was designed to assess malnutrition in outpatient department. A problem with three or more of these areas is associated with high risk for malnutrition. SCALES is observed to be highly correlated with MNA.[15] With the above background, the present study was conducted at a tertiary care centre, to assess the nutritional status of geriatric age group population using three scales i.e. MUST, MNA and SCALES; and to assess its role with social status, co-morbidities and other parameters. The study also aimed to assess the correlation of MUST and SCALES with MNA for assessment of Malnutrition.

METHODOLOGY

The present study was conducted as a facility based cross sectional study at Department of Medicine, Gandhi Medical College and associated Hamidia Hospital Bhopal on 250 individuals belonging to age group of ≥65 years for a period of 2 years i.e. from 1st September 2018 to 31st August 2020. However, elderly individuals with cognitive impairment, known mental disorder or who were comatose; unable to perform laboratory tests or anthropometric measurements; suffering from critical illness, acute disease or infection, needing treatment prior to nutritional assessment and not willing to participate in the study were excluded.

After obtaining ethical clearance from Institute's ethical committee, all the patient fulfilling inclusion criteria and giving consent were selected using purposive sampling. Detailed information regarding sociodemographic variables such as age, gender, occupation, education, socioeconomic status was obtained from all the study participants. Detailed history regarding presenting complaints, presence of comorbid conditions, drug history, family history and detailed dietary history was obtained from all the study participants. All the participants were then subjected to detailed general and physical examination. Further, all the participants underwent detailed systemic examination and findings were noted. Blood investigations such as CBC, RFT, LFT, Lipid profile, serum electrolytes and serum proteins were conducted. Apart from this urinalysis and Chest Xray was done in all cases.

For screening of malnutrition, three tools were used

1. Malnutrition Universal Screening Tool (MUST)[19]

Three components were assessed i.e. BMI, history of unexplained weight loss over last 3 to 6 months and effect of acute illness. Unexplained weight loss was assessed by looking for weight in past record and current weight was deducted from previous weight to calculate amount of weight lost. More than 10 kg weight loss during the last 3 to 6 months was considered clinically significant whereas weight loss of 5-10 kg was considered early indicator of increased risk of undernutrition. Weight loss of <5 kg was considered insignificant weight loss. Overall risk of malnutrition was calculated by adding the

score of above three steps and it was classified as
- 0 = low risk
- 1 = medium risk
- ≥2= high risk

2. Mini Nutritional Assessment (MNA)[20,21]
The tool consisted of a 6-item short form screening tool (MNA-SF) and 18-item long form scale (MNA-LF). By adding up the scores, the maximum score obtained is 30 and based upon the total score individuals were classified as

- <17 ='malnourished',
- 17–23.5 ='at risk of malnutrition'
- ≥24 ='normal nutritional status'

3. **SCALES**[22]
This scale consisted of 6 component i.e. S-sadness; C-Cholesterol; A-Albumin; L-Loss of weight; E-Eating problem physical/cognitive; S-Shopping problems. A problem with three or more of these areas was associated with high risk for malnutrition.

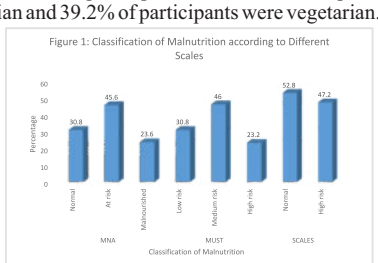
STATISTICALANALYSIS
Data was compiled using MsExcel and analysed using SPSS 20 software. Categorical data was grouped and expressed as frequency and percentage. Association of malnutrition with various factors was calculated using chi square test. P value <0.05 was considered statistically significant.

RESULT-
The present study included a total of 250 elderly individuals belonging to more than 65 years of age.

Table 1: Distribution of Study Population according to baseline variables

Baseline variables		Frequency (n=250)	Percentage
Age group	65-74	191	76.4
	75-84	43	17.2
	≥85	16	6.4
Gender	Male	162	64.8
	Female	88	35.2
Occupation	Sedentary	145	58.0
	Non sedentary	105	42.0
Socioeconomic status	Lower	44	17.6
	Lower Middle	63	25.2
	Middle	93	37.2
	Upper Middle	50	20.0
Comorbidities	Diabetes	27	10.8
	COPD	26	10.4
	Hypertension	20	8
	HTN and DM	21	8.4
	Hypothyroidism	18	7.2
	Asthma	11	4.4
	Old pulm. TB	10	4
	COPD and DM	5	2
	None	112	44.8
Diet	Vegetarian	98	39.2
	Non vegetarian	152	60.8

The mean age of study participants was 71.08±6.43 and majority i.e. about 64.8% of participants were males. About 58% of participants were engaged in sedentary occupation. Majority of participants belonged to middle socio-economic status (37.2%). Diabetes was the most common associated comorbidity observed in 10.8% participants while pulmonary tuberculosis was the least common comorbidity and was observed in 4% of participants. About 60.8% of participants were non-vegetarian and 39.2% of participants were vegetarian.



According to MNA, about 45.6% of participants were at risk of malnutrition, 30.4% were normal and 23.6% were malnourished. According to MUST, 46% of participants were at medium risk, 30.8% were at low risk and 23.2% were at high risk. According to SCALES, 52.8% of participants were normal while 47.2% were at high risk.

Table 2- Association of various factors with malnutrition using MNA scale

Baseline variables		Normal (n=77)		At risk (n=114)		Malnourished (n=59)		P value
		n	%	n	%	n	%	
Age group	65-74	60	77.9	84	73.7	47	79.7	0.39
	75-84	15	19.5	21	18.4	7	11.9	
	≥85	2	2.6	9	7.9	5	8.5	
Gender	Male	51	66.2	69	60.5	42	71.2	0.36
	Female	26	33.8	45	39.5	17	28.8	
Occupation	Sedentary	41	53.2	76	66.7	28	47.5	0.03
	Non sedentary	36	46.8	38	33.3	31	52.5	
Socioeconomic status	Lower	0	0	16	14	28	47.5	0.001
	Lower Middle	1	1.3	38	33.3	24	40.7	
	Middle	44	57.1	42	36.8	7	11.9	
	Upper Middle	32	41.6	18	15.8	0	0	
Comorbidities	Diabetes	0	0	18	15.8	9	15.3	0.001
	COPD	0	0	17	14.9	9	15.3	
	Hypertension	2	2.6	10	8.8	8	13.6	
	HTN and DM	0	0	15	13.2	6	10.2	
	Hypothyroidism	0	0	14	12.3	4	6.8	
	Asthma	1	1.3	7	6.1	3	5.1	
	Old pulm. TB	0	0	8	7	2	3.4	
	COPD and DM	0	0	5	4.4	0	0	
	None	74	96.1	20	17.5	18	30.5	
Diet	Vegetarian	27	35.1	51	44.7	20	33.9	0.26
	Non vegetarian	50	64.9	63	55.3	39	66.1	

Table 2 reveal association of malnutrition with various factors. Our study documented statistically significant association of malnutrition using MNA scale with non sedentary occupation, lower socioeconomic status and presence of comorbid condition (p<0.05).

Table 3- Association of various factors with malnutrition using MUST scale

Baseline variables		Low risk (n=77)		Medium risk (n=115)		High risk (n=58)		P value
		n	%	n	%	n	%	
Age group	65-74	60	77.9	84	73	47	81	0.37
	75-84	15	19.5	21	18.3	7	12.1	
	≥85	2	2.6	10	8.7	4	6.9	
Gender	Male	51	66.2	69	60	42	72.4	0.26
	Female	26	33.8	46	40	16	27.6	
Occupation	Sedentary	41	53.2	77	67	27	46.6	0.02
	Non sedentary	36	46.8	38	33	31	53.4	
Socioeconomic status	Lower	0	0	16	13.9	28	48.3	0.001
	Lower Middle	1	1.3	38	33	24	41.1	
	Middle	44	57.1	43	37.4	6	10.3	
	Upper Middle	32	41.6	18	15.7	0	0	
Comorbidities	Diabetes	0	0	18	15.7	9	15.5	0.001
	COPD	0	0	17	14.8	9	15.5	
	Hypertension	2	2.6	10	8.7	8	13.8	
	HTN and DM	0	0	15	13	6	10.3	

	Hypothyroidism	0	0	14	12.2	4	6.9	
	Asthma	1	1.3	7	6.1	3	5.2	
	Old pulm. TB	0	0	9	7.8	1	1.7	
	COPD and DM	0	0	5	4.3	0	0	
	None	74	96.1	20	17.4	18	31	
Diet	Vegetarian	27	35.1	51	44.3	20	34.5	0.31
	Non vegetarian	50	64.9	64	55.7	38	65.5	

Similar to MNA, we observed statistically significant association of malnutrition using MUST scale with non sedentary occupation, lower socioeconomic status and presence of comorbid condition ($p<0.05$).

Table 4- Association of various factors with malnutrition using SCALES

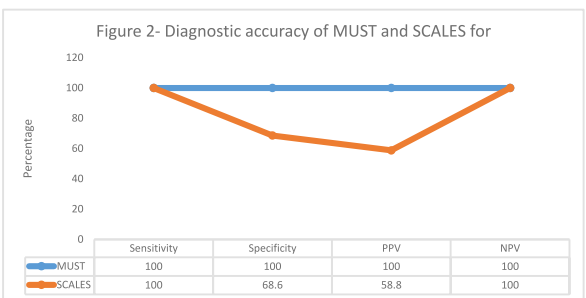
Baseline variables		Normal (n=132)		High Risk (n=118)		P value
		n	%	n	%	
Age group	65-74	102	77.3	89	75.4	0.94
	75-84	22	16.7	21	17.8	
	≥85	8	6.1	8	6.8	
Gender	Male	85	64.4	77	65.3	0.89
	Female	47	35.6	41	34.7	
Occupation	Sedentary	78	59.1	67	56.8	0.07
	Non sedentary	54	40.9	51	43.2	
Socioeconomic status	Lower	7	5.3	37	31.4	0.001
	Lower Middle	19	14.4	44	37.3	
	Middle	68	51.1	25	21.2	
	Upper Middle	38	28.8	12	10.2	
Comorbidities	Diabetes	10	7.6	17	14.4	0.001
	COPD	5	3.8	21	17.8	
	Hypertension	8	6.1	12	10.2	
	HTN and DM	7	5.3	14	11.9	
	Hypothyroidism	7	5.3	11	9.3	
	Asthma	4	3	7	5.9	
	Old pulm. TB	5	3.8	5	4.2	
	COPD and DM	2	1.5	3	2.5	
	None	84	63.6	28	23.7	
Diet	Vegetarian	51	38.6	47	39.8	0.85
	Non vegetarian	81	61.4	71	60.2	

Using SCALES, it was observed that presence of comorbidities and lower socioeconomic status were significantly associated with higher risk of malnutrition ($p<0.01$).

Table 5: Correlation of MUST and SCALES with MNA for assessment of Malnutrition

		MNA						kappa	P value
		Normal (n=77)		At risk (n=114)		Malnourished (n=59)			
		N	%	n	%	n	%		
MUST	Low risk	77	100	0	0	0	0	0.92	0.001
	Medium risk	0	0	113	100	1	1.7		
	High risk	0	0	0	0	58	98.3		
SCALES	Normal	77	100	53	46.9	1	1.7	0.56	0.001
	High risk	0	0	60	53.1	58	98.3		

Out of 59 participants identified as malnourished by MNA, about 98.3% participants were identified as at high risk of malnutrition by MUST. Kappa statistic value (>0.90) revealed almost perfect level agreement between MNA and MUST. Similarly, about 98.3% participants were identified as at high risk of malnutrition by SCALES. Kappa statistic value (k=0.575) revealed moderate level of agreement between MNA and SCALES for assessment of malnutrition.



In present study, MUST scale had 100% diagnostic accuracy whereas SCALES showed sensitivity and NPV of 100%, however, specificity and PPV were documented to be 68.6% and 58.8% respectively.

DISCUSSION

Various factors such as psychological depression, dementia, low income, poverty, isolation, dependency on others, anorexia of ageing, poor dentition and oral health, limited access to food, unable to shop, not able to eat desired food, and presence of comorbidities to be significantly associated factors contributing to risk of malnutrition among elderly. Other factors that may affect nutritional status include social factors such as low income, female gender, alteration in taste and smell, dry mouth inability to chew food and lack of physical activities.

Nutritional status of study population was assessed using 3 scales namely, Mini Nutritional Assessment (MNA), Malnutrition Universal Screening Test (MUST) and SCALES. Based upon the risk assessment using MNA scale, 45.6% of participants were at risk of malnutrition, and 23.6% were malnourished. Whereas, using MUST scale, about 30.8%, 46% and 23.2% participants were at low, medium and high risk of malnutrition respectively. However, according to SCALES, 47.2% were at high risk of malnutrition. Krishnamoorthy et al documented prevalence of malnutrition in 17.9% elderly using MNA scale whereas about 58.8% were observed to be at risk of malnutrition.[23] Hormozi et al used MUST tool to define malnutrition among elderly and observed high-risk elderly patients for malnutrition to be 33.3%.[24]

Malnutrition in the elderly is one of the common yet highly neglected condition. Poor nutritional status significantly increases the risk of comorbidities and also hinders the treatment of comorbidities.[25] The present study documented no statistically significant association of age and gender with risk of malnutrition using MNA, MUST and SCALES tool. Similar findings were documented by Dent et al in which no significant association between malnutrition and age was observed among elderly.[26] Gandhi et al observed no association of gender and nutritional status.[27] However, Lahiri et al documented higher risk of malnutrition in females as compared to females but the difference was statistically insignificant ($p>0.05$).[28]

The disparity in nutritional status amongst population of different socioeconomic strata is well documented. Higher socioeconomic status is associated with overweight and obesity whereas lower socioeconomic group has been associated with malnutrition as their diet is far below recommendations.[29] In present study, prevalence of malnutrition was significantly higher in participants with lower socioeconomic status as compared to higher socioeconomic status using all the scale ($p<0.01$). Similar findings were documented by Dent et al[26] and Lahiri et al[29] in which lower income group participants significantly had malnutrition using MNA scale.

Sedentary level of activity has long been associated with overweight and obesity. The present study observed statistically significant association between non sedentary occupation and lower nutritional status using MNA and MUST ($p<0.05$). Camilo et al in their review documented that even longer exposure to sedentary behavior among elderly did not increase the odds of obesity among them.[30] Diet play significant role in determining nutritional status of an individual. Some nutrients are deficient in vegetarian diet that may be supplemented by non-vegetarian diet. However in India, vast majority of population consume only vegetarian diet owing to their religious and cultural beliefs. Nutrition status amongst study participants did not differ with diet consumed in our study ($p>0.05$). Arlappa et al observed that the consumption of all the foods was below recommended daily intakes (RDI) among elderly population, and also, the in-adequacy (<70% of RDI) of intake was high with respect to leafy vegetables, milk & milk products, fats & oils and sugar & jaggery.[31]

Comorbid conditions may affect nutritional status of an individual, similarly nutritional status may contribute to development of comorbid conditions. With the increase in life expectancy, the prevalence of non-communicable disease have increased. In present study, diabetes was the most common associated comorbidity. Multiple comorbidities were also observed in few participants. The present study documented higher prevalence of malnutrition or risk of malnutrition in participants presenting with various comorbidities ($p<0.01$). The findings of present study were supported by findings of Dube et al (2018) in which physiological anorexia, the presence of comorbid medical conditions (including COPD), smoking were factors with significant impact on nutrition status of an individual.[32] Fávaro-Moreira et al also documented excessive drugs for comorbid

conditions, Parkinson disease, cognitive decline, dementia etc. to be associated with significant level of malnutrition ($p<0.01$).[33]

Our study also aimed to assess the diagnostic accuracy of MUST and SCALES for malnutrition as compared to MNA scale. The level of agreement for identification of malnutrition between MNA and MUST was documented to be almost perfect (>0.90) whereas moderate level of agreement between MNA and SCALES was noted (0.57). Overall the diagnostic accuracy of MUST for diagnosis of malnutrition was similar to MNA i.e. 100% in all variables i.e. sensitivity, specificity, PPV and NPV. However, SCALES showed sensitivity and NPV of 100% whereas specificity and PPV were documented to be 68.6% and 58.8% respectively. Baek et al reported much lower sensitivity and specificity of MUST when compared to MNA. They observed the sensitivity and specificity to be 80.6% and 98.7% respectively.[34] On the other hand Hormozi S et al (2019) observed sensitivity and specificity of MUST to be 90.0% and 73.25% respectively.[24] None of the studies have reported the diagnostic accuracy of SCALES. However, Hormozi et al documented significant correlation between MNA and SCALES.[24]

CONCLUSION

Elderly group of population is vulnerable to malnutrition. Risk of Malnutrition is significantly higher in participants with lower socioeconomic status and engaged in non sedentary activity. Presence of comorbidities make the elderly patients vulnerable to malnutrition. MUST has similar diagnostic accuracy as MNA whereas SCALES is a less reliable test for assessing malnutrition.

REFERENCES

1. World Health Organisation. Jayprakash Indira : Ageing in India. Available from: https://apps.who.int/iris/bitstream/handle/10665/65965/WHO_HSC_AHE_99.2.pdf;jsessionid=1C595FA379AEE4922B81B96158322599?sequence=1
2. Nations U. World Population Ageing 2017: Highlights. New York: Department of Economic and Social Affairs, United Nations. 2015.
3. WHO | Nutrition for older persons [Internet]. WHO. Available from: http:// www.who.int/ nutrition/topics/ageing/en/index1.html. [Last accessed on 2020 August 29].
4. World Health Organization. The world health report 2008: primary health care now more than ever. World Health Organization; 2008.Available from: https://reliefweb.int/report/world/world-health-report-2008-primary-health-care-now-more-ever#:~:text=The%20 World% 20 Health% 20Report% 202008%20analyses %20how% 20 primary %20health%20care,for% 20 health % 20 and %20health%20care [Last accessed on 2020 August 29].
5. Joshi K, Kumar R, Avasthi A. Morbidity profile and its relationship with disability and psychological distress among elderly people in Northern India. Int J Epidemiol 2003;32:978-87.
6. Wells JL, Dumbrell AC. Nutrition and aging: assessment and treatment of compromised nutritional status in frail elderly patients. Clinical interventions in aging. 2006 Mar;1(1):67.
7. Lesourd B. Nutrition: A major factor influencing immunity in the elderly. J Nutr Health Aging 2004;8:28-37
8. Stuck AE, Walthert JM, Nikolaus T, Büla CJ, Hohmann C, Beck JC. Risk factors for functional status decline in community-living elderly people: A systematic literature review. Soc Sci Med 1999;48:445-69.
9. Galanos AN, Pieper CF, Cornoni-Huntley JC, Bales CW, Fillenbaum GG. Nutrition and function: Is there a relationship between body mass index and the functional capabilities of community-dwelling elderly? J Am Geriatr Soc 1994;42:368-73.
10. Natarajan VS, Shanthi R, Krishnaswamy B. High prevalence of nutritional disorders and nutrient deficits in elderly people in a rural community in Tamil Nadu, India. JHK Geriatr Soc. 1995 May;6:40-3.
11. Ministry of Home Affairs, Govt. of India Sample registration system statistical report (2010), pp. 11-28 Available from- https:// censusindia. gov.in/ vital statistics/ srs/ Contents 2010.pdf Last accessed on 9th October 2020
12. Chapman IM. Nutritional disorders in the elderly. Medical Clinics. 2006 Sep 1;90(5):887-907.
13. Semwal J, Vyas S, Juyal R, Sati HC. Nutritional status and associated comorbidities among the elderly in Doiwala block, Dehradun. Indian J Community Health 2014;26:197-203
14. Natarajan VS, Ravindran S, Sivashanmugam, Thyagarajan, Kailash K, Krishnaswamy B, et al. Assessment of nutrient intake and associated factors in an Indian elderly population. Age Ageing 1993;22:103-8
15. Ahmed T, Haboubi N. Assessment and management of nutrition in older people and its importance to health. Clinical interventions in aging. 2010;5:207.
16. Stratton RJ, Hackston A, Longmore D, Dixon R, Price S, Stroud M, et al. Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool' ('MUST') for adults. The British journal of nutrition. 2004;92(5):799-808.
17. Berner YN. Assessment tools for nutritional status in the elderly. IMAJ 2003;5: 365-7
18. Knodrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening 2002. Clin Nutr 2003;22: 415-21
19. Elia M. Screening for malnutrition: a multidisciplinary responsibility. Development and use of the Malnutrition Universal Screening Tool ('MUST') for adults. Redditch: BAPEN. 2003.
20. Guigoz Y, Vellas B, Garry PJ. Assessing the nutritional status of the elderly: The Mini Nutritional Assessment as part of the geriatric evaluation. Nutrition reviews. 1996;54(1):S59.
21. Holvoet E, Vanden Wyngaert K, Van Craenenbroeck AH, Van Biesen W, Eloot S. The screening score of Mini Nutritional Assessment (MNA) is a useful routine screening tool for malnutrition risk in patients on maintenance dialysis. Plos one. 2020 Mar 4;15(3):e0229722.
22. Azad N. Nutrition in the elderly. http://www.stacommunications.com/ journals/ diagnosis/2002/03-March/ 083 Elderly Nutrition.pdf_Last accessed on 9th October 2020.
23. Krishnamoorthy Y, Vijayageetha M, Kumar S G, Rajaa S, Rehman T. Prevalence of malnutrition and its associated factors among elderly population in rural Puducherry using mini-nutritional assessment questionnaire. J Family Med Prim Care 2018;7:1429-33
24. Hormozi S, Alizadeh-Khoei M, Sharifi F, Chehrehgosha M, Esmaeili R, Rezaie-Abhari F, Aminalroaya R, Madadi Z. VALIDITY OF MALNUTRITION UNIVERSAL SCREENING TOOL (MUST) IN GERIATRIC PATIENTS: APPROPRIATE SCREENING TOOL IN HOSPITAL; MUST OR FULL-MNA?.
25. Saka B. Yaşlı Hastalarda Malnütrisyon. Klinik Gelişim 2012; 25: 82-9.
26. Dent E, Hoogendijk EO, Wright OR. New insights into the anorexia of ageing: from prevention to treatment. Current Opinion in Clinical Nutrition & Metabolic Care. 2019 Jan 1;22(1):44-51.
27. Gandhi SJ, Choudary MK, Kumar R, Bhatnagar D. Nutritional status of the geriatric population in the field practice area of a medical college in Rajasthan. Int J Community Med Public Health 2018;5:220-4
28. Lahiri S, Biswas A, Santra S, Lahiri SK. Assessment of nutritional status among elderly population in a rural area of West Bengal, India. Int J Med Sci Public Health. 2015 Apr 1;4(4):569-72.
29. Alkerwi AA, Vernier C, Sauvageot N, Crichton GE, Elias MF. Demographic and socioeconomic disparity in nutrition: application of a novel Correlated Component Regression approach. BMJ open. 2015 May 1;5(5).
30. Camilo BD, Resende TI, Moreira ÉF, Damião R. COMPORTAMIENTO SEDENTARIO Y EL ESTADO NUTRICIONAL DE LOS ANCIANOS: UNA META-ANÁLISIS. Revista Brasileira de Medicina do Esporte. 2018 Aug;24(4):310-5.
31. Arlappa N, Balakrishna N, Kokku SB, Harikumar R, Rao KM. Diet and Nutritional Status of the Older Adults in Rural India. Journal Of Aging Research And Healthcare - 2016 1(1):44-57.
32. Dubé BP, Laveneziana P. Effects of aging and comorbidities on nutritional status and muscle dysfunction in patients with COPD. Journal of Thoracic Disease. 2018 May;10(Suppl 12):S1355.
33. Fávaro-Moreira NC, Krausch-Hofmann S, Matthys C, Vereecken C, Vanhauwaert E, Declercq A, Bekkering GE, Duyck J. Risk factors for malnutrition in older adults: a systematic review of the literature based on longitudinal data. Advances in nutrition. 2016 May;7(3):507-22.
34. Baek MH, Heo YR. Evaluation of the efficacy of nutritional screening tools to predict malnutrition in the elderly at a geriatric care hospital. Nutrition research and practice. 2015 Dec 1;9(6):637-43.