Clinical Research

Prevalence and factors associated with frailty among hospitalized geriatric patients at a tertiary hospital in Egypt

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pISSN: 0853-1773 • eISSN: 2252-8083
https://doi.org/10.13181/mji.oa.257760
Med J Indones. 2025;34:92–8

Received: August 27, 2024
Accepted: March 18, 2025
Published online: May 16, 2025

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ABSTRACT

BACKGROUND Frailty is a geriatric syndrome linked to poor clinical outcomes. Certain diseases and biomarkers may serve as indicators of frailty. This study aimed to assess the prevalence and factors associated with frailty among hospitalized geriatric patients.

METHODS This cross-sectional study was conducted on 206 older adults at a tertiary care geriatrics hospital in Egypt. A comprehensive geriatric evaluation was conducted to identify geriatric syndromes. Clinical history and laboratory tests were performed. The clinical frailty scale (CFS) and the mini-mental state examination (MMSE) assessed frailty and cognitive abilities, respectively. Pressure injury (PI) was identified through physical examination. Prehospitalization medications were checked and counted. Polypharmacy was defined as the daily use of ≥5 medications. The Charlson comorbidity index (CCI) was used to determine multimorbidity. Potential frailty biomarkers included red cell distribution width, serum C-reactive protein/albumin ratio, and neutrophil-lymphocyte ratio. Logistic regression and Spearman's correlation analyses were performed.

RESULTS Frailty was prevalent among 59.2% of the participants and associated with older age, female sex, higher CCI, lower MMSE scores, and lower serum total proteins. Significant geriatric syndromes included dementia, PI, incontinence, polypharmacy, and falls. A history of stroke was a significant comorbidity. Dementia was associated with the highest odds of frailty (odds ratio: 15.695, $p<0.001$). CFS was negatively correlated with MMSE scores ($r = -0.314$, $p = 0.002$) and positively correlated with CCI ($r = 0.227$, $p = 0.003$).

CONCLUSIONS Frailty is a prevalent geriatric syndrome associated with dementia, falls, multimorbidity, incontinence, PI, malnutrition, and polypharmacy. Novel biomarkers may indicate frailty at mild stages.

KEYWORDS dementia, frailty syndrome, geriatric assessment

Frailty is a common geriatric syndrome that indicates unsuccessful aging, characterized by reduced resilience to stressors, increased vulnerability to disease, and poor outcomes. It is highly prevalent in geriatric patients and is associated with physical deficits, institutionalization, and increased morbidity and mortality.[1] Timely screening and assessment of frailty in hospitalized older adults are crucial for guiding therapeutic interventions.[2]

Several tools are available for frailty assessment, including the Fried frailty phenotype criteria, the FRAIL scale, and the clinical frailty scale (CFS). Among these, the CFS is a simple, highly feasible, and convenient tool across various clinical settings.[2] Frailty often co-occurs with other geriatric syndromes, including cognitive impairment, falls, polypharmacy, malnutrition, and multimorbidity.[3] The combination of frailty and cognitive impairment has gained clinical attention

due to its strong association with increased mortality in geriatric patients. Additionally, risk factors such as malnutrition, comorbidities, physical decline, and poor perceived health may create a vicious cycle of frailty and cognitive deterioration. Cognitive impairment is more prevalent among frail older adults and shows a dose-response relationship with subsequent disability and decreased quality of life (QoL).[4] Common comorbidities, such as cardiovascular and renal diseases, may accelerate frailty through biological pathways, including inflammatory mediators and biomarkers. This study aimed to define clinical indicators and novel biomarkers to improve early management and interventions for frailty.

Although pooled data on the prevalence of frailty exist, variations persist depending on age, population, clinical situation, and operational definition of frailty used. Studies assessing the prevalence of frailty among hospitalized geriatric patients remain limited.[5] To address this gap, we aim to contribute to study of frailty prevalence, specifically in hospitalized geriatric patients in Egypt.

METHODS

Ethical statement

The study protocol was reviewed and approved by the Research Ethics Committee at the Faculty of Medicine, Ain Shams University (FMASU R 213/2021). Informed consent was obtained from all participants, and data confidentiality was confirmed.

Sample size calculation

The sample size was calculated using PASS 11.0 (NCSS, LLC., USA) based on a previous study.[6] A minimum sample size of 202 was required to achieve 80% power to detect a difference of −0.196 between the null hypothesis correlation of <0.001 and the alternative hypothesis correlation of 0.196, using a two-sided hypothesis test with a significance level of 0.05.

Study design, population, and setting

This cross-sectional observational study included 206 geriatric patients admitted to a tertiary care geriatrics hospital at Ain Shams University, Egypt, from December 2021 to May 2024. Participants were selected using simple random sampling throughout the study period. Inclusion criteria were male and female patients aged ≥60 years who were inpatients at the geriatrics hospital. Exclusion criteria included community-dwelling patients, those attending outpatient clinics, and those who refused to participate in the study.

Each participant underwent a comprehensive geriatric assessment. Clinical history was analyzed to determine sociodemographic and clinical data, including age, sex, diagnosis of chronic diseases, and comorbidities based on medical history, physical examination, and available investigations. The Charlson comorbidity index (CCI)[7] was used to determine the burden of multiple morbidities and predict 10-year survival. Prehospitalization medications were reviewed and counted. Polypharmacy was defined as the regular use of five or more medications daily.[8] Other geriatric syndromes, including dementia, falls, and urinary or fecal incontinence, were assessed through direct questioning. A physical examination was performed to assess pressure injury (PI) on admission. PI was defined as focal skin necrosis due to pressure over a bony protrusion, ranging from fixed redness (stage 1) to partial or full-thickness skin necrosis (stages 2–4), or unstageable PI, where dead tissue appeared as black eschar or slough.[9]

Frailty and cognitive assessment

The CFS is a nine-point clinical scale used to assess frailty based on a cumulative deficit model.[10] This scale categorizes patients into robust, pre-frail, and frail categories, which are then classified into frail (CFS ≥5) and non-frail (CFS 1–4) patients. The Arabic version of the mini-mental state examination (MMSE) was used to screen for cognitive impairment among participants. The MMSE is a 30-point screening tool used to assess cognitive domains, including visuospatial skills, orientation, attention, recall, calculation, and language capabilities.[11]

Laboratory analysis

Blood specimens were collected by trained nursing staff and analyzed in the clinical laboratories of Ain Shams University Hospitals. Blood cell counts were measured using an XN-1000 (Sysmex, Germany), CELL-DYN Ruby automated hematology analyzer (Abbott, USA), and ADVIA 560 (Siemens, India). Biochemical analyses were performed using cobas c 311 (Roche Diagnostics, Germany), and AU480/AU680 clinical chemistry analyzers (Beckman Coulter, USA).

Laboratory tests conducted on admission included complete blood count (CBC) with differential counts,

serum electrolyte levels, albumin, total protein, creatinine, total bilirubin, alanine aminotransferase, aspartate aminotransferase, C-reactive protein (CRP), blood urea nitrogen, and international normalized ratio.

Selected measurements

Based on laboratory data and the inflammatory hypothesis of frailty, we selected novel inflammatory markers, including red cell distribution width (RDW),[12] serum CRP/albumin ratio (CAR), and neutrophil-lymphocyte ratio (NLR).[13] RDW, found in routine CBC reports, measures anisocytosis (variability in red blood cell size) and has prognostic implications in hospitalized patients.[14] CAR was calculated by dividing CRP (mg/l) by albumin (g/l), and had additional prognostic value.[15] NLR was calculated by dividing the absolute neutrophil count by the lymphocyte count, as found in differential CBC reports. It serves as a clinical biomarker of cell-mediated inflammatory responses.[16]

Statistical methods

Data were entered and analyzed using SPSS software version 28 (IBM Corp., USA). Data were summarized using mean, standard deviation, median, minimum, and maximum for quantitative data, and frequency and percentage for categorical data. The Mann–Whitney *U* test was used to compare quantitative variables, while the chi-square test was used for categorical comparisons. The exact test was used when the expected frequency was <5, and Spearman's correlation coefficient was used for correlations between quantitative variables. Logistic regression analysis was used to identify clinical indicators of frailty. Statistical significance was set at $p<0.05$.

RESULTS

The prevalence of frailty among the study participants was 59.2%. The mean CFS score among the frail patients was 6.44. Most frail patients were females or older. Frail patients had significantly lower MMSE scores and higher CCI scores compared to non-frail patients. Among the laboratory tests, serum albumin and total protein levels were significantly associated with frailty, with mean serum total protein levels being lower in frail patients (Tables 1 and 2).

Compared to non-frail patients, frail older adults had a significantly higher prevalence of geriatric syndromes, including dementia (28.7% *versus* 2.5%), falls (24.1% *versus* 12.5%), polypharmacy (38.5% *versus* 24.3%), incontinence (29.4% *versus* 14.9%), and PI (25.9% *versus* 6.3%). In addition, the frail group had a significantly higher prevalence of previous strokes (32.0% *versus* 4.8%) (Table 2).

Univariate regression analysis identified factors associated with frailty, including MMSE score (odds ratio [OR]: 0.846, $p = 0.001$) and dementia (OR: 15.695, $p<0.001$). Other significant clinical indicators are listed in Table 3.

The correlations between CFS as a representative of frailty status and other geriatric assessment domains were performed. Spearman's correlation analysis revealed a statistically significant inverse correlation between CFS and MMSE ($r = -0.314$, $p = 0.002$) and a statistically significant positive correlation between CFS and CCI ($r = 0.227$, $p = 0.003$).

The study also analyzed the correlation between CFS and different novel inflammatory biomarkers including NLR, RDW, and CAR as follows; CFS & NLR ($r = -0.065$, $p = 0.647$), CFS & RDW ($r = -0.008$, $p = 0.958$) and CFS & CAR ($r = 0.112$, $p = 0.188$).

DISCUSSION

This study reinforces the results of several studies across different populations, highlighting that frailty is often overlooked in hospitals despite its high prevalence and clinical significance. In this study, frailty was present in 59.2% of participants, which is consistent with a pooled prevalence of 47.4% (95% confidence interval [CI]: 43.7–51.1) reported in a meta-analysis of 467,779 hospitalized geriatric patients.[5] The study also explored a clinically important association between frailty and cognitive function, as demonstrated by the significant inverse relationship between CFS and MMSE scores. These findings align with those of a Chinese study of 3,279 patients, which reported a significant inverse association between frailty index (FI) and MMSE ($\beta = -0.28$, 95% CI: −0.43–0.13), as well as cognitive impairment (OR: 1.19, 95% CI: 1.04–1.35). Additionally, regression analysis in the same study showed a significant linear relationship between the FI and both MMSE scores and cognitive impairment ($p<0.05$).[17]

In this study, dementia was the most prevalent geriatric syndrome associated with frailty, with 33 of the 35 dementia cases being frail. This finding aligns with a previous analysis reporting that a 10% increment in the

Table 1. Comparison between frail and non-frail patients as regards quantitative variables

Quantitative variables	Frail (CFS ≥5)		Non-frail (CFS 1–4)		*p*
	Mean (SD)	Median (min–max)	Mean (SD)	Median (min–max)	
CFS	6.44 (1.12)	6.00 (5.00–9.00)	3.32 (0.78)	3.00 (1.00–4.00)	**<0.001**
Estimated 10-year survival (%)	14.47 (23.39)	2.00 (0.00–90.00)	20.61 (27.56)	2.00 (0.00–90.00)	0.172
Age (years)	74.67 (8.71)	73.00 (60.00–102.00)	70.49 (6.58)	70.00 (60.00–89.00)	**<0.001**
CCI	6.65 (2.22)	6.00 (2.00–13.00)	5.83 (1.88)	6.00 (2.00–10.00)	**0.026**
Number of daily medications	4.04 (2.70)	3.00 (0.00–12.00)	3.27 (2.39)	3.00 (0.00–12.00)	0.058
MMSE	21.28 (7.43)	24.00 (0.00–30.00)	25.85 (3.30)	26.00 (14.00–30.00)	**0.003**
TLC (normal range: 4–10×10^3/µl)	9.63 (4.04)	8.60 (2.30–21.20)	9.57 (6.59)	7.65 (1.50–43.00)	0.088
Neutrophils count (normal range: 2.00–7.00×10^3/µl)	9.00 (15.91)	5.57 (1.88–84.10)	9.70 (11.26)	7.22 (1.71–58.90)	0.364
Lymphocytes count (normal range: 1.00–3.00×10^3/µl)	1.91 (1.38)	1.53 (0.05–7.50)	2.10 (3.94)	1.50 (0.20–25.60)	0.484
NLR	6.21 (9.48)	3.62 (0.91–48.40)	6.20 (4.58)	5.47 (0.64–19.31)	0.233
Monocytes count (normal range: 0.20–1.00×10^3/µl)	1.03 (1.42)	0.73 (0.28–7.40)	1.87 (4.25)	0.61 (0.20–19.90)	0.703
Eosinophils count (normal range: 0.02–0.50×10^3/µl)	0.12 (0.14)	0.07 (0.00–0.60)	0.35 (0.87)	0.06 (0.00–3.47)	0.716
Basophils count (normal range: 0.02–0.10×10^3/µl)	0.04 (0.03)	0.03 (0.01–0.17)	0.08 (0.24)	0.02 (0.00–1.20)	0.189
Hb (normal range: 12–15 g/dl)	10.18 (2.63)	10.05 (4.30–15.90)	10.72 (2.87)	10.70 (4.30–16.80)	0.222
RDW (normal range: 11.5–14.0%)	16.81 (3.26)	16.00 (13.60–24.80)	17.00 (4.22)	15.40 (12.20–28.60)	0.687
Platelets (normal range: 150–410×10^3/µl)	262.04 (112.66)	250.00 (44.00–664.00)	268.04 (161.01)	231.00 (28.00–897.00)	0.577
Hematocrit (normal range: 40.0–50.0%)	30.62 (7.81)	28.55 (15.20–43.10)	33.61 (9.16)	33.60 (21.30–58.40)	0.319
MCV (normal range: 80–100 fl)	81.35 (7.11)	81.20 (66.90–94.90)	79.14 (8.84)	80.00 (51.50–101.00)	0.330
MCH (normal range: 27.0–32.0 pg)	26.46 (4.52)	26.40 (16.50–41.00)	25.82 (3.65)	26.20 (17.50–32.10)	0.860
MCHC (normal range: 31.5–34.5 g/dl)	31.25 (4.14)	32.00 (13.90–35.40)	31.88 (3.17)	32.45 (20.30–36.60)	0.443
INR (normal range: 0.80–1.20)	1.28 (0.43)	1.20 (0.90–3.40)	1.19 (0.25)	1.10 (0.90–2.20)	0.190
CRP (normal range: <6 mg/l)	68.19 (79.29)	38.75 (0.20–378.00)	60.75 (74.75)	22.50 (0.80–308.00)	0.386
Albumin (normal range: 3.5–5.7 g/dl)	3.41 (3.27)	3.10 (1.70–3.50)	3.29 (0.60)	3.40 (1.40–4.50)	**0.036**
CAR	2.45 (2.97)	1.27 (0.01–15.12)	2.06 (2.66)	0.74 (0.02–9.93)	0.318
BUN (normal range: 8–20 mg/dl)	36.77 (33.13)	24.00 (4.00–243.00)	29.99 (20.08)	24.50 (5.00–99.00)	0.500
Creatinine (normal range: 0.6–1.2 mg/dl)	1.78 (1.58)	1.20 (0.40–10.00)	1.81 (2.47)	1.10 (0.30–18.70)	0.356
Sodium (normal range: 136–145 mmol/l)	136.28 (6.57)	137.00 (114.00–165.00)	136.62 (4.57)	137.50 (117.00–145.00)	0.422
Potassium (normal range: 3.5–5.1 mmol/l)	4.18 (0.82)	4.20 (2.50–6.60)	4.25 (0.58)	4.30 (2.80–5.60)	0.255
Magnesium (normal range: 1.8–2.6 mg/dl)	1.95 (0.44)	1.80 (1.20–4.00)	1.83 (0.26)	1.80 (1.00–2.20)	0.461
Phosphorus (normal range: 2.5–5.0 mg/dl)	3.37 (1.24)	3.20 (1.20–9.10)	3.35 (0.95)	3.40 (1.00–5.50)	0.474
AST (normal range: 13–39 IU/l)	34.75 (34.32)	23.50 (9.00–233.00)	32.59 (31.39)	22.00 (11.00–217.00)	0.778
ALT (normal range: 7–52 IU/l)	26.55 (38.07)	16.00 (4.00–245.00)	24.61 (24.92)	16.50 (6.00–128.00)	0.520
Total bilirubin (normal range: 0.3–1 mg/dl)	1.11 (3.25)	0.60 (0.10–31.00)	1.30 (2.52)	0.70 (0.10–17.10)	0.580
Total proteins (normal range: 6–8.3 g/dl)	6.18 (0.80)	6.20 (3.90–8.10)	6.67 (1.24)	6.60 (4.40–11.50)	**0.019**
Total calcium (normal range: 8.6–10.3 mg/dl)	8.89 (1.13)	9.20 (6.80–11.10)	8.75 (0.86)	8.70 (7.10–12.00)	0.344

ALT=alanine aminotransferase; AST=aspartate aminotransferase; BUN=blood urea nitrogen; CAR=C-reactive protein/albumin ratio; CCI=Charlson comorbidity index; CFS=clinical frailty scale; CRP=C-reactive protein; Hb=hemoglobin; INR=international normalized ratio; MCH=mean corpuscular hemoglobin; MCHC=mean corpuscular hemoglobin concentration; MCV=mean corpuscular volume; MMSE=mini-mental state examination; NLR=neutrophil-lymphocyte ratio; RDW=red cell distribution width; SD=standard deviation; TLC=total leukocyte count

Table 2. Association between qualitative variables and frailty

Qualitative variables	Frail group (CFS ≥5), n (%) (N = 122)	Non-frail group (CFS 1–4), n (%) (N = 84)	*p*
Female gender	79 (64.8)	41 (48.8)	**0.023**
Hypertension	72 (59.0)	49 (58.3)	0.922
DM	57 (46.7)	40 (47.6)	0.899
CLD	24 (19.7)	26 (31.0)	0.063
CKD/ESRD	29 (23.8)	18 (21.4)	0.694
Prostatism	11 (9.0)	11 (13.1)	0.352
Malignancy	20 (16.4)	13 (15.5)	0.860
Previous stroke	39 (32.0)	4 (4.8)	**<0.001**
Cardiac disease	52 (42.6)	27 (32.1)	0.128
Respiratory disease	13 (10.7)	16 (19.0)	0.089
Gastritis/peptic ulcer	7 (5.7)	11 (13.1)	0.066
Thyroid disease	13 (10.7)	4 (4.8)	0.131
Dementia*	33 (28.7)	2 (2.5)	**<0.001**
Falls*	28 (24.1)	10 (12.5)	**0.043**
Pressure injury*	28 (25.9)	5 (6.3)	**<0.001**
Incontinence*	32 (29.4)	11 (14.9)	**0.023**
Polypharmacy*	42 (38.5)	18 (24.3)	**0.045**

CFS=clinical frailty scale; CKD=chronic kidney disease; CLD=chronic liver disease; DM=diabetes mellitus; ESRD=end-stage renal disease
*The final analysis for these variables had few missing data because of various causes as poor recall of certain events as falls, medication intake, or patient refusal to report data

Table 3. Univariate regression to identify clinical indicators of frailty

Clinical indicator of frailty	OR (95% CI)	*p*
Age	1.073 (1.031–1.115)	**<0.001**
CCI	1.213 (1.040–1.416)	**0.014**
MMSE	0.846 (0.763–0.937)	**0.001**
Albumin	1.021 (0.892–1.169)	0.763
Total proteins	0.582 (0.353–0.958)	**0.033**
Sex (female)	1.927 (1.093–3.395)	**0.023**
Previous stroke	9.398 (3.211–27.503)	**<0.001**
Dementia	15.695 (3.643–67.620)	**<0.001**
Falls	2.227 (1.014–4.894)	**0.046**
Pressure injury	5.180 (1.900–14.119)	**0.001**
Incontinence	2.380 (1.111–5.098)	**0.026**
Polypharmacy	0.513 (0.266–0.988)	**0.046**

CI=confidence interval; CCI=Charlson comorbidity index; MMSE=mini-mental state examination; OR=odds ratio

FI was associated with an increased risk of dementia over a 19-year follow-up (hazard ratio: 1.17, 95% CI: 1.07–1.18) after adjustment for gender, age, educational level, and smoking habits.[18] Another study involving 6,000 community-based geriatric patients showed that 615 cases (10.3%) had concurrent frailty and cognitive impairment.[19] These findings support the significance of cognitive frailty, a syndrome characterized by the concomitant presence of frailty and cognitive impairment without overt dementia. Cognitive frailty is particularly concerning due to its higher risk of institutionalization and mortality. Several factors contribute to the relationship between frailty and cognitive impairment, including malnutrition, disability, sociodemographic factors, medications, comorbidities, and other geriatric syndromes.[20] This study further confirms the interplay between these factors.

Additionally, this study demonstrated the clinical impact of certain geriatric syndromes among frail older adults, including falls, incontinence, multimorbidity, polypharmacy, and PI. Falls were significantly more prevalent in the frail group. Similarly, a study in Indian older adults showed a higher prevalence of falls among frail individuals (15.43% *versus* 11.85%).[21] Frailty has also been positively correlated with a history of falls in hospitalized older adults.[22] In a US-based study of community-dwelling older adults, frailty was identified as a strong predictor of recurrent falls (rate ratio: 1.31, 95% CI: 1.18–1.44), although no synergistic effect was observed between frailty and cognitive impairment.[19] On the other hand, other studies suggest a complex interplay, where cognitive limitations in the presence of frailty may weaken the defensive mechanisms against falls due to physiological limitations, such as slower gait speed, prolonged reaction time, decreased muscle strength, increased postural sway, limited physical workout, and poorer contrast sensitivity.[23]

Polypharmacy was another indicator of frailty in this study, supported by a cross-sectional analysis which showed the significance of both the number of medications and polypharmacy in frailty. The study proposed a cut-off of six or more medications, with a specificity of 73% and sensitivity of 62%.[24] Similarly, previous studies have reported a positive association between frailty and polypharmacy in hospitalized older adults.[22]

Pressure injury was significantly more prevalent in frail individuals (25.9% *versus* 6.3%, $p<0.001$), likely influenced by risk factors such as incontinence,

poor nutrition, and limited mobility, which together create a synergistic relationship between the two syndromes.[25] Moreover, this study found that incontinence was more common in frail older adults, consistent with a meta-analysis of 1,540 individuals, which demonstrated that urinary incontinence was more than twice as common in physically frail patients (OR: 2.28; 95% CI: 1.35–3.86). This bidirectional relationship between incontinence and frailty may explain this common comorbidity. Incontinence can lead to psychosocial disturbances and functional decline, contributing to the accumulation of deficits and frailty. Furthermore, frailty, characterized by homeostenosis, leads to cognitive decline, gait disturbances, and balance issues which may trigger incontinence. Accordingly, screening and strategic interventions for these syndromes are essential for improving the QoL of older adults.[26]

This study identified a history of stroke as an indicator of frailty. This finding is supported by data from three international surveys, which reported a higher prevalence of frailty among stroke patients, using various assessment methods, including the Fried criteria, FI, and CFS. Interestingly, adding the cognitive domain to the CFS highlights the detrimental effects of vascular strokes, including higher mortality.[27] The CCI was utilized to assess multimorbidity among participants and was significantly associated with frailty. Previous studies have linked CCI with certain geriatric syndromes, such as polypharmacy, dementia, and frailty.[28] Additionally, higher CCI scores have been associated with weaker muscle strength and slower gait velocity.[29]

This study also analyzed the potential role of various inflammatory biomarkers, including RDW, CRP, CAR, and NLR, in frailty but found no significant contribution. In contrast, previous reports have suggested the inflammatory hypothesis of frailty, showing higher levels of CRP and interleukin-6, which are thought to contribute to "inflammaging" and the pathogenesis and frailty in geriatric patients.[12] The absence of significant findings in this study may be attributed to factors such as the limited sample size, missing data, participant characteristics, and the frailty assessment method used. However, considering serum albumin as a negative-phase reactant and an indicator of malnutrition, its lower median level in frail individuals aligned with the reported inverse correlation between serum albumin and the Rockwood frailty scale ($r = -0.024$, $p<0.001$).[28] Similarly, lower serum total protein levels, a nutritional biomarker, were significantly associated with frailty in our logistic regression analysis. Previous studies have also linked frailty to various nutritional biomarkers, including serum albumin levels, transferrin, prealbumin, total proteins, retinol-binding protein, and hemoglobin.[22] Geriatric patients with higher serum levels of albumin and total proteins are less likely to progress to frailty. These simple laboratory biomarkers can be used to assess malnutrition and frailty in hospitalized older adults.[22]

Finally, this study found that older age and female gender were more likely to be associated with frailty. Retrospective analyses of sociodemographic risk factors associated with frailty have shown that age, gender, occupation, and marital status significantly affect frailty.[30] Similarly, previous studies have reported a positive relationship between frailty and age in hospitalized geriatric patients.[22]

The limitations of this study include its relatively small sample size with few missing data in the final analysis. The study focused on a single geriatrics hospital in Egypt, which limits the generalizability of the findings to a broader population. The cognitive assessment may have been more reliable in a community-based setting, as hospitalized patients with complex medical conditions could have affected the testing scores. The study on biomarkers was inadequate, as more specific potential biomarkers have already been explored in other publications. Additionally, the cross-sectional design of the study prevented establishing a causal association.

In conclusion, frailty is a highly prevalent geriatric syndrome among hospitalized older adults and is significantly associated with cognitive decline and multimorbidity. Clinical indicators of frailty include MMSE score, CCI, total proteins, the presence of certain geriatric syndromes, and comorbidities such as dementia, falls, incontinence, PI, polypharmacy, and previous stroke. Several inflammatory biomarkers are available for the early detection of frailty.

Conflict of Interest

The authors affirm no conflict of interest in this study.

Acknowledgment

The authors would like to thank all patients who participated in this study.

Funding Sources

None.

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