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Malnutrition in Community-Dwelling Elderly in Turkey: A Multicenter, Cross-Sectional Study

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Background: This study aimed to investigate the prevalence of malnutrition and explore the somatic, psychological, functional, and social or lifestyle characteristics linked to malnutrition in elderly people at a hospital in Turkey.

Material/Methods: This study included 1030 patients older than 65 years of age who were seen at the internal medicine and geriatrics outpatient clinics of the study centers in Istanbul, Ankara, Duzce, Corum, Mardin, Malatya, and Diyarbakir provinces between January and December 2014. All patients underwent Mini Nutritional Assessment (MNA) and Geriatric Depression Scale (GDS) tests via one-on-one interview method. The demographic properties of the patients were also recorded during this interview.

Results: Among 1030 patients included in this study, 196 (19%) had malnutrition and 300 (29.1%) had malnutrition risk. The malnutrition group and the other groups were significantly different with respect to mean GDS score, income status, educational status, the number of children, functional status (ADL, IADL), the number of patients with depression, and the number of comorbid disorders. According to the results of the logistic regression analysis, age (OR=95% CI: 1.007–1.056; p=0.012), BMI (OR=95% CI: 0.702–0.796; p<0.001), educational status (OR=95% CI: 0.359–0.897; p=0.015), comorbidity (OR=95% CI: 2.296–5.448; p<0.001), and depression score (OR=95% CI: 1.104–3.051; p=0.02) were independently associated with malnutrition.

Conclusions: Our study demonstrates that age, depression, BMI, comorbidity, and the educational status were independently associated with malnutrition in an elderly population.

MeSH Keywords: Frail Elderly • Malnutrition • Nutrition Assessment

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Background

In addition to developing socio-economic parameters, advances in diagnosis and therapy of diseases have resulted in an increased overall life expectancy in the last 2 decades. Thus, the percentage of the population aged 65 years or above, also called the elderly population, has reached as high as 15% in developed countries. It is estimated that 22% of the world population will be elderly by 2020 [1,2]. Considered a young nation, Turkey is also affected by this demographic shift. It is expected that as the number of adults continues to increase, the percentage of elderly will reach 7.7% in 2020 and 9.3% in 2025 [3,4].

Aging is characterized by accumulation of various disorders and pathological alterations, including cognitive and physical decline, depressive symptoms, and emotional changes, all of which may directly determine the balance between nutritional intake and body requirements [5]. Despite being so prevalent, especially in the geriatric population, and having a proven, strong impact on morbidity and mortality rates, malnutrition is a clinical condition to which no attention is paid by many clinicians and no effort is made to treat it when diagnosed. A timely and simple assessment of malnutrition may clearly avert its poor outcomes.

This study aimed to investigate the prevalence of malnutrition in elderly people attending a hospital outpatient clinic in Turkey. It also aimed to explore the somatic, psychological, functional, and social or lifestyle characteristics linked to malnutrition.

Material and Methods

Subjects

This study included 1030 patients older than 65 years of age who attended internal medicine and geriatrics outpatient clinics. Study centers were Istanbul, Ankara, Duzce, Corum, Mardin, Malatya, and Diyarbakir provinces. The study period was the 12 months from January to December 2014. The patients were classified into 3 categories: early elderly period (65–74 years of age), middle elderly period (75–84 years of age), and late elderly period (>85 years of age) [6]. All patients underwent Mini Nutritional Assessment (MNA) and Geriatric Depression Scale (GDS) tests via one-on-one interview method. The demographic properties of the patients were also recorded during this interview, including age, sex, height, weight, marital status (married, single, widow), persons with whom the patient lives (spouse, alone, children, relatives), income status (low or high), social security status (covered or not covered by health insurance), educational status (illiterate and primary school graduates were classified as having a low educational status, middle school and high school graduates as having an intermediate educational status, and college graduates as having a high educational status), comorbidities (hypertension, diabetes mellitus, coronary artery disease, congestive heart failure, chronic renal failure, chronic obstructive pulmonary disease (COPD), cerebrovascular disease (CVD), osteoporosis and musculoskeletal system disease), the number of comorbidities (0–3 *vs.* ≥4), polypharmacy (currently using ≥5 drugs), and urinary incontinence. The activities of daily living (ADL) scale containing 6 items and the instrumental activities of daily living (IADL) scale containing 8 items were used for an assessment of functional status. The ADL scale questions self-performance status of 6 daily activities including bathing or showering, dressing, carrying out personal toileting, moving from bed to chair, bowel or urine continence, and eating. The (IADL) scale, on the other hand, deals with instrumental activities that are more complex, including the telephone usage, shopping, cooking, housekeeping, laundry, transportation, ability to take medications, and financial management [7]. Both scales classify a person as dependent or not dependent. Participants reporting that they needed help with any of the activities or that they had some or many difficulty performing any of the activities were considered to have dependent ADL. Participants who reported some many difficulties, or who reported not being able to perform 1 or more of these activities, were considered to have dependent IADL. The patients were also questioned about drinking (current drinker, former drinker, non-drinker) and smoking (current smoker, former smoker, or non-smoker) habits. We excluded patients with active malignancy or a gastrointestinal pathology directly causing malnutrition, patients with previously diagnosed depression and/or using antidepressant drugs, patients living in nursing homes, patients with visual or hearing problems complicating the interview, patients with schizophrenia, mental retardation, bipolar disorder, and patients with a Mini Mental State Examination (MMSE) score less than 17 [8]. Informed consent was obtained from each patient. The Dicle University local ethics committee approved the study (2013/85).

Scales used in the study

Mini Nutritional Assessment

Mini Nutritional Assessment (MNA) test is composed of 18 questions, with 15 verbal questions and 3 based on anthropometric measurements; the highest possible overall nutritional score is 30 points [9]. If the individual scored 12 out of 14 points in the initial test, it was concluded that the person did not have malnutrition, and so the rest of the test was not used. On the other hand, if they scored 11 points or less in the initial test, we asked the remaining 12 questions. The MNA comprises 15 oral questions and 3 measurements. The anthropometric measurements in MNA included body mass index (BMI), upper arm

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circumference, and calf circumference. Patients with a BMI less than 18.50 kg/m^2 were considered underweight, those with a BMI of 18.50–24.99 kg/m^2 were normal weight, those with a BMI 25.00–29.99 kg/m^2 were overweight, and those with a BMI ≥30.00 kg/m^2 were obese [10]. MNA test scores less than 17 points were classified as definite malnutrition (MNA-A), 17–23.5 points as malnutrition risk (MNA-B), and 23.5–30 points as normal nutritional status (MNA-C).

The Geriatric Depression Scale

The presence of depression in the elderly people was assessed with the help of the Geriatric Depression Scale (GDS), developed by Yesavage and evaluated by Ertan and Eker for its validity and reliability in its Turkish version. This scale is composed of 30 questions, and each question has answer options of "Yes" or "No". Each answer in favor of depression is scored 1 point and the other answer scores 0 points; the sum of the points is the depression score. Zero to 30 points can be scored in the scale. Zero to 10 points suggests that "depression is absent", 11–13 points are "suggestive of depression", and 14 or more points suggest that "depression is present". The scale has demonstrated a high level of internal consistency (0.92) and a high level of validity (0.97) [11,12].

Statistical analysis

The statistical analyses were carried out using the Statistical Package for Social Sciences software ver.16 (SPSS Inc., Chicago, IL, USA). Descriptive parameters are shown as mean ± standard deviation or percentages. Patient characteristics were calculated for the nutritional status categories (MNA-A <17.0, MNA-B: 17.0–23.5, and >MNA-C: 23.5). Differences across categories were tested with ANOVA for normally distributed variables, Kruskall-Wallis test was used for non-normally distributed variables, and chi-square test was used for categorical variables. The 3 groups were compared with one another using the chi-square test for categorical variables and the t test for numerical variables. Correlations between different continuous variables were evaluated by Pearson correlation analysis. Logistic regression analysis was performed to evaluate the independent predictors of malnutrition (MNA-A Group). A *p* value below 0.05 was considered as statistically significant.

Results

When the whole study population is considered, 196 (19%) had malnutrition and 300 (29.1%) had malnutrition risk. The 3 groups (MNA; malnutrition, MNA-B; malnutrition risk, MNA-C; normal nutritional status) were similar with respect to mean age and gender distribution. In the malnutrition group, 37 (18.9%) patients had depression, 124 (63.3%) had polypharmacy, 106 (54.1%) had a low income level, and 151 (77.0%) had a low educational level. The malnutrition group and the other groups (malnutrition risk and normal malnutrition status) were significantly different with respect to mean GDS score, income status, educational status, the number of children, functional status (activities of daily living and instrumental activities of daily living), the number of patients with depression, and the number of comorbid disorders. The clinical and demographic properties of the study population based on categorical nutritional status and their statistical comparisons are shown in Table 1.

The most common comorbidities accompanying malnutrition were, in descending order of prevalence, hypertension (66%), coronary artery disease (63%), diabetes (29%), and hyperlipidemia (27%). When the whole study population is considered, the prevalence of comorbid conditions such as DM, hyperlipidemia, COPD, and CVD were significantly higher in the malnutrition group compared to the other groups. The rates and statistical comparisons of the comorbid conditions accompanying nutritional status in the whole study population are presented in Table 2.

Pearson correlation analysis revealed that GDS is significantly negatively correlated with MNA score (r=–0.136, p<0.001)

The logistic regression method was used to analyze age, gender, patients with depression (GDS ≥14), BMI, polypharmacy, low educational status, low income status, low number of children, multiple comorbidities, and ADL and IADL parameters. According to the results of the analysis, age (OR=95% CI: 1.007–1.056; p=0.012), BMI (OR=95% CI: 0.702–0.796; p<0.001), educational status (OR=95% CI: 0.359–0.897; p=0.015), comorbidity (OR=95% CI: 2.296–5.448; p<0.001), and depression score (OR=95% CI: 1.104–3.051; p=0.02) were independently associated with malnutrition. The results of the logistic regression analysis are shown in Table 3 and the Pearson correlation analysis of continuous variables is presented in Table 4.

Discussion

Our study revealed that age, low BMI, number of comorbid disorders, low educational level, and presence of depression were independently associated with malnutrition in this elderly population. Our study is the first multicenter trial conducted in a geriatric patient population attending outpatient clinics in our country.

Malnutrition is an important health problem in developed societies where the average life expectancy steadily increases. Thus, detection of populations at high risk for developing malnutrition has been the subject of many studies [13–18], with an observed malnutrition prevalence of 0–35%. Such a wide range of

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Table 1. The clinical and demographic properties of the study population based on categorical nutritional status.

Variable	MNA-A (N=196) n (%)	MNA-B (N=300) n (%)	MNA-C (N=534) n (%)	p value
Sex, Women	102 (52.0%)	172 (57.3%)	292 (54.7%)	0.5
Age (years, mean ±SD)	72.7±7.3[b**]	70.9±6.7[a**]	71.7±7.1	0.1
Age group (years)				
65–74	124 (63.3%)[b*]	208 (69.3%)	362 (67.8%)	
75–84	58 (29.6%)	84 (28.0%)	140 (26.2%)	
>84	14 (7.1%)	8 (2.7%)	32 (6.0%)	0.1
GDS mean score (mean ±SD)	10.6±5.6[b*,c***]	9.5±4.3[a*,c*]	8.6±4.8[a***,b*]	**<0.001**
Number of patients with GDS ≥14	67 (22.3%)[b*,c***]	37 (18.9%)[a*]	43 (8.1%)[a***]	**<0.001**
BMI (kg/m^2, mean ±SD)	20.7±3.7[b**,c***]	21.6±2.5[a**,c***]	24.7±2.6[a***,b***]	**<0.001**
Number of medications (mean ±SD)	5.9±1.3	3.1±1.3	4.1±1.2	0.07
Number of patients with polypharmacy	124 (63.3%)[c**]	210 (70.0%)	400 (74.9%)[a**]	**0.007**
ADL, depent	55 (28.1%)[b*,c**]	29 (9.6%)[a**]	22 (4.1%)[a**,b*]	**<0.001**
IADL, depent	66 (33.6%)[b**,c**]	24 (8.0%)[a**]	15 (2.8%)[a***,b*]	**0.001**
Education, low	151 (77.0%)[c***]	252 (84.0%)[c**]	484 (90.6%)[a***,b**]	**<0.001**
Income status, low	106 (54.1%)[b**]	202 (67.3%)[a**,c***]	296 (55.4%)[b***]	**0.001**
Number of children (<4), low	170 (86.7%)[b***,c**]	220 (73.3%)	408 (76.4%)	0.001
Smoking, current	32 (16.3%)	70 (23.3%)	104 (19.5%)	0.14
Alcohol use, current	21 (11.0%)	18 (6.0%)	24 (4.4%)	0.07
Urinary incontinence present	25 (%12.7)[b**,c**]	31 (%10.3)[a***]	85 (%15.9)[a**]	0.08
No health insurance	64 (32.7%)	94 (31.3%)	176 (33.0%)	0.8
Comorbidities (≥4)	60 (30.6%)[c**]	71 (23.7%)[c***]	51 (9.6%)[a**,b***]	**<0.001**
Marital status				
Married	136 (69.4%)	222 (74.0%)	366 (68.5%)	0.4
Single	2 (1.0%)	4 (1.3%)	10 (1.9%)	
Widow	58 (29.6%)	74 (24.7%)	158 (29.6%)	
The person with whom the patient lives				
Spouse	138 (70.4%)	220 (73.3%)	368 (68.9%)	0.24
Alone	14 (7.1%)	28 (9.3%)	40 (7.5%)	
Children	36 (18.4%)	47 (15.7%)	114 (21.3%)	
Relatives	8 (4.1%)	5 (1.7%)	12 (2.2%)	

[a] Significant *vs.* MNA-A, [b] significant *vs.* MNA-B; [c] significant *vs.* MNA-C; * p<0.05; ** p<0.01; *** p<0.001; MNA – mini nutritional assessment; MNA-A – malnourishment; MNA-B – risk of malnutrition, MNA-C – normal nutritional status; GDS – Geriatric Depression Scale; SD – standard deviation; BMI – body mass index; ADL – activities of daily living; IADL – instrumental activities of daily living.

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Table 2. The comorbid conditions accompanying nutritional status of the patients.

	MNA-A (N=196) (%)	MNA-B (N=300) (%)	MNA-C (N=534) (%)	p value
Hypertension	66%	67%	68%	0.8
Diabetes mellitus	29%	24%	21%	0.42
Coronary artery disease	63%	58%	48%	<0.001
Congestive heart failure	38%	33%	27%	0.05
Renal failure	14%	8%	12%	0.08
COPD	15%	6%	7%	<0.001
Cerebrovascular disease	11%	2%	4%	0.001

MNA – mini nutritional assessment; MNA-A – malnourishment; MNA-B – risk of malnutrition; MNA-C – normal nutritional status; COPD – chronic obstructive pulmonary disease.

Table 3. Independent predictors of malnutrition in logistic regression analysis.

Variable	Odds ratio	95% CI	p value
Age (year)	1.031	1.007–1.056	0.012
BMI (kg/m^2)	0.747	0.702–0.796	<0.001
GDS score (≥14)	1.835	1.104–3.051	0.02
Comorbidities (≥4)	3.567	2.296–5.448	<0.001
Low educational status	0.568	0.359–0.897	<0.015

Table 4. Pearson correlation analysis of the continuous variables in the whole study population.

	BMI	MNA	GDS	Number of medications
Age	NS r=–0.027	NS r=–0.054	NS r=0.005	NS r=–0.11
BMI		*** r=0.317	** r=–0.081	NS r=0.010
MNA			*** r=–0.136	* r=0.079
GDS				* r=–0.074

* p<0.05; ** p<0.01; *** p<0.001; BMI – body mass index; MNA – mini nutritional assesment; NS – no significant; GDS – geriatric depression scale.

prevalence may be caused by the use of different malnutrition criteria or studying elderly populations with varying residential status (private households, general practice, communities, and institutions). Studies have reported a malnutrition prevalence of 2–8% and a malnutrition risk of 24–36% among the community-living elderly [19]. Ulger et al. and Saka et al. reported a malnutrition prevalence of 12% and 13%, respectively, and a malnutrition risk of 69% and 31%, respectively [20,21]. We found a malnutrition prevalence of 19% and a malnutrition risk of 29.1%.

Depression is a common psychiatric disorder characterized by reduced appetite and self-care, apathy, and physical weakness. These characteristics may explain the relationship between malnutrition and depression [21]. Depression has a prevalence of 45% in people living in nursing homes, a figure that is 3–4 times higher than those living in private houses [22,23]. In our study the overall depression rate (GDS ≥14) was 14.2%. Depressive symptoms were found to be independently associated with malnutrition in 579 community-living elderly

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people in Switzerland (24). No significant difference was found between subjects with and without depression with respect to MNA score among elderly people living in nursing homes in Germany. However, a regression analysis showed a modest relationship between depression and malnutrition [25]. Koster et al. reported that weight loss was predictive of increased depressive symptoms [26]. We found a significantly higher average GDS score in the malnutrition group. We also detected a significant negative correlation between GDS and MNA. Finally, we determined that a GDS ≥14 was a strong indicator independently associated with malnutrition.

Previous studies have related excessive polypharmacy (≥10) to lower MNA scores compared to patients using fewer than 5 medications [27]. Polypharmacy may lead to malnutrition by impairing food absorption or enhancing excretion, or by causing nausea, vomiting, diarrhea, constipation, or early satiety [28]. In our study, however, the rate of polypharmacy was significantly lower in the malnutrition group. This may be the consequence of the cautious use of multi-drug regimens by both physicians and the patient's relatives in the malnourished geriatric population in Turkey. This also suggests that inability to fully access healthcare services may also be related to malnutrition.

Chronic disorders may increase the risk of malnutrition. Appetite is reduced by chronic diseases characterized by widespread inflammation such as cancer, COPD, chronic renal failure, and heart failure [29]. She et al. reported that comorbidity was an independent predictor of malnutrition [30]. Similarly, some studies have reported an association between malnutrition and certain comorbidities such as fecal incontinence, bone mineral density, cognitive decline, and functional dependence [20,21]. In our study the malnutrition group had significantly more comorbid conditions compared with the other groups. Moreover, patients with comorbidities had a 3.5-fold increased risk of malnutrition.

Previous studies have linked malnutrition to increased mortality and functional insufficiency [31,32]. Many studies have used activities of daily living (ADL) and instrumental activities of daily living (IADL) scales for determination of functional status [33–35]. Accordingly, Cavarro-carvajal et al. reported that functional capacity (ADL- and IADL-independent) was an independent predictor of nutritional status [33]. In our study, the rates of ADL-dependency and IADL-dependency were significantly higher. In the logistic regression analysis, however, these parameters were not independent predictors of malnutrition.

In Western society, a comparison between elderly people living alone and having a low educational level and young elderly reveals that social factors have an important impact on nutritional status [36,37]. Lower socioeconomic and income levels are also related to poor nutritional intake [33]. Previous studies have reported that income level was negatively correlated with malnutrition [38]. The rates of lower educational status and income were lower in the malnutrition group (77% *vs.* 54.1%, respectively). Furthermore, the rate of elderly with fewer than 4 children was higher in the malnutrition group. The differences in our results may have stemmed from the differences originating from Turkish demographic characteristics. That is, the number of children is higher and the family bonds are stronger in individuals with lower educational and income levels in Turkey. Hence, in contrast to those in Western societies, elderly people in Turkey usually live with their close relatives by tradition.

Our study has some limitations. First, the cross-sectional nature of the study does not allow us to determine causality. Second, it largely represents a geriatric population attending outpatient clinics and does not necessarily reflect data of the whole population. Third, our results may have been biased in unknown ways since some of our data was based on personal statements. Strengths of our study are its large number of patients and its multicenter nature.

Conclusions

Our study demonstrated that age, depression, BMI, comorbidity, and the educational status were independently associated with malnutrition in an elderly population. Diagnosis and treatment of individuals at high risk for malnutrition based on the results of this study may improve functional status, cost of care, and prognosis of elderly people.

Conflict of interest

The authors declare that they have no conflicts of interest concerning this article.

References:

1. Pekcan H: Aging. Erkan D, Işıkhan V (eds.). Anthropology and Aging. Ankara, 2000; 51–54
2. Turkey with Statistics 2002. T. C. Prime SIS. Ankara, 2003
3. Çınar İÖ, Kartal A: Signs of depression in the elderly relationship between depression and sociodemographic characteristics. TAF Prev Med Bull, 2008; 7(5): 399–404
4. Situation of Elderly People in Turkey and National Action Plan on Ageing. General Directorate of Social Sectors and Coordination. The Repuclic of Turkey, 2007. Internet Available from: *http://www.eyh.gov.tr/upload/Node/8638/files/NationalActionPlanonAging.pdf.* Accessed: 10.2.2014 [in Turkish]
5. Chapman IM, MacIntosh CG, Morley JE, Horowitz M: The anorexia of ageing. Biogerontology, 2002; 3: 67–71

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6. Susman R, Riley MW: Introducing the oldest old. Millbank Memorial Fund, 1985; 63: 177–86
7. Yesavage JA, Brink TL, Rose TL et al: Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res, 1982–1983; 17: 37–49
8. Mahoney FI Barthel DW: Functional evaluation: The Barthel index. Md State Med J, 1965; 14: 61–65
9. Kim JM, Shin IS, Yoon JS, Lee HY: Comparison of diagnostic validaties between MMSE-K and MMSE for screening of dementia. Journal of Korean Neuro-Psychiatric Association, 2002; 42(1): 124–30
10. Vellas B, Guigoz Y, Garry PJ et al: The mini nutritional assessment (MNA) and its use in grading the nutritional state of elderly patients. Nutrition, 1999; 15: 116–22
11. James WP, Francois PJ: The choice of cut-off point for distinguishing normal body weights from underweight or 'chronic energy deficiency' in adults. Eur J Clin Nutr, 1994; 48: 179–84
12. Yesavage JA, Brink TL, Rose TL et al: Development and validation of Geriatric Depression Screening Scale: A preliminary report. J Psychiat Res, 1982–1983; 17(1): 37–49
13. Statistics Netherlands. Prevalence data on self reported nutritional status 2010. Ref Type: Internet Communication
14. Schilp J, Wijnhoven HA, Deeg DJ, Visser M: Early determinants for the development of undernutrition in an older general population: longitudinal aging study Amsterdam. Br J Nutr, 2011; 106: 708–17
15. Meijers JM, Schols JM, van Bokhorst-de van der Schueren MA et al: Malnutrition prevalence in the Netherlands: results of the annual Dutch national prevalence measurement of care problems. Br J Nutr, 2009; 101: 417–23
16. Meijers JM, Candel MJ, Schols JM et al: Decreasing trends in malnutrition prevalence rates explained by regular audits and feedback. J Nutr, 2009; 139: 1381–86
17. Schilp J, Kruizenga HM, Wijnhoven HA et al: High prevalence of undernutrition in Dutch community-dwelling older individuals. Nutrition, 2012; 28: 115–16
18. Van Wayenburg CA, van de Laar FA, van WC et al: Nutritional deficiency in general practice: a systematic review. Eur J Clin Nutr, 2005; 1(Suppl.59): S81–87
19. Guigoz Y: The mini nutritional assessment (MNA) review of the literature. What does it tell us? J Nutr Health Aging, 2006; 10(6): 466–87
20. Saka B, Kaya O, Ozturk GB et al: Malnutrition in the elderly and its relationship with other geriatric syndromes. Clin Nutr, 2010; 29(6): 745–48
21. Ulger Z, Halil M, Kalan I et al: Comprehensive assessment of malnutrition risk and related factors in a large group of community-dwelling older adults. Clin Nutr, 2010; 29(4): 507–11
22. Jongenelis K, Pot AM, Eisses AM et al: Prevalence and risk indicators of depression in elderly nursing home patients: The AGED study. J Affect Disor, 2004; 83: 135–42
23. Teresi J, Abrams R, Holmes D et al: Prevalence of depression and depression recognition in nursing homes. Soc Psychiatry Psychiatr Epidemiol, 2001; 36: 613–20
24. Johansson Y, Bachrach-Lindström M, Carstensen J, Ek AC: Malnutrition in a home-living older population: prevalence, incidence and risk factors. A prospective study. J Clin Nurs, 2009; 18: 1354–64
25. Smoliner C, Norman K, Wagner KH et al: Malnutrition and depression in the institutionalised elderly. Br J Nutr, 2009; 102: 1663–67
26. Koster A, van Gool CH, Kempen GI et al: Health ABC Study: Late-life depressed mood and weight change contribute to the risk of each other. Am J Geriatr Psychiatry, 2010; 18: 236–44
27. Jyrkka J, Enlund H, Lavikainen P et al: Association of polypharmacy with nutritional status, functional ability, and cognitive capacity over a three-year period in an elderly population. Pharmacoepidemiol Drug Saf, 2011; 20: 514–22
28. Agarwal E, Miller M, Yaxley A, Isenring E: Malnutrition in the elderly: A narrative review. Maturitas, 2013; 76: 296–302
29. Stratton RJ, Green CJ, Elia M: Disease-related Malnutrition: an evidence-based approach to treatment.Edited by: Stratton RJ, Green CJ, Elia M (eds.). Anonymous Oxon: CABI Publishing; 2003; 93–155
30. Shi R, Duan J, Deng Y et al: Nutritional status of an elderly population in southwest china: a cross-sectional study based on comprehensive geriatric assessment.J Nutr Health Aging, 2015; 19(1): 26–32
31. Flodin L, Svensson S, Cederholm T: Body mass index as a predictor of 1 year mortality in geriatric patients. Clin Nutr, 2000; 19: 121–25
32. Martyn CN, Winter PD, Coles SJ, Edington J: Effect of nutritional status on use of health care recources by patients with chronic disease living in the community. Clin Nutr, 1998; 17: 119–23
33. Chavarro-Carvajal D, Reyes-Ortiz C, Samper-Ternent R et al: Nutritional assessment and factors associated to malnutrition in older adults: a cross-sectional study in Bogotá, Colombia. J Aging Health, 2015; 27(2): 304–19
34. van Bokhorst-de van der Schueren MA, Lonterman-Monasch S, de Vries OJ et al: Prevalence and determinants for malnutrition in geriatric outpatients. Clin Nutr, 2013; 32: 1007–11
35. Akin S, Safak ED, Coban SA et al: Nutritional status and related risk factors which may lead to functional decline in community-dwelling Turkish elderly. European Geriatric Medicine, 2014; 5: 294–97
36. Feldblum I, German L, Castel H et al: Characteristics of undernourished older medical patients and theidentification of predictors for undernutrition status. Nutr J, 2007; 6: 37
37. Pirlich M, Schutz T, Kemps M et al: Social risk factors for hospital malnutrition. Nutrition, 2005; 21: 295–300
38. Kabir ZN, Ferdous T, Cederholm T etal: Mini nutritional assessment of rural elderly people in Bangladesh: the impact of demographic, socioeconomic and health factors. Public Health Nutr, 2006; 9: 968–74

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