American Journal of Public Health Research, 2021, Vol. 9, No. 3, 100-105
Available online at http://pubs.sciepub.com/ajphr/9/3/3
Published by Science and Education Publishing
DOI:10.12691/ajphr-9-3-3

Are Nutritional Screening Scores Associated with the Serum Albumin Levels and the Presence of Bedsores in Bedridden and Chairbound Home Care Patients?

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Received March 04, 2021; Revised April 10, 2021; Accepted April 18, 2021

Abstract Based on the fact that immobile bedridden patients have a high risk of developing bedsores and infection, we evaluated whether the presence of bedsores and low serum albumin levels significantly alter the scores of long and short forms of Mini Nutritional Assessment and body mass index. From January to July 2016, 143 bedridden/chairbound home care patients were visited with the Karaman State Hospital home healthcare team. The Mini Nutritional Assessment and Mini Nutritional Assessment-short form were used for nutritional evaluation. The retrospective serum albumin levels that had been analysed in the last 30 days, were recorded from the patients' files. Also, the skin integrity was evaluated by the home care physician to detect the presence of bedsores. The mean Mini Nutritional Assessment and Mini Nutritional Assessment-short form scores of the patients were 13.2±7.0 and 6.4±3.8, respectively. The mean serum albumin level was 3.2±0.6 g/dL, and 33 patients had bedsores. The Mini Nutritional Assessment and Mini Nutritional Assessment-short form scores, and body mass index values in patients with normal serum albumin levels were significantly higher than those in patients with low serum albumin levels. Moreover, these nutritional parameters in patients with bedsores were significantly lower than those in patients without bedsores. Lastly, the serum albumin levels were found to be significantly positively correlated with all these nutritional parameters. (r=0.477 for Mini Nutritional Assessment; r=0.456 for Mini Nutritional Assessment-short form; r=0.451 for body mass index). Low Mini Nutritional Assessment and Mini Nutritional Assessment-short form scores were significantly related to the presence of bedsores, providing strong evidence that malnutrition may be a major risk factor for bedsore formation. An effective, comprehensive, and holistic treatment protocol and care plan, including nutritional intervention, is important and necessary for immobile home care patients.

Keywords: *nutritional assessment, bedridden patients, bedsore, serum albumin, body mass index*

Cite This Article: Emre Adıgüzel, and Nilüfer Acar-Tek, "Are Nutritional Screening Scores Associated with the Serum Albumin Levels and the Presence of Bedsores in Bedridden and Chairbound Home Care Patients?." *American Journal of Public Health Research*, vol. 9, no. 3 (2021): 100-105. doi: 10.12691/ajphr-9-3-3.

1. Introduction

Home healthcare services, which were put into action with different regulations in 2005 and 2015 in Turkey [1,2], are considered a novel healthcare service model in Turkey. Likewise, globally, the model is particularly applied to meet the minor healthcare needs of older adults, thereby reducing hospitalisations [3]. The World Health Organization (WHO) estimates that the population of individuals aged 60 years and older will reach 1.2 billion, and approximately two-thirds of this population will be living in low-income countries by 2025 [4]. Considering the proportion of elderly individuals in the global population, the importance of home healthcare services is evident today and in the future, because, compared to institutional care, home healthcare services have notable advantages such as a low economic burden, low risk of infection, and maintenance of social and psychological wellbeing for individuals [5].

Malnutrition often develops through a long-term and silent process. Fatigue, impaired concentration, and susceptibility to infections are some non-specific signs and symptoms of malnutrition. For this reason, it is quite difficult to detect malnutrition, especially in healthcare systems wherein nutritional status is not assessed routinely [6]. It has been reported that approximately 65% of community-dwelling older adults and 90% of institutionalized older adults have a risk of malnutrition [7]. The use of nutritional screening tools in healthcare systems such as home care and nursing homes is practical and provides great convenience in determining nutritional status [8]. In addition, many biochemical parameters, especially serum albumin and prealbumin, are frequently used to predict malnutrition in the clinic [9]. However, it can be disturbing to test for biochemical parameters frequently in patients receiving home care.

In particular, bedridden and chairbound patients are susceptible to a severe risk of sarcopenia and bedsores. Therefore, nutritional screening and intervention are important for these immobile patients [10,11].

Based on this perspective, the purpose of this study was to determine the nutritional status of bedridden and chairbound patients receiving home care and to assess the relationship between nutritional assessment tools and other nutrition-related parameters such as serum albumin levels and the presence of bedsores.

2. Materials and Methods

2.1. Study Design and Participants

Within the scope of the study, all visits by the Karaman State Hospital home healthcare team were accompanied from January to July 2016. All bedridden and chairbound patients receiving home care or their caregivers who were visited in this period were interviewed. The recorded data were not included if both the patient and caregiver had an impaired cognitive condition. Finally, the data of 143 patients receiving home care were evaluated. All the participants or caregivers were informed with detailed explanations and requested to complete a voluntary participation form in accordance with the Declaration of Helsinki protocols (World Medical Association).

The Mini Nutritional Assessment (MNA) and its short form (MNA-SF) were used to evaluate the nutritional statuses of the patients, and their body mass index (BMI) values were also recorded. In addition, retrospective serum albumin levels were recorded from the patients' files. The recorded serum albumin levels were the most recent blood test findings analysed in the last 30 days. The threshold levels of serum albumin indicated by the Association for Clinical Biochemistry and Laboratory Medicine (ACB) were accepted. Therefore, the serum albumin levels less than 3.5 g/dL were considered "low", while the levels between 3.5 g/dL and 5.0 g/dL were considered "normal" [12]. Since the serum albumin levels of all participants were less than 5.0 g/dL, a group such as "high serum albumin levels" was not defined.

2.2. Assessment of Bedsores

The skin integrity was evaluated by the home care physician to detect the presence of bedsores. The severity of bedsore was evaluated based on "Prevention of Pressure Ulcer: Quick Reference Guide" that was prepared by the collaboration of the European Pressure Ulcer Advisory Panel and the American National Pressure Ulcer Advisory Panel (EPUAP / NPUAP). The guide classifies the pressure ulcers from stage I to stage IV. At least stage II pressure ulcers were accepted as "bedsores". The stage II pressure ulcer is characterized with partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound, without slough [13].

2.3. Nutritional Assessment Tools

The MNA, consisting of 18 items, was developed to detect malnutrition in the early period in elderly individuals. It is structured in four parts: anthropometric assessment (weight loss, BMI, upper middle arm circumference (AC), and calf circumference (CC)), global assessment (e.g., living independently, mobility, medications, dementia, pressure sores), dietary assessment (e.g., decrease in food intake; number of main meals consumed; dietary protein, fruit, vegetable, and fluid intake), and self-assessment (e.g., self-view of nutritional status, self-view of health status compared with that of individuals of the same age and mode of feeding). The maximum MNA score is "30", and scores less than "24" indicate the risk of malnutrition [14]. The short form, MNA-SF, is also the screening part of the full MNA and consists of six items: decrease in food intake, weight loss, mobility, presence of psychological stress or acute disease, presence of a neuropsychological condition, and BMI range. The maximum possible score of the MNA-SF is "14", and the scores less than "12" indicate the risk of malnutrition [15].

2.4. Anthropometric Measurements

The knee height (KH), AC, abdominal circumference (AbC), and CC were measured in accordance with the method using a non-flexible tape measure to the nearest 0.1 cm for body weight and height measurements of bedridden and chairbound patients. The KH was measured in the left leg with both the knee and ankle flexed at a 90° angle. The distance between the plantar surface of the foot and anterior surface of the femoral condyle of the thigh was measured. For the AC, the midpoint between the olecranon and acromion of the non-dominant arm was marked, while the flexion position of the elbow was maintained at a 90° angle. After marking, the arms were released, and the circumference was measured in the standing posture [16]. Moreover, the AbC was measured from the midpoint between the last rib and upper edge of the iliac crest. For the CC measurement, while the sole of the foot was positioned on a flat platform, the knee was brought into a 90° flexion position. A non-elastic tape measure was moved up and down along the calf, and the maximum measurement value was recorded to the nearest 0.1 cm. These measurement values were incorporated in the formulas below, and body weight and height values were calculated. Finally, the BMI was calculated by dividing the body weight (kg) by the height (m) squared [16,17,18].

Height (cm) estimation [17]:

$$Height\left(\ for\ male\right)=\left[KH\left(cm\right)\times 2.08\right]+59.01$$

$$Height\ \left(\ for\ female\right)$$
$$=\left[KH\ \left(cm\right)\times 1.91\right]-\left[age\ \left(year\right)\times 0.17\right]+75.00$$

Weight (kg) estimation [18]:

$$Weight=\left[CC\ \left(cm\right)\times 1.3160\right]+\left[AbC\ \left(cm\right)\times 0.5646\right]$$
$$+\left[AC\left(cm\right)\times 0.4808\right]-42.2450.$$

2.5. Statistical Analysis

Statistical analysis was performed using the SPSS 21.0 statistical package programme [19]. For the descriptive

analysis, the data were expressed as "mean ± standard deviation" or "number (percentage)". The Kolmogorov–Smirnov test was used to control for normal distributions. The Mann–Whitney U test was used to evaluate statistical differences between the groups. The association between serum albumin levels and nutritional parameters (MNA, MNA-SF and BMI) was evaluated by using Spearman's rho correlation. The binary logistic regression models were used to determine whether the MNA scores, MNA-SF scores, and BMI values were independent predictors of the "presence of bedsores" and "low serum albumin levels (< 3.5 mg/dL)" in patients. $P<0.05$ was chosen to represent statistical significance.

3. Results

The average age of the patients was 75.2 ± 15.5 years, and the most were female (58.7%). Low educational statuses were remarkable; 49.0% of the patients were non-literate. The average BMI was 25.5 ± 7.0 kg/m^2. In addition, the average MNA and MNA-SF scores were 13.2 ± 7.0 and 6.4 ± 3.8, respectively. According to the MNA scores 89.5% of the patients were at risk of malnutrition; this percentage was 86.0% according to the MNA-SF scores (not shown in the tables). On the other hand, the average serum albumin level in the patients was 3.2 ± 0.6 g/dL. In addition, 60.7% of the patients had low albumin levels, while 39.3% had normal levels (not shown in the tables). The proportion of patients with bedsores was 23.1% (Table 1).

The results of the nutritional indicators such as MNA scores, MNA-SF scores, and BMI values according to the serum albumin level groups are shown in Figure 1. There were statistically significant differences in the MNA scores, MNA-SF scores, and BMI values between patients with low and normal serum albumin levels ($P<0.05$).

The MNA scores, MNA-SF scores, and BMI values in patients with bedsores were significantly lower than those in patients without bedsores ($P<0.05$). Meanwhile, in terms of the serum albumin levels, there was no statistically significant difference between these two groups ($P<0.05$) (Figure 2).

The associations between serum albumin levels and other nutritional parameters (MNA scores, MNA-SF scores, and BMI values) are demonstrated with scatter plots in the Figure 3. There were statistically significant correlations between serum albumin levels and the nutritional parameters (r = 0.477, $P<0.001$ for MNA scores; r = 0.456, $P<0.001$ for MNA-SF scores; and r = 0.451, $P<0.001$ for BMI values).

Binary logistic regression analysis showed that decreased MNA scores (B = -0.390, odds ratio (OR) = 0.677, 95% confidence interval (CI): 0.524–0.874, $P=0.003$) were associated with a significantly increased presence of bedsores. The MNA-SF scores and BMI values were not significantly associated with the presence of bedsores according to the logistic regression model (B = 0.483, OR = 1.622, 95% CI: 1.042–2.523, $P=0.052$ for MNA-SF scores and B = 0.019, OR = 1.019, 95% CI: 0.929–1.118, $P=0.683$ for BMI values) (Table 2). The independent predictors of "low serum albumin levels (< 3.5 mg/dL)" are also shown in Table 2. Although the MNA scores, MNA-SF scores, and BMI values seemed to be negatively associated with "low serum albumin levels", the associations were not statistically significant (B = -0.082, OR = 0.921, 95% CI: 0.652–1.301, $P=0.640$ for MNA scores; B = -0.053, OR = 0.948, 95% CI: 0.477–1.887, $P=0.880$ for MNA-SF scores; and B = -0.092, OR = 0.912, 95% CI: 0.806–1.032, $P=0.145$ for BMI values).

Table 1. Descriptive, nutritional and biochemical data of the patients

Characteristics	n = 143	
	mean ± SD	n (%)
Age (years)	75.2 ± 15.5	
Gender		
Male		59 (41.3)
Female		84 (58.7)
Education		
Non-literate		70 (49.0)
Literate		26 (18.2)
School educated		47 (32.8)
Height (cm)	161.5 ± 9.5	
Male	170.2 ± 5.1	
Female	155.3 ± 6.7	
Weight (kg)	66.4 ± 18.1	
Male	67.3 ± 14.2	
Female	65.8 ± 20.5	
BMI (kg/m^2)	25.5 ± 7.0	
MNA	13.2 ± 7.0	
MNA-SF	6.4 ± 3.8	
Albumin (g/dL)	3.2 ± 0.6	
Bedsores		
Yes		33 (23.1)
No		110 (76.9)

SD: standard deviation.

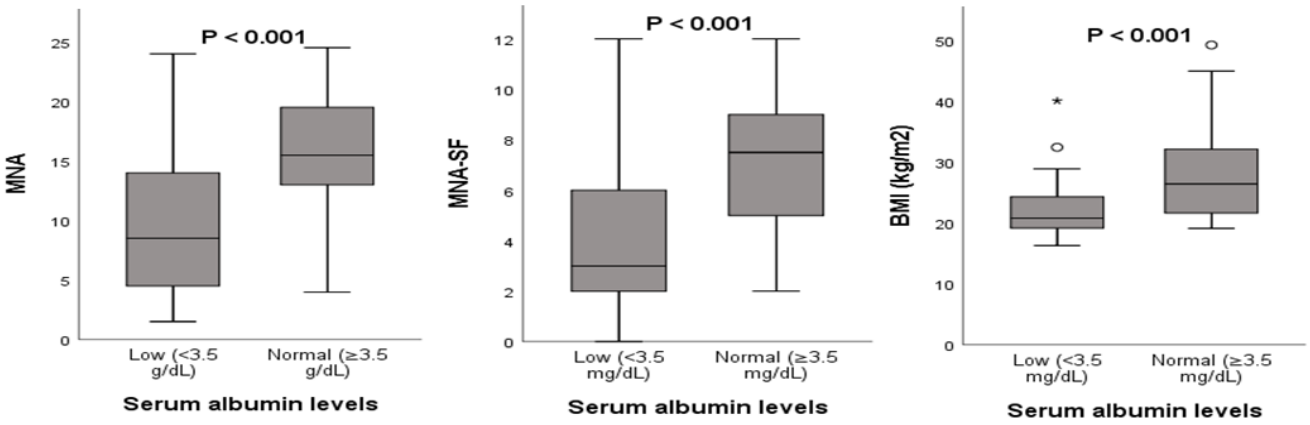

Figure 1. The MNA, MNA-SF and BMI values of patients according to the serum albumin levels (Mann Whitney U test)

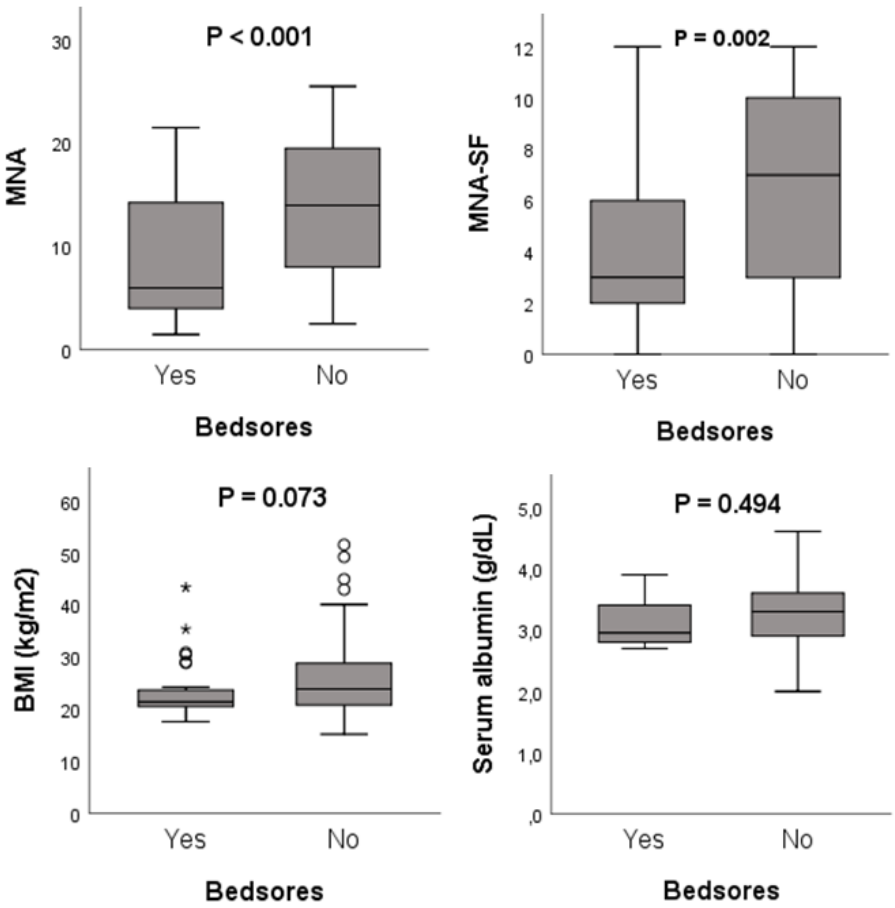

Figure 2. The MNA, MNA-SF, BMI and serum albumin values of patients according to the presence of bedsores (Mann Whitney U test)

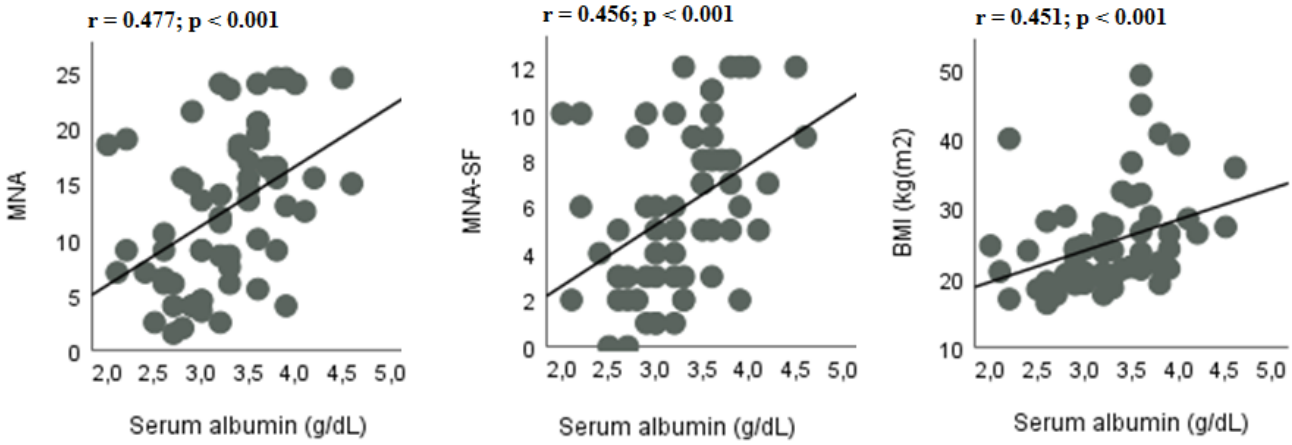

Figure 3. The associations between serum albumin levels and other nutritional parameters (MNA, MNA-SF and BMI)

Table 2. Independent predictors for "presence of bedsores" and "low serum albumin levels" in participants

Predictors for "presence of bedsores"	***B***	**OR**	**95% CI**	***P*-value**
MNA score	-0.390	0.677	0.524-0.874	0.003*
MNA-SF score	0.483	1.622	1.042-2.523	0.052
BMI	0.019	1.019	0.929-1.118	0.683
Predictors for "low serum albumin levels (<3.5 mg/dL)"	***B***	**OR**	**95% CI**	***P*-value**
MNA score	-0.082	0.921	0.652-1.301	0.640
MNA-SF score	-0.053	0.948	0.477-1.887	0.880
BMI	-0.092	0.912	0.806-1.032	0.145

OR: odds ratio, CI: confidence interval, *p < 0.05.

4. Discussion

The nutritional statuses of patients receiving home care are an important consideration. Considering that most individuals receiving home healthcare services are dependent on a bed or chair and are therefore highly immobile, the effect of nutritional intervention on disease courses and health expenditures is an undeniable fact. We should state that the risk of malnutrition is quite high according to the MNA and MNA-SF scores in this sample. Many previous studies have supported our findings. Kiesswetter et al. [20] evaluated 296 subjects within the scope of a study of older adults receiving home healthcare services in Germany and found that 68.9% of these

participants had a risk of malnutrition or were malnourished. In a study conducted among home care clients in Finland, 86% of these individuals were reported to have a risk of malnutrition or were malnourished [21].

In this study, the average serum albumin level was quite low (3.2 ± 0.6 g/dL). Furthermore, 60.7% of the patients had low serum abumin levels (< 3.5 mg/dL). Similarly, Inoue et al. [22] reported that the mean serum albumin level was 3.7 ± 0.5 g/dL in Japanese, frail, elderly individuals receiving home care. The fact that serum albumin levels are a good biochemical indicator that can be used to estimate nutritional status reinforces the perspective that malnutrition was a prevalent problem in these individuals.

There are studies reporting that there is no statistically significant difference between geriatric patients with and without malnutrition in terms of serum albumin levels [23,24]. In a study conducted with older adult patients sustaining first hip fracture, it was reported that the median serum albumin levels were 3.3 mg/dL (1.9-4.2) in malnourished patients according to the MNA-SF scores, 3.3 mg/dL (1.8-4.2) in patients at risk of malnourishment, and 3.4 mg/dL (2.0-4.3) in nutritionally normal patients, respectively [23]. Sanchez-Rodríguez et al. [24] also reported that no statistically significant difference in serum albumin levels were observed between post-acute care geriatric unit patients with or without malnutrition. The samples of these studies generally consisted of individuals receiving institutional care. Besides, not all the subjects in these studies were dependent on a bed or chair. In our study, the statistically significant differences between patients with low and normal serum albumin levels in terms of the MNA and MNA-SF scores indicate that the serum albumin may be a more sensitive nutritional parameter in bedridden and chairbound patients.

Although the logistic regression model did not suggest that the MNA scores, MNA-SF scores and BMI values were significant predictors for “low serum albumin levels”, the results of Spearman correlation analysis showed that these nutritional parameters were significantly positively associated with the serum albumin levels. Our findings about the close relationship between these nutritional parameters and serum albumin levels were supported by other studies. In a study conducted with older Chinese inpatients, the serum albumin levels of patients were found to be positively correlated with the MNA (r = 0.347; P<0.001, Spearman’s rho correlation) and MNA-SF scores (r = 0.294; P<0.001) [25]. In another study, Slee et al. [26] reported that the serum albumin levels were found to be positively associated with the MNA-SF scores in frail older inpatients (r = 0.25; P=0.046, Spearman’s rho correlation). Periodic nutritional screening of older inpatients and bedridden older adults using the MNA or MNA-SF has great importance in terms of early prediction of low serum albumin levels and thus combating malnutrition.

In this study, the prevalence of bedsores was found to be 23.1%. On the other hand, in a study conducted of 335 patients receiving home care older than 40 years of age, the prevalence of bedsores was 12.8% [27]. In our sample, which consisted of bedridden or chairbound patients, the proportion of patients with bedsores was expectedly higher. In addition, the presence of bedsores significantly affected the nutritional indicators. Patients with bedsores had lower MNA and MNA-SF scores (P<0.05). Similarly, based on a recent study by Jones et al. [28], malnutrition was a potential predictor of bedsores in nursing home residents with dementia, and the MNA scores of subjects with and without bedsores were significantly different.

5. Conclusions

Low levels of serum albumin and the presence of bedsores in bedridden and chairbound patients are associated with nutritional screening scores. Therefore, frequent nutritional screening of patients receiving home care or institutional care, especially bedridden and chairbound patients, is greatly important in terms of preventing low levels of nutrition-related biochemical parameters and avoiding the formation of bedsores.

Statement of Competing Interests

The authors have no competing interests.

List of Abbreviations

MNA: Mini Nutritional Assessment
MNA-SF: Mini Nutritional Assessment-short form
BMI: Body mass İndex
KH: Knee height
CC: Calf circumference
AbC: Abdominal circumference
AC: Arm circumference
SD: Standard deviation
OR: Odds ratio
CI: Confidence interval
WHO: World Health Organization
EPUAP: European Pressure Ulcer Advisory Panel
NPUAP: American National Pressure Ulcer Advisory Panel

References

[1] Regulation on the Provision of Home Care Services. Republic of Turkey Government Gazette No. 25751, dated March 10, 2005. Available: https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=7542&MevzuatTur=7&MevzuatTertip=5.

[2] Regulation on the Provision of Home Health Services by the Ministry of Health and Its Affiliates. Republic of Turkey Government Gazette No. 29280, dated February 27, 2015. Available: https://www.resmigazete.gov.tr/eskiler/2015/02/20150227-14.htm.

[3] Coyte, P.C. and McKeever, P, Home care in Canada: Passing the buck. Canadian Journal of Nursing Research Archive. 33. 11-25. 2001.

[4] World Health Organization (WHO). *Nutrition for older persons.* https://www.who.int/nutrition/topics/ageing/en/.

[5] Sahlen, K.G., Boman, K. and Brännström, M, “A cost-effectiveness study of person-centered integrated heart failure and palliative home care: based on a randomized controlled trial,” *Palliative Medicine*, 30 (3). 296-302. Mar.2016.

[6] Lahmann, N.A., Tannen, A. and Suhr, R, “Underweight and malnutrition in home care: A multicenter study,” *Clinical Nutrition*, 35 (5). 1140-1146. Oct.2016.

[7] Keller, H.H, “Malnutrition in institutionalized elderly: How and why?” *Journal of the American Geriatrics Society*, 41 (11). 1212-1218. Nov.1993.

[8] Kaiser, M.J., Bauer, J.M., Ramsch, C., Uter, W., Guigoz, Y., Cederholm, T., Thomas, D.R., Anthony, P., Charlton, K.E., Maggio, M., Tsai, A.C., Grathwohl, D., Vellas, B. and Sieber, C.C, "Validation of the Mini Nutritional Assessment short-form (MNA-SF): A practical tool for identification of nutritional status," *Journal of Nutrition, Health & Aging*, 13 (9). 782-788. Nov.2009.

[9] Keller, U, "Nutritional laboratory markers in malnutrition," *Journal of Clinical Medicine*, 8 (6). 775. May.2019.

[10] Saghaleini, S.H., Dehghan, K., Shadvar, K., Mahmoodpoor, A., Sanaie, S. and Ostadi, Z, "Bedsore: Epidemiology; Risk factors; classification; assessment scales and management," *Archives of Anesthesiology and Critical Care*, 2 (3). 226-230. Aug.2016.

[11] Landi, F., Calvani, R., Cesari, M., Tosato, M., Martone, A.M., Ortolani, E., Savera, G., Salini, S., Sisto, A., Picca, A. and Marzetti, E,. "Sarcopenia: An overview on current definitions, diagnosis and treatment," *Current Protein & Peptide Science*, 19 (7). 633-638. May.2018.

[12] ACB (*Association for Clinical Biochemistry and Laboratory Medicine*). Albumin (serum, plasma). Available: https://www.acb.org.uk/site-search.html?sortOrder=relevance&q=albumin.

[13] European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel. *Prevention and treatment of pressure ulcers: quick reference guide*, Washington DC, National Pressure Ulcer Advisory Panel, 2009.

[14] Vellas, B., Guigoz, Y., Garry, P.J., Nourhashemi, F., Bennahum, D., Lauque, S. and Albarede J.L, "The Mini Nutritional Assessment (MNA) and its use in grading the nutritional state of elderly patient," *Nutrition*, 15 (2). 116-122. Feb.1999.

[15] Rubenstein, L.Z., Harker, J.O., Salvà, A., Guigoz, Y. and Vellas, B, "Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF)," *The Journals of Gerontology Series A Biological Sciences and Medical Sciences*, 56 (6). 366-372. Jun.2001.

[16] Bağcı-Bosi, T, "Anthropometry in elderly," *Turkish Journal of Geriatrics*, 6 (4). 147-151. Dec.2003.

[17] Chumlea, W.C. and Guo, S, "Equations for predicting stature in white and black elderly individuals," *Journal of Gerontology*, 47(6). 197-203. Nov.1992.

[18] Rabito, E.I., Vanucchi, G.B., Suen, V.M.M., Neto, L.L.C. and Marchini, J.S, "Weight and height prediction of immobilized patients," *Revista de Nutrição*, 19 (6). 655-661. Dec.2006.

[19] Statistical Package for Social Science (SPSS version 21.0), Chicago: IBM, 2012.

[20] Kiesswetter, E., Pohlhausen, S., Uhlig, K., Diekmann, R., Lesser, S., Heseker, H., Stehle, P., Sieber, C.C. and Volkert, D, "Malnutrition is related to functional impairment in older adults receiving home care," *Journal of Nutrition, Health & Aging*, 17 (4). 345-350. Apr.2013.

[21] Kaipainen, T., Tiihonen, M., Hartikainen, S. and Nykänen, I, "Prevalence of risk of malnutrition and associated factors in home care clients," *The Journal of Nursing Home Research Sciences*, 1. 47-51. 2015.

[22] Inoue, K. and Kato, M, "Usefulness of the Mini Nutritional Assessment (MNA) to evaluate the nutritional status of Japanese frail elderly under home care," *Geriatrics and Gerontology International*, 7 (3). 238-244. Sept.2007.

[23] Helminen, H., Luukkaala, T., Saarnio, J. and Nuotio, M, "Comparison of the Mini-Nutritional Assessment short and long form and serum albumin as prognostic indicators of hip fracture outcomes," *Injury*, 48 (4). 903-908. Apr.2017.

[24] Sánchez-Rodríguez, D., Marco, E., Ronquillo-Moreno, N., Miralles, R., Vázquez-Ibar, O., Escalada, F. and Muniesa, J.M, "Prevalence of malnutrition and sarcopenia in a post-acute care geriatric unit: Applying the new ESPEN definition and EWGSOP criteria," *Clinical Nutrition*, 36 (5). 1339-1344. Oct.2017.

[25] Lei, Z., Qingyi, D., Feng, G., Chen, W., Shoshana Hock, R. and Changli, W, "Clinical study of mini-nutritional assessment for older Chinese inpatients," *Journal of Nutrition, Health & Aging*, 13 (10). 871-875. Dec.2009.

[26] Slee, A., Birch, D. and Stokoe, D, "The relationship between malnutrition risk and clinical outcomes in a cohort of frail older hospital patients," *Clinical Nutrition*, 15. 57-62. Oct.2016.

[27] Seyhan, S, "Decubitus ulcer development: An investigation on its effect and evidence in home care patients," *Indian Journal of Palliative Care*, 24 (4). 505-511. Oct.-Dec.2018.

[28] Jones, A., Pope, J., Anguah, K.O.B. and Erickson, D, "Mini Nutritional Assessment score as a potential predictor of pressure ulcers in elderly nursing home patients with dementia," *Topics in Clinical Nutrition*, 35. 42-49. 2020.