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Prevalence and Correlation of Malnutrition and Depression Among Elderly Hospitalized Patients at Alexandria Main University Hospital

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ABSTRACT

Background: Malnutrition and depression are common yet underdiagnosed conditions among elderly hospitalized patients, with significant impacts on morbidity, mortality, and quality of life. Both conditions often coexist and may be interconnected through shared physiological and social pathways.
Aim: The purpose of this study was to determine the prevalence of depression and malnutrition and explore their correlation among elderly patients who were admitted to Alexandria Main University Hospital.
Methods: 184 patients who were 65 years of age or older participated in a cross-sectional study. within the first 48 hours of admission to the internal medicine wards. The Mini Nutritional Assessment–Short Form (MNA-SF) was used to evaluate nutritional status, and depression severity was assessed using the 15-item Geriatric Depression Scale (GDS-15).
Results: Malnutrition was identified in 25% of participants, and 40.2% were at risk. Depression was observed in 69.6% of participants (39.7% mild, 9.8% moderate, and 20.1% severe). There was a statistically significant negative relationship between the MNA-SF and GDS-15 scores.($p < 0.001$). The nutritional state was significantly associated with gender, age, marital status, polypharmacy, chronic kidney disease, BMI, hemoglobin, albumin, and eGFR ($p < 0.05$).
Conclusion: Malnutrition and depression were prevalent and interrelated in elderly inpatients at Alexandria main university hospital.
Keywords: Malnutrition; Depression; Elderly; MNA-SF; GDS-15; Hospitalized patients.

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INTRODUCTION

The world's elderly population is expanding rapidly. By 2050, the expected global number of individuals aged 65 years and older will be around 1.5 billion, with significant public health consequences, especially in middle- and low-income countries[1]. Aging is related to an increased vulnerability to malnutrition and mental health disorders, especially depression, both of which contribute significantly to disability, morbidity, and mortality in this demographic[2,3].

Malnutrition in the elderly is a common yet often overlooked condition. Global estimates suggest that 18.6% of older adults are malnourished, with prevalence rates reaching up to 60% in hospitalized settings due to immobility, chronic illness, and anorexia

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of aging[4,5]. A recent systematic review of 240 studies across 62 countries reported that one in four older adults was either malnourished or at risk of becoming malnourished, highlighting the severity of the issue[6].

More than one-third of the elderly (39.1%) in an Egyptian research were at risk of malnutrition, and around one-quarter (22.9%) were malnourished, indicating an inadequate nutritional state [7]. Another population-based cross-sectional study found that 38.4% of older people in rural Egypt were at risk of malnutrition and 35% of them were malnourished [8].

Depression, similarly, is highly prevalent in elderly inpatients, affecting between 30–70% depending on the population and screening method used[9]. Biological and social contributors to geriatric depression include neurochemical changes (notably in serotonin and dopamine), chronic inflammation, social isolation, bereavement, cognitive decline, and chronic disease burden[10].

The prevalence of depression among elderly populations worldwide ranges from 4.6 - 9.3% for the age group 75 years and older, and it is higher among hospitalized and patients who need home care with prevalence of 11.5%, and 13.5% respectively in comparison to community dwelling which ranged from 1% to 5% [11,12].

The prevalence of depression in Egyptian elderly over 60 varied from 23.7% to 74.5% for those living in residential and household communities, 37.5% for those living in geriatric homes, and 72% for those receiving inpatient treatment [13,14].

Of particular interest is the emerging evidence that malnutrition and depression are closely interlinked.Interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) mediate chronic inflammation, which leads to both loss of appetite and depressive symptoms, a phenomenon referred to as “inflammaging”[15,16].

Meta-analyses confirm that the elderly suffering from malnutrition are more than twice as likely to suffer from symptoms of depression, and vice versa[6,17].

Inflammaging, a chronic low-grade inflammation associated with aging, exacerbates malnutrition by promoting anorexia, muscle loss, and insulin resistance, while malnutrition, in turn, can worsen inflammaging through mechanisms like gut dysfunction[18].

Inflammaging, or chronic low-grade inflammation associated with aging, is linked to an increased risk and severity of depression, as pro-inflammatory cytokines can signal from the body to the brain, disrupting neurotransmitter systems and leading to symptoms like anhedonia, fatigue, and poor response to standard antidepressants.[19]

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Despite their interconnection, both conditions are frequently underdiagnosed in acute medical settings. Standardized tools like the Geriatric Depression Scale–Short Form (GDS-15)and Mini Nutritional Assessment–Short Form (MNA-SF) have been validated for hospital use but are not routinely applied in many low-resource settings, including Egypt[20]. With the nation's population aging rapidly and the prevalence of chronic illness rising, identifying the prevalence and relationship between these two syndromes is critical for improving outcomes and reducing healthcare costs[21].

The present research aims to evaluate the prevalence of depression and malnutrition and explore their correlation among elderly patients enrolled to the internal medicine wards of Alexandria Main University Hospital using MNA-SF and GDS-15 scores.

PATIENTS

The sample size was calculated by the Alexandria Community Medicine Department using a total of 184 elderly patients. Participants were selected from the internal medicine wards of Alexandria Main University Hospital (AMUH) during the time frame from February 1 to May 1, 2024.

This cross-sectional study was conducted following approval from the Medical Ethics Committee of the Faculty of Medicine, Alexandria University, with serial number: 0108036 at 12/11/2023. The study's objective and procedures were given to each participant in detail, and formally informed consent was acquired. In cases of cognitive impairment, consent was secured from a legal guardian.

Inclusion Criteria: women or men aged 65 years or older who had been admitted to the hospital within 48 hours prior to assessment.

Exclusion Criteria: Patients who have previous history of malignancy or were currently receiving chemotherapy or radiotherapy or were diagnosed with end-stage renal disease. Additional exclusion criteria included decompensated liver cirrhosis with a Child-Pugh score of C, hemodynamic instability, acute confusion that could interfere with accurate assessment, or refusal to share in the study. individuals were also excluded if a legal guardian was unavailable to provide consent in cases where the patient was unable to do so, or if the patient was readmitted during the study period.

METHODS

Assessment Tools: All participants were admitted to the internal medicine wards within 48 hours prior to evaluation. Each patient underwent a thorough clinical assessment. Sociodemographic data, such as age, sex, marital status, and housing location (rural or urban), and smoking history were collected.

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A complete medical history was obtained, with particular attention to comorbid conditions such as hypertension, diabetes mellitus, and ischemic heart disease (IHD)chronic kidney disease (CKD).

The number of medications was recorded to assess for polypharmacy[22], which was described as taking five or more drugs at the same time. A full physical examination was performed, focusing on signs indicative of malnutrition.

Blood samples were collected for laboratory tests, such as serum albumin, thyroid-stimulating hormone (TSH), urea, creatinine, uric acid, alanine aminotransferase (ALT), aspartate aminotransferase (AST), complete blood count (CBC), and fasting blood glucose. Electrolyte levels including sodium, potassium, calcium, and phosphorus were also measured. Renal function was evaluated using the estimated glomerular filtration rate (eGFR), calculated by the CKD-EPI equation.

MNA-SF was used to evaluate nutritional status. This validated six-item tool evaluates body mass index (BMI), recent food consumption, weight loss, mobility, psychological stress, and neuropsychological disorders. Patients were classified based on the total score: 12–14 points indicated normal nutritional status, 8–11 points indicated a risk of malnutrition, and scores of 7 or lower denoted malnutrition. MNA-SF established good to excellent test-retest reliability for assessing nutritional status in older patients[23].

Using GDS-15, depression was assessed. GDS-15 is a standardized questionnaire specifically designed for older adults. Scores were interpreted as follows: 0–4 was considered normal mood, 5–8 indicated mild depression, 9–11 reflected moderate depression, and 12–15 signified severe depression. the inter-rater reliability for GDS-15 is generally very high, with studies showing strong agreement between raters [24].

Statistical Analysis: IBM SPSS software version 20.0 was used to analyze the data (Armonk, NY: IBM Corp., 2011). Categorical variables were summarized as frequencies and percentages. Continuous variables were tested for normality using the Kolmogorov–Smirnov test. Normally distributed data were described using means and standard deviations, while non-normally distributed data were presented as medians and interquartile ranges (IQR).

The chi-square test was utilized to compare categorical variables. Analysis of variance (ANOVA) was performed for continuous variables on normally distributed data, and the Kruskal–Wallis test was employed for non-normally distributed data. Spearman's rank correlation coefficient was used to investigate the relationship between two non-parametric continuous variables. Multivariate and Univariate logistic regression analyses were conducted to identify predictors of depression and malnutrition. Variables with a p-value less than 0.05 in univariate analysis were included in the multivariate model. For every analysis, a p-value of less than 0.05 was accepted as statistically significant.

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RESULTS

Regarding demographic data, the average age of the studied population was 77.67 years with a nearly equal gender distribution. Most of the patients were rural residents, and most were either married or widowed, as demonstrated in (Table 1).

Table (1): The demographic information of the group under study (n = 184)

	No.	%
Gender		
Male	93	50.5
Female	91	49.5
Age (years)		
Min. – Max.	66.0 – 89.0	
Mean ± SD.	77.67 ± 7.46	
Median (IQR)	79.0 (70.50 – 84.0)	
BMI (kg/m2)		
Min. – Max.	17.18 – 30.52	
Mean ± SD.	24.0 ± 2.93	
Median (IQR)	24.25 (21.91 – 26.08)	
Marital Status		
Single	35	19.0
Married	92	50.0
Widowed	57	31.0
Smoking Status		
Non-smoker	111	60.3
Smoker	50	27.2
Ex-smoker	23	12.5
Residency		
Rural	123	66.8
Urban	61	33.2

SD: Standard deviation**, IQR**: Inter quartile range, **BMI:** body mass index

Table (2): The clinical data of the study participants. (n = 184)

	No.	%
Polypharmacy	109	59.2
Hypertension	135	73.4
Diabetes mellites	72	39.1
IHD	39	21.2
CKD	52	28.3
fatigue	100	54.3
Weight loss	65	35.3
anorexia	61	33.2
Frequent infection	60	32.6
falls	56	30.4
Lower Limb Edema	85	46.2

IHD: ischemic heart disease, **CKD**: chronic kidney disease,

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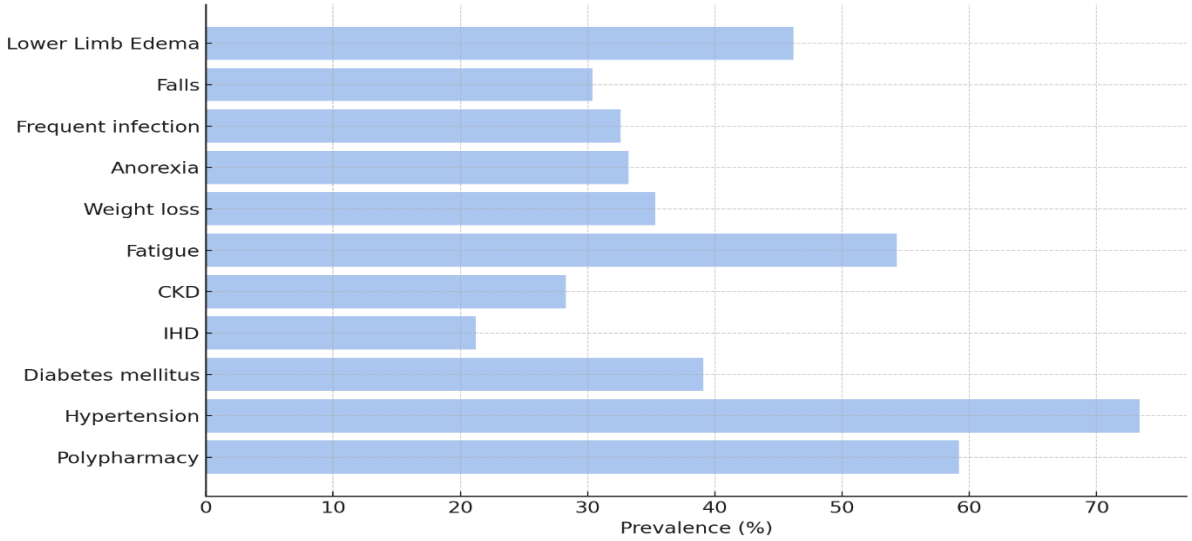

Figure (1): Bar Chart Showing the Prevalence of Clinical Features Among participants

The findings of the laboratory tests performed on research subjects, including CBC, liver transaminases, renal panel, serum electrolytes, serum albumin, and TSH, are shown in Table (3).

Table (3): Descriptive analysis of the participants according to laboratory Investigations(n =184)

	Min. – Max.	**Mean ± SD.**	**Median (IQR)**
Hemoglobin (g/dL)	7.50 – 13.50	10.17 ± 1.31	10.20 (9.20 – 10.95)
MCV (fL)	69.90 – 98.80	83.30 ± 6.49	82.80 (78.35 – 88.05)
MCH (pg)	18.60 – 34.10	26.99 ± 3.46	27.50 (24.10 – 29.55)
RBCs ($\times10^3/\mu L$)	4.44 – 5.84	5.11 ± 0.29	5.12 (4.92 – 5.32)
WBC($\times10^3/\mu L$)	2.50 – 12.70	7.65 ± 2.06	7.70 (6.10 – 8.90)
ANC ($\times10^3/\mu L$)	1.61 – 9.41	4.85 ± 1.46	4.73 (3.73 –5.77)
Platelets ($\times10^3/\mu L$)	105.0 – 416.0	265.3 ± 58.96	264.5 (224.0 – 303.50)
Urea (mg/dL)	15.0 – 88.30	38.36 ± 20.35	32.15 (22.20 – 53.25)
Creatinine (mg/dL)	0.70 – 3.27	1.39 ± 0.701	1.09 (0.91 – 1.82)
eGFR (CKD-EPI, mL/min/1.73m²)	18.30 – 97.50	56.92 ± 24.43	61.45 (30.90 – 76.40)
Calcium (mg/dL)	7.20 – 10.0	8.88 ± 0.63	9.0 (8.50 – 9.30)
Phosphorus (mg/dL)	2.65 – 5.71	3.85 ± 0.70	3.66 (3.35 – 4.41)
Albumin (g/dL)	2.80 – 4.45	3.47 ± 0.38	3.47 (3.20 – 3.71)
Na (mmol/L)	130.2 – 143.7	136.87 ± 2.92	136.95 (135.0 – 138.8)
K (mmol/L)	3.70 – 6.0	4.68 ± 0.55	4.60 (4.30 – 5.10)
ALT (U/L)	7.00 – 51.90	23.91 ± 8.91	23.70 (17.68 – 29.73)
AST (U/L)	5.00 – 40.00	22.40 ± 8.25	22.35 (16.60 – 28.32)
TSH (mIU/L)	0.40 – 6.32	2.62 ± 1.36	2.54 (1.60 – 3.50)

MCV: mean corpuscular volume, MCH: Mean corpuscular hemoglobin, RBCs**:** Red Blood Cells**,** WBC**:** White Blood Cell, ANC: absolute neutrophilic count, eGFR: estimated glomerular filtration rate, Na: sodium, K: potassium, ALT: Alanine Aminotransferase, AST: Aspartate Aminotransferase, TSH: Thyroid Stimulating Hormone

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Table 4 and figure (2) summarizes the distribution of participants regarding their depression levels and Geriatric Depression Scale-15 (GDS-15) scores. Based on the GDS-15 classification, 30.4% of patients were categorized as having normal mood, 39.7% had mild depression, 9.8% had moderate depression, and 20.1% had severe depression. The mean GDS-15 score was 6.80 ± 4.34.

Table (4): The participants distribution based on their depression level and GDS-15 Score (n = 184)

	No.	%
Depression		
Normal	56	30.4
Mild	73	39.7
Moderate	18	9.8
Severe	37	20.1
GDS-15 Score		
Min. – Max.	0.0 – 15.0	
Mean ± SD.	6.80 ± 4.34	
Median (IQR)	6.0 (4.0 – 10.0)	

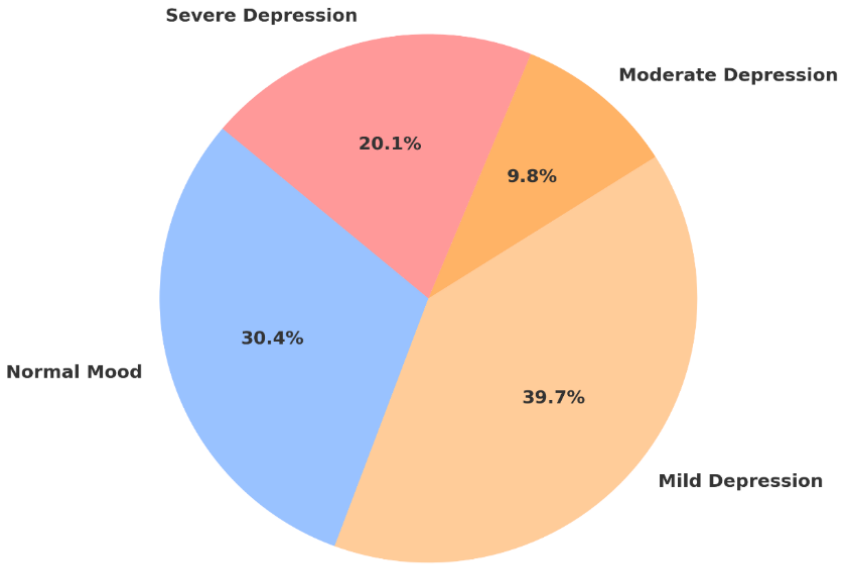

Figure (2): Pie Chart Showing the Distribution of participants according to GDS-15

Concerning nutritional status, 25% of the participants were malnourished, 40.2% were at risk of malnutrition, and 34.8% had normal nutritional status, as presented in Table (5) and figure (3)).

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Table (5): The participants distribution based on Nutrition Status and MNA-SF Score (n = 184)

	No.	%
Nutrition Status		
Normal	64	34.8
At risk	74	40.2
Malnourished	46	25.0
MNA-SF Score		
Min. – Max.	3.0 – 14.0	
Mean ± SD.	9.40 ± 3.21	
Median (IQR)	10.0 (7.50 – 12.0)	

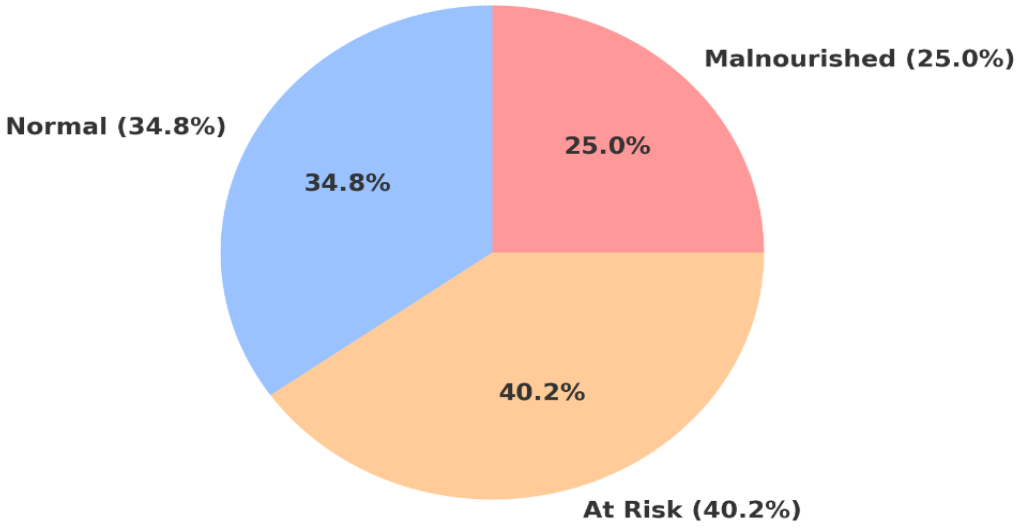

Figure (3): Pie Chart Showing the Distribution of Nutrition Status Among participants

Table (6): The relationship between the degree of depression using GDS-13 and the state of nutrition of the studied group using MNA-SF (n = 184)

	Depression								χ^2	p
	Normal (n = 56)		Mild (n = 73)		Moderate (n=18)		Severe (n =37)			
	No.	%	No.	%	No.	%	No.	%		
Nutrition Status										
Normal	34	60.7	24	32.9	2	11.1	4	10.8	52.202*	<0.001*
At risk	16	28.6	38	52.1	9	50	11	29.7		
Malnourished	6	10.7	11	15.1	7	38.9	22	59.5		

P: p value for comparison between the studied categories, χ^2: Chi square test

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The relationship between depression and nutritional status showed that 59.5% of patients with severe depression were malnourished, while 60.7% of those with normal mood had normal nutritional status, indicating a significant association between the two conditions.

A moderate, statistically significant negative relationship was observed between MNA-SF and GDS-15 scores ($r_s = -0.380$, $p < 0.001$), arguing that greater depression severity was linked to poorer nutritional status.

Regarding predictors of depression, multivariate logistic regression revealed that poor nutritional status was the only statistically significant independent predictor, with an odds ratio of 3.551 (95% CI: 1.528–8.250), as detailed in (Table 7) and illustrated in (Figure 4&5).

Table (7): Univariate and multivariate logistic analysis of regression for the predictors of depression (n = 184) (Normal vs Mild, Moderate, and Severe depression)

	Univariate		**#Multivariate**	
	p	**OR (LL – UL 95%C.I)**	**p**	**OR (LL – UL 95%C.I)**
Nutrition Status (At risk or Malnourished)	<0.001*	5.048 (2.572 – 9.910)	0.003*	3.551 (1.528 – 8.250)
Age	0.543	0.987 (0.946 – 1.030)		
Gender	0.134	1.626 (0.861 – 3.070)		
BMI	0.007*	0.853 (0.759 – 0.958)	0.502	0.954 (0.832 – 1.094)
Marital status				
Single		1.000		
Married	0.036*	0.372 (0.147 – 0.939)	0.077	0.410 (0.153 – 1.101)
Widowed	0.904	0.938 (0.330 – 2.665)	0.795	0.864 (0.285 – 2.617)
Smoking status	0.798	0.920 (0.485 – 1.744)		
Albumin	0.149	0.539 (0.232 – 1.249)		
Hemoglobin	0.106	0.817 (0.640 – 1.044)		
Polypharmacy	0.020*	2.128 (1.124 – 4.029)	0.429	1.339 (0.650 – 2.759)
Hypertension	0.265	1.482 (0.742 – 2.959)		
CKD	0.018*	2.642 (1.185 – 5.891)	0.536	1.337 (0.533 – 3.351)
Diabetes mellitus	0.200	1.541 (0.795 – 2.985)		
IHD	0.222	0.631 (0.301 – 1.321)		

OR: Odd`s ratio; **C.I:** Confidence interval; **UL:** Upper Limit**; LL:** Lower limit**; CKD:** chronic kidney disease; **#:** All variables with p<0.05 was included in the multivariate; ***:** Statistically significant at $p \leq 0.05$

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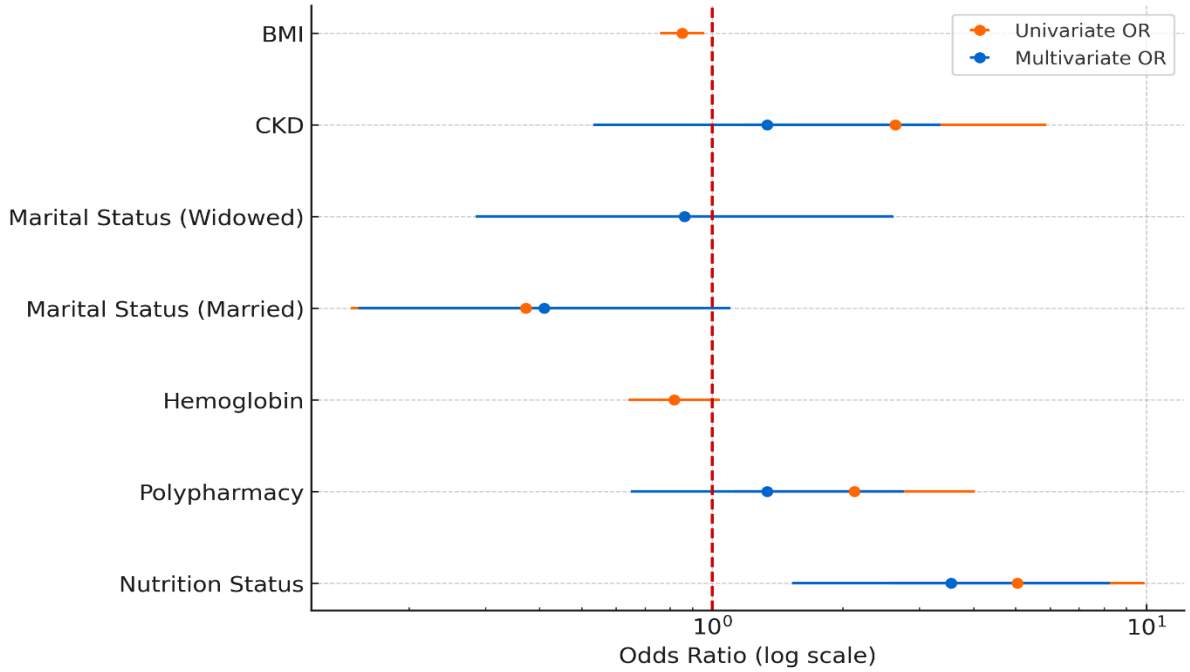

Figure (4): Forest Plot Comparing Univariate and Multivariate Odds Ratios for Predictors of Depression (n = 184)

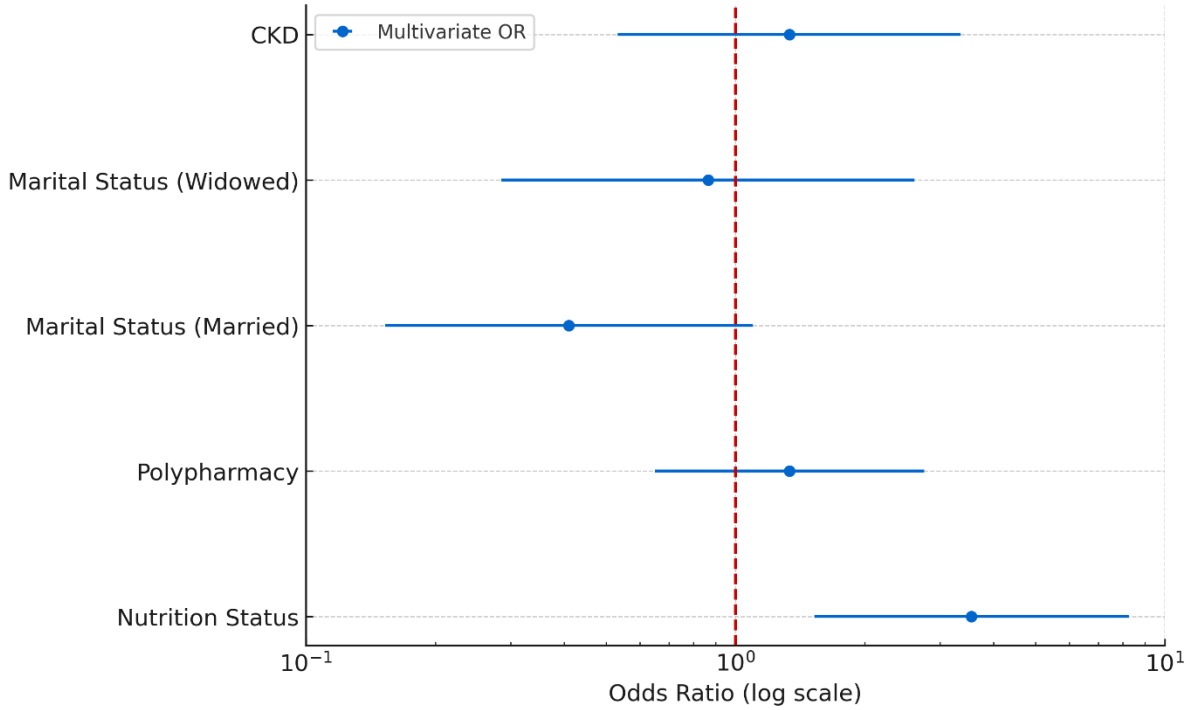

Figure (5): Forest Plot of Multivariate Predictors of Depression among participants.

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Table (8): shows the results of univariate and multivariate logistic regression analyses to identify independent predictors of poor nutritional status. In the univariate analysis, depression, age, gender, BMI, hemoglobin, polypharmacy, and CKD were significantly associated with nutritional status ($p < 0.05$). Patients with depression had higher odds of being at risk or malnourished (OR = 5.048, 95% CI: 2.572–9.910, $p < 0.001$), and female gender was also associated with increased risk (OR = 2.107, 95% CI: 1.132–3.921, $p = 0.019$). Increasing age and polypharmacy were positively associated, while lower BMI and lower hemoglobin levels were associated with increased risk.

In the multivariate analysis, In the multivariate analysis, having any level of depression (mild, moderate, or severe) remained a significant independent predictor of poor nutritional status (OR = 5.001, 95% CI: 1.655–15.114, $p = 0.004$), along with age (OR = 1.169, 95% CI: 1.081–1.265, $p < 0.001$), female gender (OR = 5.762, 95% CI: 1.827–18.170, $p = 0.003$), polypharmacy (OR = 14.041, 95% CI: 4.142–47.591, $p < 0.001$), and CKD (OR = 79.460, 95% CI: 4.092–665.191, $p < 0.001$). Lower BMI (OR = 0.623, 95% CI: 0.497–0.780, $p < 0.001$) and lower hemoglobin (OR = 0.361, 95% CI: 0.229–0.567, $p < 0.001$) remained significant predictors of malnutrition after adjustment.

Table (8): Univariate and multivariate logistic analysis of regression for the predictors of Nutrition Status (n = 184) (At risk & Malnourished vs. Normal)

	Univariate		#Multivariate	
	p	**OR (LL – UL 95%C.I)**	**p**	**OR (LL – UL 95%C.I)**
Depression (Mild, Moderate or Severe)	<0.001*	5.048 (2.572 – 9.910)	0.004*	5.001 (1.655 – 15.114)
Age	0.013*	1.055 (1.011 – 1.100)	<0.001*	1.169 (1.081 – 1.265)
Female	0.019*	2.107 (1.132 – 3.921)	0.003*	5.762 (1.827 – 18.170)
BMI	<0.001*	0.666 (0.575 – 0.771)	<0.001*	0.623 (0.497 – 0.780)
Marital status				
Single		1.000		
Married	0.309	0.651 (0.285 – 1.487)		
Widowed	0.597	1.283 (0.509 – 3.239)		
Smoking status (Smoker/ex-Smoker)	0.146	0.633 (0.342 – 1.173)		
Hemoglobin	<0.001*	0.576 (0.441 – 0.753)	<0.001*	0.361 (0.229 – 0.567)
Polypharmacy	<0.001*	3.640 (1.927 – 6.876)	<0.001*	14.041 (4.142 – 47.591)
Hypertension	0.715	0.879 (0.439 – 1.758)		
CKD	<0.001*	14.033 (4.164 – 47.290)	<0.001*	79.460 (9.492 – 665.191)
Diabetes	0.989	1.004 (0.539 – 1.870)		
IHD	0.358	0.711 (0.344 – 1.470)		

OR: Odd`s ratio; **C.I:** Confidence interval; **UL:** Upper Limit**; LL:** Lower limit**; BMI:** body mass index; **IHD:** ischemic heart disease **CKD:** chronic kidney disease; **#:** All variables with p<0.05 was included in the multivariate; ***:** Statistically significant at $p \leq 0.05$

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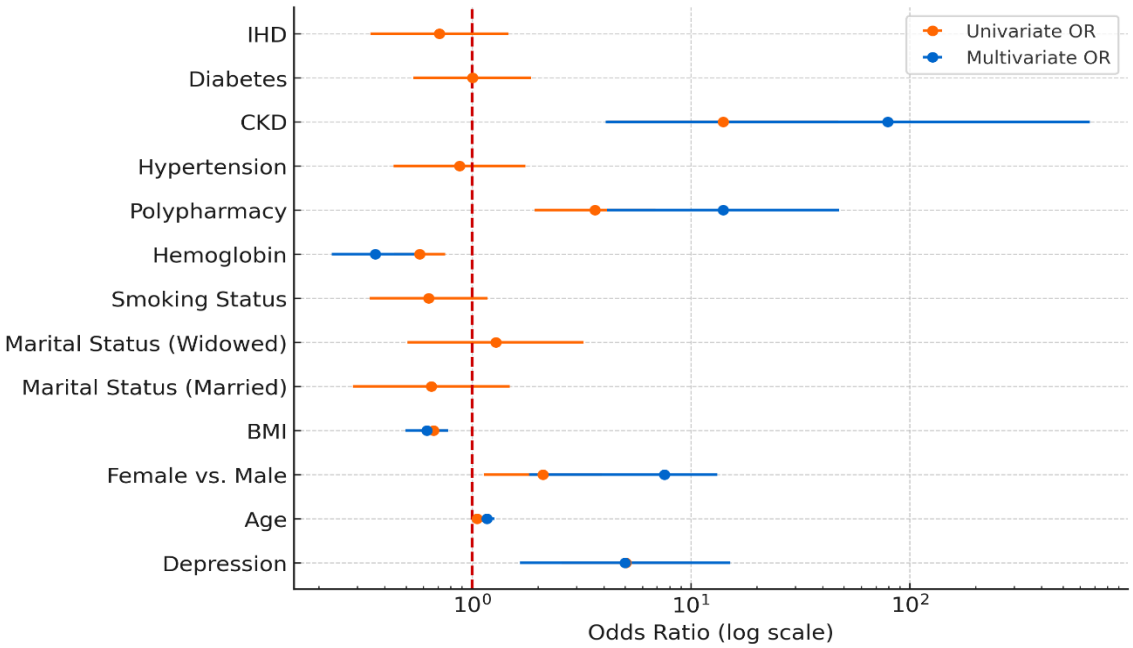

Figure (6) Forest Plot Comparing Univariate and Multivariate Odds Ratios for Predictors of Poor Nutritional Status among participants

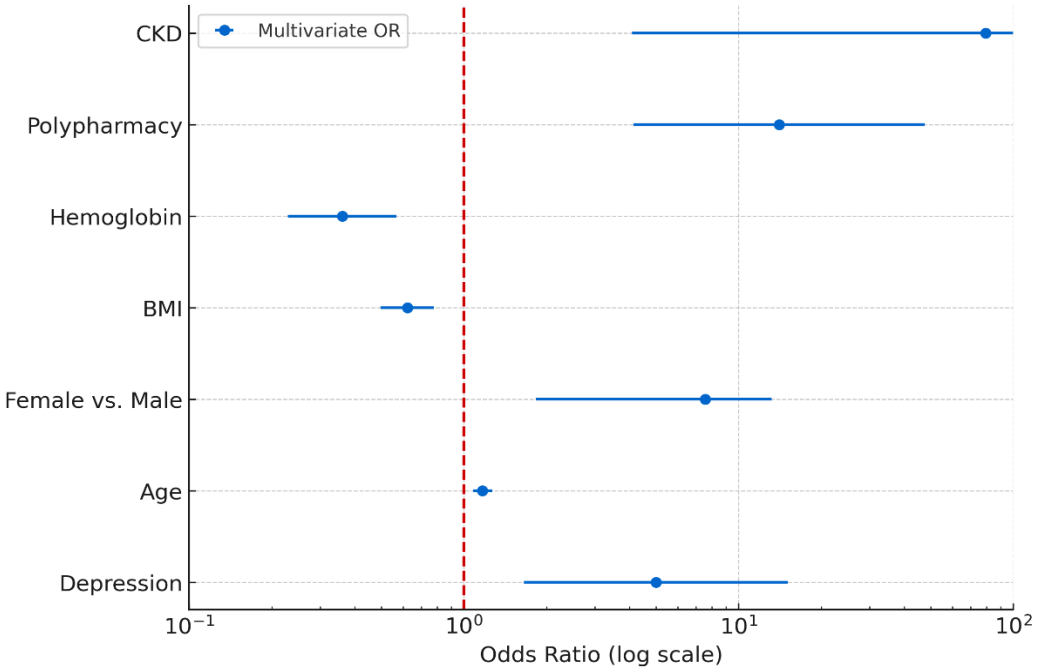

Figure (7): Forest Plot of Multivariate Predictors of Malnutrition Risk among participants

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Discussion

This study found that 69.6% of elderly patients admitted to internal medicine wards had some degree of depression, and 25% were malnourished, with another 40.2% at nutritional risk. These results align with those reported by Payahoo et al., who found that nearly 60% of elderly patients were either malnourished or at risk[13], and align with international figures where hospital malnutrition reaches 50–60%[4,5,6].

The depression rate in our population was higher than that observed in some community-based studies, such as those by Cabrera et al. and El-Gilany et al., who reported rates between 30–57% in ambulatory elderly groups[25]. Hospitalization itself is known to exacerbate depressive symptoms due to acute illness, reduced autonomy, and social disconnection[10,26].

Our results revealed a moderate negative relationship between MNA-SF and GDS-15 scores ($r_s = -0.380$, $p < 0.001$), indicating that worsening depression is associated with poorer nutritional status. These findings are in accordance with Ahmadi et al. and Vafaei et al., who also found significant associations between depression severity and malnutrition scores[3,10]. The concept of mutual causation has been increasingly recognized, particularly in light of common inflammatory and neuroendocrine pathways that impact both mood and appetite regulation[15,16].

Multivariate logistic regression confirmed that poor nutritional status was an independent predictor of depression (OR 3.55), and that depression was likewise a significant predictor of malnutrition (OR 5.00). These results are in line with studies by Ma et al. and Krishnan & Nestler, who emphasized the bidirectional and self-reinforcing relationship between the two conditions[27].

Furthermore, symptoms such as anorexia, weight loss, fatigue, and frequent infections were significantly more prevalent among depressed individuals—mirroring the overlap seen in geriatric syndromes and reinforcing the importance of syndrome rather than isolated diagnosis[2,9]. Notably, widowed patients had the highest depression scores in our sample, consistent with Zisook and Shear's findings linking bereavement to late-life depressive episodes[28].

Conclusion

Malnutrition and depression are highly prevalent and interrelated in elderly patients who were admitted to Alexandria Main University Hospital.

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Recommendations

- Routine screening using validated tools like MNA-SF and GDS-15 should be incorporated into hospital admission protocols.
- Early identification and combined management of depression and malnutrition may prevent hospital readmissions, improve rehabilitation outcomes, and reduce mortality among elderly inpatients.
- It is necessary to do long-term studies to examine the causal direction of these associations, and interventional trials could help define the most effective treatment strategies.

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Conflicts of interest: According to the authors, there are none.

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