ORIGINAL ARTICLE

DOI: 10.4274/nkmj.galenos.2026.53929
Nam Kem Med J 2026;14(3):243-251

Inability to Perform the Chair Stand Test Identifies a High-risk Geriatric Phenotype Associated with Frailty and Nutritional Impairment

Sandalyeden Kalkma Testini Yapamama: Frailty ve Beslenme Bozukluğu ile İlişkili Yüksek Riskli Geriatrik Fenotip

İrem KIRAÇ UTKU[1], Nezahat Müge ÇATIKKAŞ[2]

[1]Tekirdağ Dr. İsmail Fehmi Cumalıoğlu City Hospital, Clinic of Internal Medicine, Division of Geriatrics, Tekirdağ, Türkiye
[2]Sancaktepe Martyr Prof. Dr. İlhan Varank Training and Research Hospital, Clinic of Internal Medicine, Division of Geriatrics, İstanbul, Türkiye

ABSTRACT

Aim: Inability to perform the Five-Times Chair Stand test is frequently observed in very old adults but is often excluded from analyses, leading to an underestimation of advanced geriatric vulnerability. This study aimed to investigate whether inability to perform the Chair Stand test represents a clinically meaningful high-risk functional phenotype and to compare the associations of clinical and biochemical nutritional indices with this phenotype.

Materials and Methods: This retrospective cross-sectional study included 417 geriatric outpatients who underwent comprehensive geriatric assessment. Chair Stand performance was categorized as ≤15 s, >15 s, or unable to perform. Nutritional status was assessed using the Mini Nutritional Assessment-Short Form (MNA-SF), prognostic nutritional index (PNI), and controlling nutritional status (CONUT). Associations with frailty, functional dependence, and physical performance were examined using correlation analyses and multivariable logistic regression.

Results: Overall, 39.1% of participants were unable to perform the Chair Stand test. These individuals had significantly higher frailty and activities of daily living/instrumental activities of daily living dependency rates and poorer nutritional status. In adjusted models, higher MNA-SF and PNI scores were independently associated with lower odds of inability to perform the test, whereas CONUT was not.

Conclusion: Inability to perform the Chair Stand test reflects a distinct state of advanced functional vulnerability closely linked to frailty and nutritional impairment. Inability to perform the Chair Stand test identifies a clinically relevant high-risk geriatric phenotype and should be recognized as an integral component of geriatric assessment rather than excluded from analyses.

Keywords: Geriatrics, frailty, malnutrition, geriatric assessment, functional dependence

ÖZ

Amaç: Five-Times Chair Stand testini tamamlayamama, çok ileri yaştaki bireylerde sık görülmesine rağmen çoğu zaman analizlerin dışında bırakılmakta ve bu durum ileri düzey geriatrik kırılganlığın olduğundan düşük tahmin edilmesine yol açmaktadır. Bu çalışmanın amacı, Sandalyeden Kalkma testini tamamlayamamanın klinik açıdan anlamlı yüksek riskli bir fonksiyonel fenotipi temsil edip etmediğini araştırmak ve bu fenotip ile klinik ve biyokimyasal beslenme göstergeleri arasındaki ilişkiyi karşılaştırmaktır.

Gereç ve Yöntem: Bu retrospektif kesitsel çalışmaya kapsamlı geriatrik değerlendirmeden geçirilen 417 geriatrik poliklinik hastası dahil edildi. Chair Stand testi performansı ≤15 saniye, >15 saniye ve testi tamamlayamayanlar olarak sınıflandırıldı. Beslenme durumu Mini Nütrisyonel Değerlendirme-Kısa Formu (MNA-SF), prognostik nütrisyonel indeks (PNI) ve kontrol edici nütrisyonel durum (CONUT) skorları kullanılarak değerlendirildi. Kırılganlık, fonksiyonel bağımlılık ve fiziksel performans ile ilişkiler korelasyon analizleri ve çok değişkenli lojistik regresyon analizleri ile incelendi.

Address for Correspondence: İrem KIRAÇ UTKU MD, Dr. İsmail Fehmi Cumalıoğlu City Hospital, Clinic of Internal Medicine, Division of Geriatrics, Tekirdağ, Türkiye
E-mail: driremkirac@gmail.com **ORCID ID:** orcid.org/0000-0003-3806-5291
Received: 09.01.2026 **Accepted:** 05.02.2026 **Publication Date:** 14.09.2026

Cite this article as: Kıraç Utku İ, Çatıkkaş NM. Inability to perform the chair stand test identifies a high-risk geriatric phenotype associated with frailty and nutritional impairment. Nam Kem Med J. 2026;14(3):243-251

Bulgular: Katılımcıların %39,1'i Chair Stand testini tamamlayamadı. Bu bireylerde kırılganlık ile günlük yaşam aktiviteleri ve enstrümantal günlük yaşam aktiviteleri bağımlılık oranları anlamlı derecede daha yüksek, beslenme durumu ise daha kötüydü. Düzeltilmiş modellerde, daha yüksek MNA-SF ve PNI skorları testi tamamlayamama olasılığının bağımsız olarak daha düşük olmasıyla ilişkili bulunurken, CONUT skoru ile anlamlı bir ilişki saptanmadı.

Sonuç: Chair Stand testini tamamlayamama, kırılganlık ve beslenme bozukluğu ile yakından ilişkili, ileri düzey fonksiyonel kırılganlığı yansıtan ayrı bir klinik durumu temsil etmektedir. Chair Stand testini tamamlayamama, klinik açıdan önemli, yüksek riskli bir geriatrik fenotipi tanımlamakta olup analizlerden dışlanmak yerine geriatrik değerlendirmenin ayrılmaz bir bileşeni olarak kabul edilmelidir.

Anahtar Kelimeler: Geriatri, kırılganlık, malnütrisyon, geriatrik değerlendirme, fonksiyonel bağımlılık

INTRODUCTION

Physical performance measures are essential elements of geriatric assessment, offering pragmatic insights into mobility, functional capacity, and overall health status in older adults. The Chair Stand test has become especially important among these measures because it is a simple, equipment-free way to measure lower extremity strength and functional reserve. It has also been linked to disability, falls, institutionalization, and death in older adults[1]. Historically, physical performance has been assessed on a quantitative continuum, where extended completion times signify inferior functional status. In the short physical performance battery (SPPB), which has a repeated chair stand part, longer completion times have been linked to worse clinical outcomes in older adults, such as functional decline, institutionalization, and death[2].

Nonetheless, a crucial yet frequently neglected facet of physical performance assessment in older adults is the condition of being unable to complete the test. In the majority of studies, individuals unable to complete physical performance tasks are excluded from analyses, either regarded as missing data or eliminated due to methodological limitations. This practice consistently excludes the functionally weakest segment of the geriatric population, leading to an underestimation of actual functional vulnerability and potentially skewing observed correlations with clinical outcomes[1,3]. Emerging evidence indicates that the inability to execute a physical test is not merely an outlier on a performance spectrum but signifies a unique clinical condition correlated with expedited functional deterioration, heightened care dependency, and increased mortality[3,4].

From a clinical standpoint, the inability to execute the Chair Stand test due to physical factors such as osteoarthritis, muscle weakness, balance impairment, and mobility limitation may indicate a qualitative threshold in geriatric health rather than merely a quantitative decline in performance. Crossing this threshold probably means that several geriatric syndromes, such as frailty, functional dependency, and decreased physiological reserve, are coming together. Although its clinical plausibility is evident, the inability to execute the Chair Stand test has seldom been investigated as a distinct functional phenotype, and its broader ramifications for geriatric vulnerability remain inadequately defined.

Malnutrition and the risk of malnutrition are significant public health issues among older adults, with epidemiological studies indicating prevalence rates of 20-45% among individuals aged 65 years and older in both community and clinical settings[5,6]. Age-related factors, including anorexia of aging, sensory decline, oral and dental issues, decreased physical activity, polypharmacy, and the progressive loss of functional capacity, significantly contribute to the deterioration of nutritional status as individuals age[7]. Malnutrition has significant repercussions that transcend weight loss, impacting muscle strength, immune function, wound healing, cognitive performance, mortality, and overall quality of life[8].

In geriatric practice, nutritional status is evaluated through both clinically oriented instruments and laboratory-based indices. The Mini Nutritional Assessment-Short Form (MNA-SF) was specifically designed for older adults and includes functional aspects pertaining to mobility and activities of daily living (ADL), facilitating a multidimensional assessment that closely correlates with geriatric syndromes[9]. Conversely, biochemical indices like the prognostic nutritional index (PNI) and the controlling nutritional status (CONUT) score were initially developed as prognostic indicators in surgical and oncological cohorts[10,11]. These laboratory-based indices, while responsive to metabolic stress and immunological changes, may only partially reflect the long-term functional effects of chronic malnutrition in older adults[12]. It has been underscored that dependence solely on biochemical parameters may inadequately represent the functional aspect of nutritional deficiency in geriatric cohorts[13].

Malnutrition is intricately linked to fundamental geriatric syndromes. Nutritional inadequacy has been linked to cognitive decline, likely through mechanisms involving protein-energy deficiency and micronutrient insufficiency. Epidemiological studies indicate a heightened risk of cognitive impairment in malnourished older adults[14]. Malnutrition exacerbates muscle weakness and increases dependency by reducing muscle mass and strength, thereby impairing performance in basic and instrumental ADL[15,16]. Polypharmacy complicates this relationship by both contributing to malnutrition—by impairing appetite, taste perception, and gastrointestinal tolerance—and resulting from nutritional deterioration due to heightened disease burden and treatment demands[17].

Even though there are well-known links between nutritional status and functional outcomes, most studies so far have only looked at people who could pass physical performance tests. This means that they have assumed that there is a direct link between poor nutrition and poor function. The clinical importance of the incapacity to execute a basic physical task, along with the various nutritional assessment methodologies that illustrate this elevated-risk functional condition, has not been thoroughly investigated. Combining clinically relevant and laboratory-derived nutritional indices, while explicitly including individuals who cannot undergo physical performance assessments, may yield a more thorough comprehension of advanced geriatric vulnerability.

This study seeks to determine if the inability to complete the Chair Stand test in elderly individuals serves as a clinical marker of advanced geriatric frailty. Additionally, it aims to compare the efficacy of clinical Mini Nutritional Assessment-Short Form (MNA-SF) and biochemical (PNI and CONUT) nutritional indices in distinguishing this high-risk functional phenotype concerning frailty, functional dependence, cognitive performance, and physical performance impairment.

Aim

The aim of this study is to investigate whether the inability to perform the Chair Stand test in elderly individuals represents a clinically meaningful high-risk functional phenotype, that is frequently encountered in practice but commonly excluded from research analyses, and to comparatively evaluate the relationship between clinical (MNA-SF) and biochemical (PNI and CONUT) nutritional indices and this high-risk functional phenotype.

Hypothesis

We hypothesize that elderly individuals who are unable to perform the Chair Stand test have a substantially higher burden of frailty and functional dependency, and that this clinically vulnerable phenotype is more consistently reflected by the MNA-SF, which incorporates functional components, compared with biochemical nutritional indices.

MATERIALS AND METHODS

Study Design and Sample

This study was designed as a retrospective observational study with a cross-sectional analytical approach. Data were obtained from older adults who presented to the geriatric outpatient clinic of our hospital between 1 November 2024 and 1 November 2025. During this period, 417 consecutive individuals who underwent a comprehensive geriatric assessment (CGA) performed by a geriatric specialist were included in the study.

Demographic characteristics, clinical measurements, functional assessments, cognitive screening results, and nutritional indices were retrospectively extracted from the hospital information management system and standardized outpatient clinic record forms. For inclusion in the final sample, patients were required to have complete clinical assessments and laboratory data necessary for the calculation of nutritional indices.

To minimize the confounding effects of acute illness and inflammation on nutritional biomarkers, individuals with C-reactive protein (CRP) levels >5 mg/L, clinical evidence of active infection, or acute medical conditions at the time of assessment were excluded. Only patients who had been evaluated during periods of clinical stability, with CRP values below the predefined threshold, were included in the analysis.

During the study period, a total of 680 older adults were screened in the geriatric outpatient clinic. Of these, 38 individuals were excluded due to evidence of acute infection or elevated CRP levels at the time of assessment, and 125 individuals were excluded because of missing laboratory data required for the calculation of nutritional indices. In addition, 27 patients were unable to reliably complete the physical performance tests due to insufficient understanding of the assessment instructions, and 73 patients were excluded because of incomplete components of the CGA. After these exclusions, 417 patients with complete clinical and laboratory evaluations were included in the final analysis. No missing data were present for the variables analyzed in the study.

Laboratory Data

For the assessment of nutritional indices, laboratory parameters including serum albumin, total cholesterol, and lymphocyte count were extracted from fasting blood samples (≥8 hours) obtained during the geriatric outpatient visit or from laboratory tests carried out concurrently with the comprehensive clinical assessment.

For each patient, laboratory values closest to the date of the CGA were used to ensure temporal consistency between nutritional and clinical evaluations. The presence of normal CRP levels across the study population allowed variations in albumin and lymphocyte counts to be interpreted as reflecting chronic nutritional status rather than acute inflammatory or infectious processes.

Nutritional Assessment

MNA-SF

MNA-SF scores were retrieved from standardized CGA records, with total scores ranging from 0 to 14. Nutritional status was classified as normal (≥12 points), at risk of malnutrition (8–11 points), or malnourished (≤7 points). For statistical analyses, MNA-SF was evaluated both as a continuous variable and as a categorical measure.

PNI

PNI was calculated according to the established formula: PNI=10 × serum albumin (g/dL) + 0.005 × total lymphocyte count (/mm^3). Based on conventional cut-off values, PNI scores were categorized as normal (≥50), moderate nutritional risk (45–49), or high nutritional risk (<45), and were analyzed as both continuous and categorical variables.

CONUT Score

The CONUT score was derived from serum albumin concentration, total cholesterol level, and peripheral lymphocyte count, in accordance with the established scoring criteria reported in previous studies. Based on total score values, nutritional status was categorized as normal (0-1 points), mild impairment (2-4 points), or moderate to severe malnutrition (≥5 points). For statistical analyses, the CONUT score was treated both as a continuous variable and as a categorical classification.

Frailty and Functional Assessment

Frailty status was assessed using the Clinical Frailty scale (CFS), which ranges from 1 to 9. Participants with CFS ≥5 were classified as frail.

Basic ADL were assessed using the Katz index, and participants with scores below 6 were classified as dependent in ADL instrumental activities of daily living (IADL) were evaluated with the Lawton IADL scale, with scores less than 8 indicating dependency in instrumental activities.

Mini-mental state examination (MMSE) was used for descriptive and group comparisons and was additionally included as a covariate in multivariable regression models.

Physical Performance Assessment

Physical performance was evaluated using the Five-Times Chair Stand test. Participants were instructed to rise from a standardized chair and sit down five consecutive times as quickly as possible without using their arms. Chair Stand performance was categorized into three groups: ≤15 s, >15 s, and unable to perform. The 15-second cut-off was selected based on previously established geriatric performance thresholds associated with impaired lower extremity strength, frailty, and increased risk of disability, rather than a data-driven quartile approach. A fixed, clinically meaningful time threshold was preferred to enhance interpretability and consistency with prior geriatric literature. In line with the conceptual framework of the SPPB, inability to perform the Chair Stand test was considered the poorest performance category rather than missing data[2]. Time-based measurements were available only for participants who completed the test (n=254). For analyses incorporating the full cohort, Chair Stand performance was treated as an ordinal variable (≤15 s, >15 s, unable to perform), allowing inclusion of individuals without time-based measurements; Spearman's rank correlation coefficient was used for correlation analyses in the entire sample (n=417).

Statistical Analysis

Statistical analyses were conducted utilizing IBM SPSS Statistics version 28. Continuous variables are displayed as either the mean with standard deviation or the median with interquartile range, depending on the distribution of the data. Categorical variables are represented as frequencies and percentages. We used the Kolmogorov-Smirnov test and graphical methods to assess the distributional characteristics.

We used Welch's t-test for continuous variables that were normally distributed and the Mann-Whitney U test for non-normal distributions to compare groups of participants who could and could not complete the Five-Times Chair Stand test. The chi-square test or Fisher's exact test was used to compare categorical variables, depending on what was needed.

Correlation analyses were conducted to examine the relationships between nutritional indices (MNA-SF, PNI, and CONUT score) and critical geriatric outcomes, including frailty status as defined by the CFS dependency in basic and IADL, and Chair Stand performance category. Due to the ordinal characteristics of certain variables, Spearman's rank correlation coefficient was utilized.

To ascertain independent associations between nutritional indices and functional outcomes, multivariable logistic regression models were developed. The primary model characterized the inability to complete the Five-Times Chair Stand test as a binary outcome. Separate regression models were also created for frailty (CFS ≥5), dependence in basic ADL (Katz index <6), and dependence in IADL (Lawton IADL score <8).

In every regression analysis, the MNA-SF, PNI, and CONUT score were incorporated as independent variables, with adjustments made for age, sex, body mass index, and cognitive performance evaluated through the MMSE. We used variance inflation factor values to check for multicollinearity, and all of them were less than 2.0. Odds ratios with 95% confidence intervals are used to report effect estimates. A two-sided p-value below 0.05 was used to define statistical significance.

This study received ethical clearance from the Scientific Research Ethics Committee of Sancaktepe Martyr Prof. Dr. İlhan Varank Training and Research Hospital (approval no: 2025/413, date: 14.11.2025) and was conducted in line with internationally accepted ethical principles, including those of the Declaration of Helsinki.

RESULTS

The study population consisted of 417 older adults with a mean age of 82.9±4.9 years, of whom 65.7% were female. According to the MNA-SF, 66.2% of participants had normal nutritional status, while 29.7% were at risk of malnutrition and 4.1% were malnourished. Based on functional assessments, 69.3% of participants were classified as frail (CFS ≥5), 58.3% had ADL dependency, and 58.0% had IADL dependency. Regarding physical performance, 39.1% of the study population were unable to perform the Chair Stand test, highlighting a substantial burden of functional impairment in this geriatric outpatient cohort. In addition, 30.0% of participants had depressive symptoms based on a Geriatric Depression Scale-Short Form score ≥5, and 54.9% were exposed to polypharmacy, defined as the use of five or more medications (Table 1).

When participants were grouped according to their ability to perform the Chair Stand test, 254 (60.9%) were classified as able to perform, whereas 163 (39.1%) were unable to complete the test. Compared with those able to perform, individuals unable to perform the Chair Stand were significantly older and demonstrated a markedly worse geriatric profile, with substantially higher rates of frailty, ADL dependency, and IADL dependency (all p<0.001). Nutritional status was also poorer in the unable group, reflected by lower MNA-SF scores, lower PNI values, and higher CONUT scores. Body mass index did not differ significantly between groups, while cognitive performance assessed by MMSE was significantly lower among participants unable to perform the Chair Stand test (Table 2).

Correlation analyses demonstrated that MNA-SF showed the strongest associations with functional outcomes, displaying a moderate-to-strong negative correlation with frailty and positive correlations with both ADL and IADL scores. MNA-SF was also moderately correlated with Chair Stand performance when inability to perform the test was classified as the poorest category. In contrast, PNI and CONUT exhibited weaker correlations across functional domains, particularly in relation to Chair Stand performance (Table 3).

In multivariable logistic regression analysis, higher MNA-SF scores were independently associated with significantly lower

Table 1. Baseline clinical, nutritional, and functional characteristics of the study population (n=417)

Variable	Presentation format	Value
Age (years)	Mean ± SD	82.9±4.9
BMI (kg/m^2)	Mean ± SD	27.9±5.8
MNA-SF	Median (IQR)	12 (10-13)
PNI	Mean ± SD	51.7±5.8
CONUT	Median (IQR)	1 (0-2)
CFS	Median (IQR)	5 (4-6)
MMSE	Mean ± SD	24.4±4.4
ADL (Katz)	Median (IQR)	5 (4-6)
IADL (Lawton)	Median (IQR)	6 (4-8)
Categorical variables (n, %)		
Variable	**n**	**%**
Sex		
Male	143	34.3
Female	274	65.7
MNA-SF categories		
Normal (12-14)	276	66.2
At risk of malnutrition (8-11)	124	29.7
Malnutrition (≤7)	17	4.1
PNI categories		
Normal (≥50)	274	65.7
Moderate risk (45-49)	100	24.0
High risk (<45)	43	10.3
CONUT categories		
Normal (0-1)	303	72.7
Mild (2-4)	106	25.4
Moderate-severe (≥5)	8	1.9
Frailty (CFS ≥5)	289	69.3
ADL dependency (Katz < 6)	243	58.3
IADL dependency (Lawton <8)	242	58.0
Depression (GDS-SF ≥5)	125	30.0
Polypharmacy (≥5 medications)	229	54.9
Chair Stand categories		
≤15 seconds	89	21.3
>15 seconds	165	39.6
Unable to perform	163	39.1

Continuous variables are presented as mean ± standard deviation (SD) for normally distributed variables and as median (interquartile range, IQR) for non-normally distributed variables. Categorical variables are presented as number (n) and percentage (%). Chair Stand performance was categorized as ≤15 seconds, >15 seconds, and inability to perform the test. BMI: Body mass index, MNA-SF: Mini Nutritional Assessment-Short Form, PNI: Prognostic Nutritional index; CONUT: Controlling nutritional status, CFS: Clinical frailty scale, MMSE: Mini-mental state examination, ADL: Activities of daily living, IADL: Instrumental activities of daily living, GDS-SF: Geriatric Depression Scale-Short Form

Table 2. Comparison of nutritional and functional characteristics between older adults able and unable to perform the Chair Stand test

Variable	Able to perform (n=254)	Unable to perform (n=163)	p-value
Age (years)	82.1±4.8	84.3±4.8	<0.001
BMI (kg/m^2)	27.6±5.1	28.4±6.8	0.187
MNA-SF	13 (12-14)	11 (10-13)	<0.001
PNI	52.7±5.3	50.1±6.1	<0.001
CONUT	1 (0-1)	1 (0-2)	0.005
Frailty (CFS ≥5), n (%)	138 (54.3%)	151 (92.6%)	<0.001
ADL dependency (Katz <6), n (%)	120 (47.2%)	123 (75.5%)	<0.001
IADL dependency (Lawton<8), n (%)	103 (40.6%)	139 (85.3%)	<0.001
MMSE	25.3±3.7	22.9±5.1	<0.001

Continuous variables are presented as mean ± standard deviation (SD) or median (interquartile range, IQR), as appropriate. Categorical variables are presented as number (n) and percentage (%). Group comparisons were performed using Welch's t-test for continuous variables presented as mean ± SD, Mann-Whitney U test for non-normally distributed variables, and chi-square test for categorical variables. Inability to perform was defined as inability to complete the Five-Times Chair Stand test within the standardized assessment protocol, CFS: Clinical frailty scale, MMSE: Mini-mental state examination, ADL: Activities of daily living, IADL: Instrumental activities of daily living, MNA-SF: Mini Nutritional Assessment-Short Form

Table 3. Correlations between nutritional indices and functional outcomes, with inability to perform the chair stand classified as the poorest performance category

Nutritional index	Frailty (CFS)	ADL score (Katz)	IADL score (Lawton)	Chair Stand category
MNA-SF	–0.48*	+0.40*	+0.50*	–0.33*
PNI	–0.25*	+0.25*	+0.24*	–0.22*
CONUT	+0.16*	–0.20*	–0.22*	+0.16*

Values are Spearman's rank correlation coefficients. *p<0.05. Frailty (Clinical Frailty scale, CFS) and Chair Stand performance were coded such that higher values indicate worse functional status, with inability to perform the Chair Stand test classified as the poorest performance category. ADL (Katz index) and IADL (Lawton scale) scores were coded such that higher scores indicate better functional independence. Accordingly, negative correlation coefficients indicate better nutritional status associated with lower frailty or better, Chair Stand performance, whereas positive coefficients indicate better nutritional status associated with higher ADL and IADL scores (greater functional independence). MNA-SF: Mini Nutritional Assessment-Short Form, PNI: Prognostic nutritional index, CONUT: Controlling nutritional status, CFS: Clinical frailty scale, ADL: Activities of daily living, IADL: Instrumental activities of daily living

odds of inability to perform the Five-Times Chair Stand test [odds ratio (OR) 0.79, p<0.001]. PNI also showed an independent but more modest association with Chair Stand inability (OR: 0.94, p=0.017), whereas CONUT was not independently associated with the outcome. Increasing age (OR: 1.08 per year, p=0.002) and higher body mass index (BMI) (OR: 1.06 per kg/m^2, p=0.005) were independently associated with increased odds of inability to perform the Chair Stand test. Cognitive performance, assessed by MMSE, was not independently associated with Chair Stand inability after full adjustment (p=0.057). Sex was not a significant predictor (Table 4).

Table 4. Independent associations of nutritional indices and cognitive performance with inability to perform the Five-Times Chair Stand test

Variable	OR	95% CI	p-value
MNA-SF	0.79	0.71-0.89	<0.001
PNI	0.94	0.89-0.99	0.017
CONUT	0.94	0.75-1.17	0.568
Age (per year)	1.08	1.03-1.13	0.002
BMI (kg/m^2)	1.06	1.02-1.10	0.005
Sex (female)	1.45	0.89-2.31	0.129
MMSE	0.95	0.90-1.00	0.057

Results are derived from a fully adjusted multivariable logistic regression model in which Mini Nutritional Assessment-Short Form (MNA-SF), Prognostic Nutritional index (PNI), and controlling nutritional status (CONUT) score were entered simultaneously and adjusted for age, sex, body mass index (BMI), and cognitive performance assessed by the mini-mental state examination (MMSE). Inability to perform the Five-Times Chair Stand test was used as the binary outcome. Odds ratios (ORs) are presented with 95% confidence intervals (CIs). ORs <1 indicate lower odds of inability to perform the test, whereas ORs >1 indicate higher odds

DISCUSSION

This study examined the clinical significance of inability to perform the Chair Stand test in very elderly individuals and its associations with frailty, functional dependency, cognitive performance, and nutritional status. Our findings indicate that inability to complete the Chair Stand test represents a distinct and clinically identifiable functional phenotype reflecting advanced geriatric frailty.

The Chair Stand test is a key measure of lower extremity muscle strength and functional reserve and constitutes a core component of composite assessments such as the SPPB. In the original SPPB framework, individuals unable to perform the Chair Stand task are classified within the lowest performance category, a status consistently associated with increased risks of disability, functional decline, and mortality[2]. Accordingly, failure to perform the Chair Stand test should be interpreted not merely as a quantitative extension of prolonged completion time, but as a qualitative threshold indicating advanced functional impairment.

Conversely, the current literature primarily assesses Chair Stand performance through time-based metrics or composite scores, often excluding individuals unable to complete the test from analyses or omitting it for methodological reasons[18]. This practice results in the oversight of the subgroup representing the most significant functional impairment within the geriatric population.

In our study, individuals unable to perform the Chair Stand test demonstrated an exceedingly high prevalence of frailty, markedly elevated rates of ADL and IADL dependency, and poorer cognitive performance in group comparisons, indicating that this cohort represents the segment of the geriatric population with the most severe functional impairment. Together, these findings underscore the central role of lower extremity function in maintaining functional independence in advanced age. These results are consistent with earlier evidence identifying lower extremity performance as a major determinant of disability and dependency[2,19].

Importantly, the inability to complete the Chair Stand test in our study was not attributable to insufficient cognitive cooperation but rather to genuine physical limitations, including reduced muscle strength, balance impairment, mobility restriction, and fear of falling. This observation reinforces the interpretation that the “unable to perform” category reflects a clinically meaningful loss of physical capacity rather than a methodological artifact[18,19].

In addition, nutritional status was closely associated with Chair Stand performance. Individuals unable to execute the test exhibited lower MNA-SF and PNI scores and higher CONUT scores, supporting existing literature that links advanced functional impairment with nutritional deficiency[20-22].

However, given the cross-sectional design of the present study, the observed associations between nutritional status and functional impairment should be interpreted as potentially bidirectional rather than causal. While nutritional impairment may contribute to muscle weakness, reduced physical performance, and increased functional dependency, advanced functional limitation may in turn exacerbate nutritional deterioration through reduced mobility, impaired access to food, decreased appetite, and greater care dependency. Consequently, nutritional impairment and functional decline likely interact in a reciprocal cycle, particularly among older adults with advanced geriatric vulnerability.

Among the nutritional indices examined, MNA-SF showed the most consistent association with inability to complete the Chair Stand test. A likely explanation is that MNA-SF incorporates functional elements, including mobility and daily activities, in addition to nutritional parameters. Although this feature may allow MNA-SF to better capture advanced geriatric frailty, some of the observed associations may partly reflect overlapping measurement domains. Therefore, MNA-SF should be interpreted not solely as a nutritional assessment tool but as a composite indicator of overall geriatric vulnerability encompassing nutritional, functional, and health-related dimensions.

In contrast, the purely biochemical indices PNI and CONUT showed weaker correlations with Chair Stand performance. Inflammatory states, chronic disease burden, and pharmacological effects can influence parameters such as serum albumin and total cholesterol, limiting the ability of these indices to accurately reflect functional capacity in older adults[23,24]. Indeed, previous studies have demonstrated weak associations between biochemical markers, including serum albumin, and functional performance outcomes[25].

Age was independently associated with inability to complete the Chair Stand test in multivariable analyses, consistent with prior evidence that cumulative age-related declines in neuromuscular function, balance, and physiological reserve substantially impair lower extremity performance. Even in advanced age, chronological age remains a marker of increased biological burden, particularly for mobility tasks requiring muscle strength, coordination, and postural control. Accordingly, inability to perform the Chair Stand test may be viewed as a phenotype reflecting advanced-stage functional frailty associated with age-related loss of reserve[26].

Likewise, although BMI did not differ significantly in unadjusted group comparisons, it emerged as an independent correlate of Chair Stand inability after multivariable adjustment. This apparent discrepancy likely reflects confounding and suppression effects revealed after adjustment for age, frailty, and other geriatric covariates. In advanced age, BMI is a limited proxy for body composition; higher BMI values may reflect increased fat mass rather than preserved muscle mass and may coexist with sarcopenia or sarcopenic obesity[27]. These phenotypes adversely affect lower extremity muscle strength and physical performance. Therefore, the observed association of BMI should be interpreted as an indirect marker of unfavorable body composition rather than nutritional adequacy.

Although individuals unable to perform the Chair Stand test exhibited poorer cognitive performance, those who failed to complete the test due to insufficient cognitive cooperation were excluded at the assessment stage. In line with this classification, MMSE did not remain an independent predictor in multivariable models, indicating that inability to perform the test predominantly reflects physical rather than cognitive limitations.

A key methodological strength of this study is that individuals unable to perform the Chair Stand test were not excluded from analyses but were instead treated as a distinct clinical category representing the most severe functional impairment. This approach minimized sample attrition and enabled a more realistic assessment of the relationship between nutrition and function in the geriatric population[18].

From a clinical perspective, inability to perform the Chair Stand test should be regarded as a strong indicator of advanced geriatric frailty and care dependency, warranting CGA encompassing physical performance, nutritional status, functional dependency, and cognitive function.

Study Limitations

This study has several limitations that should be acknowledged. First, the single-center design may limit the generalizability of the findings, as patient characteristics, referral patterns, and clinical practices may differ across institutions. Therefore, the observed associations—particularly those related to advanced functional vulnerability—may partly reflect the profile of a tertiary academic geriatric outpatient clinic.

Second, the retrospective and cross-sectional nature of the study precludes causal inference. The observed relationships between nutritional status, functional impairment, and inability to perform the Chair Stand test can only be interpreted as associations. The directionality of these relationships—whether nutritional impairment precedes functional decline or vice versa—cannot be determined.

Third, laboratory parameters used to calculate PNI and CONUT were obtained within a limited time window around the clinical assessment and may not fully capture longitudinal changes in nutritional or inflammatory status. Although exclusion criteria were applied to minimize the effects of acute inflammatory states by removing individuals with acute infection or CRP levels >5 mg/L, the possibility that chronic disease–related factors may have influenced the results cannot be fully dismissed. In addition, the MNA-SF includes functional components such as mobility and ADL. Consequently, part of the strong association observed between MNA-SF and frailty or functional outcomes may reflect overlapping measurement constructs rather than purely biological nutritional effects. Nevertheless, this overlap mirrors real-world geriatric assessment, in which nutritional, functional, and frailty domains are inherently interconnected rather than independent. Importantly, the absence of significant multicollinearity among MNA-SF, PNI, and CONUT supports the interpretation that these indices provide independent contributions within multivariable models. However, the persistence of MNA-SF as an independent predictor after simultaneous adjustment for purely biochemical indices supports its clinical—not merely methodological—relevance.

The use of cholesterol-lowering medications was not evaluated separately in this study. As total cholesterol is a component of the CONUT score, pharmacological lowering of cholesterol may have influenced CONUT values in some participants, potentially leading to an overestimation of malnutrition prevalence. Nevertheless, even under these conditions, CONUT showed the weakest associations with geriatric outcomes. Therefore, it is unlikely that adjustment for lipid-lowering therapy would have materially altered the main conclusions.

Finally, although inability to perform the Chair Stand test was carefully evaluated and attributed primarily to physical limitations rather than cognitive non-cooperation, the categorization of physical performance remains dependent on clinical judgment and may be influenced by contextual factors such as fear of falling or temporary functional fluctuations.

Despite these limitations, the study is strengthened by its relatively large sample size, minimal missing data, CGA, and—most importantly—the deliberate inclusion of individuals unable to perform the Chair Stand test rather than excluding them from analysis. This methodological choice enhances clinical relevance and reduces selection bias. Future prospective, multicenter studies are needed to validate these findings and to explore the longitudinal implications of inability to perform simple physical performance tests in older adults, particularly to assess the predictive validity of the “unable to perform” phenotype for adverse clinical outcomes.

CONCLUSION

This study demonstrates that inability to perform the Chair Stand test represents a clinically meaningful marker of advanced functional vulnerability in older adults, characterized by a high burden of frailty, functional dependency, cognitive impairment, and nutritional risk. Treating “unable to perform” as a valid functional category—rather than excluding these individuals—provides a more realistic and clinically relevant understanding of geriatric vulnerability.

Among the nutritional indices examined, MNA-SF showed the most consistent associations with this high-risk functional phenotype, whereas laboratory-based indices such as PNI and CONUT demonstrated weaker and less stable relationships. These findings suggest that nutritional tools incorporating clinical and functional components are better aligned with advanced geriatric vulnerability than indices based solely on biochemical parameters.

From a clinical perspective, the results support the integration of simple physical performance assessments and functional nutritional screening into routine geriatric evaluation. In particular, inability to perform the Chair Stand test should be recognized as a red flag indicating severe functional compromise, warranting comprehensive geriatric and nutritional assessment rather than being dismissed as missing or unmeasurable data.

Ethics

Ethics Committee Approval: This study received ethical clearance from the Scientific Research Ethics Committee of Sancaktepe Martyr Prof. Dr. İlhan Varank Training and Research Hospital (approval no: 2025/413, date: 14.11.2025) and was conducted in line with internationally accepted ethical principles, including those of the Declaration of Helsinki.

Informed Consent: The requirement for informed consent was waived due to the retrospective design of the study.

Footnotes

Authorship Contributions

Concept: İ.K.U., Design: İ.K.U., Data Collection or Processing: İ.K.U., N.M.Ç., Analysis or Interpretation: İ.K.U., N.M.Ç., Literature Search: İ.K.U., N.M.Ç., Writing: İ.K.U.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Núñez-Cortés R, Andersen LL, Cruz-Montecinos C, Polo-López A, López-Bueno R, Calatayud J. Five-repetition chair-stand test vs. handgrip strength: which better predicts mortality risk? A follow-up study in 43,605 middle-aged and older adults. Braz J Phys Ther. 2025;29:101529.
2. Guralnik JM, Simonsick EM, Ferrucci L, Glynn RJ, Berkman LF, Blazer DG, et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. J Gerontol. 1994;49:M85-94.
3. Makizako H, Shimada H, Doi T, Tsutsumimoto K, Nakakubo S, Hotta R, et al. Predictive cutoff values of the five-times sit-to-stand test and the timed up & go test for disability incidence in community-dwelling older adults. Phys Ther. 2017;97:417-24.
4. Studenski S, Perera S, Patel K, Rosano C, Faulkner K, Inzitari M, et al. Gait speed and survival in older adults. JAMA. 2011;305:50-8.
5. Agarwal E, Miller M, Yaxley A, Isenring E. Malnutrition in the elderly: a narrative review. Maturitas. 2013;76:296-302.
6. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. Clin Nutr. 2017;36:49-64.
7. Morley JE. Anorexia of aging: a true geriatric syndrome. J Nutr Health Aging. 2012;16:422-5.
8. Leslie W, Hankey C. Aging, nutritional status and health. Healthcare (Basel). 2015;3:648-58.
9. Guigoz Y, Lauque S, Vellas BJ. Identifying the elderly at risk for malnutrition: the mini nutritional assessment. Clin Geriatr Med. 2002;18:737-57.
10. Buzby GP, Mullen JL, Matthews DC, Hobbs CL, Rosato EF. Prognostic nutritional index in gastrointestinal surgery. Am J Surg. 1980;139:160-7.
11. Ignacio de Ulíbarri J, González-Madroño A, de Villar NG, González P, González B, Mancha A, et al. CONUT: a tool for controlling nutritional status. First validation in a hospital population. Nutr Hosp. 2005;20:38-45.
12. Don BR, Kaysen G. Serum albumin: relationship to inflammation and nutrition. Semin Dial. 2004;17:432-7.
13. Thomas DR. Loss of skeletal muscle mass in aging: examining the relationship of starvation, sarcopenia and cachexia. Clin Nutr. 2007;26:389-99.
14. O'Keeffe M, Kelly M, O'Herlihy E, O'Toole PW, Kearney PM, Timmons S, et al. Potentially modifiable determinants of malnutrition in older adults: a systematic review. Clin Nutr. 2019;38:2477-98.
15. Lorenzo-López L, Maseda A, de Labra C, Regueiro-Folgueira L, Rodríguez-Villamil JL, Millán-Calenti JC. Nutritional determinants of frailty in older adults: a systematic review. BMC Geriatr. 2017;17:108.
16. Dent E, Wright ORL, Woo J, Hoogendijk EO. Malnutrition in older adults. Lancet. 2023;401:951-66.
17. Kok WE, Haverkort EB, Algra YA, Mollema J, Hollaar VRY, Naumann E, et al. The association between polypharmacy and malnutrition (risk) in older people: a systematic review. Clin Nutr ESPEN. 2022;49:163-71.
18. Cesari M, Kritchevsky SB, Newman AB, Simonsick EM, Harris TB, Penninx BW, et al. Added value of physical performance measures in predicting adverse health-related events. J Am Geriatr Soc. 2009;57:251-9.
19. Guralnik JM, Ferrucci L, Simonsick EM, Salive ME, Wallace RB. Lower-extremity function in persons over the age of 70 years as a predictor of subsequent disability. N Engl J Med. 1995;332:556-61.
20. Kramer CS, Groenendijk I, Beers S, Wijnen HH, van de Rest O, de Groot LCPGM. The association between malnutrition and physical performance in older adults: a systematic review and meta-analysis. Curr Dev Nutr. 2022;6:nzac007.
21. Verlaan S, Ligthart-Melis GC, Wijers SLJ, Cederholm T, Maier AB, de van der Schueren MAE. High prevalence of physical frailty among malnourished older adults: a systematic review and meta-analysis. J Am Med Dir Assoc. 2017;18:374-82.
22. Mugica-Errazquin I, Zarrazquin I, Seco-Calvo J, Gil-Goikouria J, Rodriguez-Larrad A, Virgala J, et al. Nutritional status and physical performance in institutionalized older adults. Nutrients. 2021;13:3716.
23. Cabrerizo S, Cuadras D, Gomez-Busto F, Artaza-Artabe I, Marín-Ciancas F, Malafarina V. Serum albumin and health in older people: review and meta-analysis. Maturitas. 2015;81:17-27.
24. Fortess EE, Soumerai SB, McLaughlin TJ, Ross-Degnan D. Utilization of essential medications by vulnerable older people after a drug benefit cap. J Am Geriatr Soc. 2001;49:793-7.
25. Bouillanne O, Hay P, Liabaud B, Duché C, Cynober L, Aussel C. Evidence that albumin is not a suitable marker of body composition-related nutritional status in elderly patients. Nutrition. 2011;27:165-9.
26. Seene T, Kaasik P. Muscle weakness in the elderly: role of sarcopenia, dynapenia, and possibilities for rehabilitation. Eur Rev Aging Phys Act. 2012;9:109-17.
27. Villareal DT, Apovian CM, Kushner RF, Klein S. Obesity in older adults: technical review and position statement. Am J Clin Nutr. 2005;82:923-34.