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Relationship Between Malnutrition Risk, Activities of Daily Living, and Adaptation to Chronic Diseases in Older People with Chest Diseases

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Abstract

Introduction. The increased risk of malnutrition in older people may have significant impacts on chronic disease management and quality of life.
This study **aimed** to investigate the relationship between chronic diseases, activities of daily living (ADLs), and malnutrition risk.

Methods. This cross-sectional, correlational study was conducted on 352 patients over 65 years old, who had a chronic disease for at least one year and were admitted to Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital, Izmir, Turkey. The data were collected using the Descriptive Information Form, Adaptation to Chronic Illness Scale (ACIS), Nutrition Risk Screening-2002 (NRS-2002), and Katz Activities of Daily Living (Katz ADL) scale.

Results. The mean age of the participants was 70.65 $\pm$ 4.18 years. All participants were at risk of malnutrition according to the NRS-2002 assessment, 29% were independent, and 35.8% were partially dependent based on the Katz ADL scale assessment. The ACIS score was 82.83 $\pm$ 13.88. Multivariate linear regression analysis revealed that age, disease duration, perceived disease knowledge, and interference from the disease with planned activities were significant positive predictors of ACIS, while hospitalization in the last 6 months, the number of meals per day, difficulty in meeting personal care needs, and NRS-2002 were significant negative predictors of ACIS ($p < 0.05$).

Conclusions. Despite the unexpected homogeneity in malnutrition risk, the NRS-2002 score emerged as a negative predictor of chronic disease adaptation. Furthermore, recent hospital admissions, daily meal consumption, and impairment in self-care were also found to have a negative influence, while age, disease duration (in years), appropriate disease knowledge, and the absence of interference from the disease with planned activities demonstrated a positive impact on chronic disease adaptation.

Keywords
Chronic Diseases; Adaptation to Chronic Diseases; Malnutrition Risk; Activities of Daily Living; Older People

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Introduction

Chronic diseases can seriously affect individuals' quality of life due to their persistence and often progressive nature. The most common chronic conditions are diabetes mellitus, hypertension, heart diseases, cancer, and arthritis, and their prevalence represents a significant public health concern, particularly among the elderly population [1]. According to epidemiological data, the prevalence of chronic diseases increases with age, potentially impacting older individuals' ability to maintain activities of daily living (ADLs) and manage the risk of malnutrition [2]. According to the data released by the World Health Organization, 41 million people die every year due to chronic diseases, which corresponds to 74% of all deaths worldwide [3, 4]. Chronic diseases pose challenges not only in terms of medical management but also in terms of physiological and

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social implications.

Older people are particularly prone to multimorbidity, which can complicate treatment plans and outcomes [5]. Chronic diseases bring about various challenges, including unfulfilled roles, reduced income due to disease-related limitations, deterioration in body image and lifestyle, compromised social life, and increased cost of treatment [6]. All these factors negatively affect individuals' quality of life [7]. Having a chronic disease along with aging adversely affects individuals' ability to perform ADLs and increases their addiction [8]. ADLs include basic activities such as personal care, eating and drinking, dressing, toilet needs, and mobility which are necessary for people to maintain independence and functionality in their daily lives. In older individuals, the decrease in physical and cognitive abilities with aging can seriously affect ADL performance [9]. Physiological changes associated with aging along with increasing dependency and environmental factors such as polypharmacy, dental and oral health issues, inability to shop independently, and difficulty preparing and consuming meals, negatively affect the nutritional status of older people and cause malnutrition [10]. The European Society for Clinical Nutrition and Metabolism (ESPEN) defines malnutrition as a condition resulting from inadequate nutritional intake or irregular nutrition, leading to changes in body composition (low lean mass and body cell mass), decreased physical and mental functions, and deterioration of clinical outcomes [11]. When food intake decreases or metabolic needs increase, the food taken cannot meet the energy the body needs, which leads to the development of malnutrition. In older individuals, socioeconomic factors, education level, living conditions, and chronic diseases can significantly increase the risk of malnutrition [12]. Problems likely to arise due to the increased risk of malnutrition may make it difficult for older people to adapt to their diseases.

Older individuals' adaptation to chronic diseases includes disease management and self-care abilities. Multimorbidity can complicate the adaptation process and negatively affect individuals' ability to maintain ADLs. The management of chronic diseases in older people can be affected by factors related to the patient, health professionals, and health and social care systems [13]. Although there are studies in the literature indicating that chronic diseases negatively affect ADLs, they are limited in number, highlighting a gap in the literature related to investigations into the relationship between chronic disease management and ADLs. Similarly, while the relationship between malnutrition and a single chronic disease has been investigated in the literature [14, 15], there is a lack of studies investigating the relationship between malnutrition and the management of common chronic diseases. Poor management of chronic diseases is thought to exacerbate dependency and elevate the risk of malnutrition. This study **aimed** to clarify the limited information in the literature.

Materials and Methods

Study Design

This cross-sectional, correlational study was conducted on 352 patients over 65 years of age who were admitted to Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital, Izmir, Turkey, had a chronic disease for at least one year, and agreed to participate in the study.

Study Population and Eligibility Criteria

The minimum sample size of the study was calculated as 290 people in the G*Power 3.1.9.7 program (80% power, α = 0.05 significance level, d = 0.15 effect size) [16, 17]. Of the 512 patients admitted to the aforementioned hospital, 423 individuals at the age of 65 years and over, who agreed to participate, were included in the study. However, of these 423 patients, those whose anthropometric measurements could not be taken (n=33), those who were unreachable (n=19), and those diagnosed with a psychiatric disease (n=19) were excluded from the study. Thus, the data obtained from 352 patients were analyzed.

Data Collection

Before the data were collected, all participants were informed about the purpose and scope of the study and submitted the informed consent forms they signed. The researchers collected the data through face-to-face interviews using the following questionnaire: the Descriptive Information Form, Adaptation to Chronic Illness Scale (ACIS), Nutrition Risk Screening-2002 (NRS-2002), and Katz Activities of Daily Living (Katz ADL) scale.

Descriptive Information Form

The form consists of items questioning the participants' age, sex, education level, marital status, employment status, perceived income status, exercise status, disabilities, perceived disease knowledge, smoking status, dietary practices, presence of chronic diseases, alcohol consumption, and tendency to skip main meals. Patients self-reported their nutritional status. They were also asked about their daily medication intake, with polypharmacy defined as the use of four or more medications per day.

Adaptation to Chronic Illness Scale (ACIS)

Atik and Karatepe developed the ACIS (2016) to assess how well patients with chronic diseases adapt to their condition [18]. The scale has 25 items and the following 3 sub-dimensions: physical adaptation (items 1, 9, 10, 13, 14, 15, 16, 18, 22, 23, 24), social adaptation (items 2, 3, 5, 7, 17, 19, 25), and psychological adaptation (items 4, 6, 8, 11, 12, 20, 21). The maximum and minimum possible scores that can be obtained from the sub-dimensions are "55 and 11", "35 and 7", and "35 and 7", respectively. The maximum possible score that can be obtained from the overall ACIS is 125. A higher score on the overall Adaptation to Chronic Illness Scale (ACIS) or its subscales indicates better adaptation to the disease. The Cronbach's alpha value of the overall scale was 0.88 in a study by Atik and Karatepe [18] and 0.87 in the present study.

Nutrition Risk Screening-2002 (NRS-2002)

The NRS-2002, developed by Kondrup *et al.* (2002), comprises two sections: initial screening and main screening [19]. Initial screening consists of "yes/no" questions regarding the individual's body mass index (BMI), body weight loss, change in food consumption, and general condition. If any of these questions is answered as "yes", the main screening process starts. If all the questions receive a "no" response, the patient undergoes pre-screening procedure weekly. The main screening process comprises two components: "nutritional status" and "severity of the disease". Depending on the individual's condition, each section is rated on a four-point scale ranging from 0 to 3 (0: "no problem", 1: "mild problem", 2: "medium problem", 3: "severe problem"). If the patient is $\geq$ 70 years old, 1 point is added to the score due to their age. It is recommended that patients with a total score of < 3 should be screened every week. If the patient's total score is ≥ 3, they are considered to be at nutritional risk [19]. Bolayir *et al.* conducted a validity and reliability study of the Turkish version of the NRS-2002 in hospitalized patients (2019) [20].

Katz Activities of Daily Living (ADL) Scale (Katz ADL Scale)

Katz developed the Katz ADL scale in 1963 [21] to assess the level of independence in performing ADLs among older individuals or those with chronic diseases. The following ADLs: bathing, dressing, toileting, transferring to and from a chair, maintaining continence, and feeding are evaluated. As the score obtained from the scale decreases, the person has difficulty in performing ADLs and relies more on assistance from others. A score between 0 and 2 indicates dependence, a score between 3 and 4 indicates partial dependence, and a score between 5 and 6 indicates independence. Pehlivanoğlu *et al.* conducted a validity and reliability study of the Turkish version of the scale in 2018 [22]. The Cronbach's alpha coefficient of the Katz ADL scale was 0.83 in a study by Pehlivanoğlu *et al.* [22], and 0.91 in our study. P-values less than 0.05 were considered statistically significant.

Anthropometric Measurements

Participants' body weight was measured using a precise electronic scale (TANITA HD 366) with an accuracy of 0.1 kg, while they were fasting and wearing lightweight clothes without shoes. Body height was measured by a researcher using a tape measure with a head position in the Frankfurt Plane [23]. BMI was calculated as body weight (kg) divided by the square of body length (m^2) and categorized following the World Health Organization (WHO) standards: < 18.5 kg/m^2 as thin, 18.5-24.9 kg/m^2 as normal, 25.0-29.9 kg/m^2 as overweight, and ≥ 30 kg/m^2 as obese [24].

Data Analysis

The data were analyzed in the SPSS (Statistical Package for the Social Sciences) 23.0. Normality of data distribution was assessed using kurtosis and skewness coefficients, and the variables with kurtosis-skewness coefficients ranging between -1.0 and +1.0 were considered as normally distributed. Descriptive statistics, including the number, percentage, arithmetic mean, and standard deviation, were used in data analysis. In the comparative analysis, the independent samples t-test and one-way ANOVA were used to compare normally distributed data, whereas the Kruskal-Wallis H-test was used for non-normally distributed data. Further post-hoc analysis was performed with the Tukey-B (one-way ANOVA) or Bonferroni test (Kruskal-Wallis H-test). Multiple linear regression analysis was used to assess the effect of independent variables on the dependent variable (adaptation to chronic illnesses). P-values less than 0.05 were considered statistically significant.

Results

In this study, most participants were males (61.1%). A significant proportion of the population was married (89.2%) and retired (51.4%), with nearly half living with their spouse and children (47.2%). Two-thirds of the participants (72.2%) reported having diabetes mellitus, while almost all reported having a cardiovascular disease (92%). A substantial proportion (84.4%) had never consumed alcohol. Additionally, over half of the respondents suffered from respiratory diseases (56.3%), and 40.1% were current smokers. Most participants were diagnosed 10-19 years ago, had not been hospitalized for chronic diseases within the last six months, perceived their health status as "moderate"; and considered their disease knowledge as "partially adequate" (Table 1).

Characteristics of the participants regarding nutrition and ADLs are given in Table 2.

The majority of the participants were classified as overweight based on BMI classifications, reported having inadequate and unbalanced diets, consumed three meals a day, sometimes exercised, occasionally met their personal care needs, and were sometimes interfered from the disease with planned activities. All participants were at risk of malnutrition according to the NRS-2002 assessment, 29% were independent, and 35.8% were partially dependent according to the Katz ADL scale assessment.

The mean ACIS scores significantly differed in terms of age, disease duration, hospitalization in the last 6 months, and perceived disease knowledge.

As for the other variables such as sex, marital status, education status, employment status, people they lived with, perceived income status, smoking and alcohol habits, and presence of polypharmacy, there were no statistically significant differences in their mean ACIS scores ($p > 0.05$) (Table 3).

The comparison of the participants' mean ACIS scores concerning variables such as perceived nutritional status and ADLs was detailed in Table 4. Analysis results revealed a significant difference in mean ACIS scores among participants based on the "number of meals per day" variable ($p < 0.05$). Further analysis showed that the significant difference stemmed from the mean score of the participants consuming four or more meals a day, with their ACIS score being lower compared to the participants in other groups. The participants' mean ACIS scores concerning the "doing exercise" variable was significantly higher in those who ex-

Table 1. Participants' sociodemographic and health/disease-related characteristics.

Characteristics		n	%
Age (Mean±SD) (min-max): 70.65±4.18 (65-82)			
Age groups	65-74 years	279	79.3
	≥75 years	73	20.7
Sex	Women	137	38.9
	Men	215	61.1
Marital status	Married	314	89.2
	Single	38	10.8
Education status	Literate but not a graduate of any school/primary school	231	65.6
	High school and higher education	121	34.4
Employment status	Not working/homemaker	87	24.7
	Retired	181	51.4
	Working	84	23.9
People they lived with	Alone	37	10.5
	Spouse	149	42.3
	Spouse and children	166	47.2
Perceived income status	Good	20	5.7
	Moderate	260	73.9
	Bad	72	20.4
Smoking	Yes	141	40.1
	No	88	25.0
	Ex-smoker	123	34.9
Alcohol consumption	Yes	12	3.4
	No	297	84.4
	Ex-drinker	43	12.2
Chronic diseases*	Cardiovascular diseases	324	92.0
	Diabetes mellitus	254	72.2
	Respiratory diseases	198	56.3
	Neurological diseases	26	7.4
	Others	39	11.1
Polypharmacy	Yes (≥4 medications/day)	120	34.1
	No (<4 medications/day)	232	65.9
Disease duration	10 years	115	32.7
	10-19 years	153	43.4
	≥20 years	84	23.9
Hospitalization in the last 6 months	Yes	134	38.1
	No	218	61.9
Perceived health status	Good	41	11.7
	Moderate	251	71.3
	Bad	60	17.0
Disease knowledge	Adequate	116	33.0
	Partially adequate	181	51.4
	Inadequate	55	15.6
Total		352	100

Note: * – More than one disease was stated. All the patients had more than one disease.

Table 2. Participants' characteristics related to nutrition and activities of daily living.

Characteristics		n	%
BMI classification	Underweight	14	4.0
	Normal weight	107	30.4
	Overweight	177	50.3
	Obese	54	15.3
Is the perceived nutritional status adequate and balanced?	Yes	107	30.4
	No	160	45.5
	Varies	85	24.1
Number of meals per day	1	20	5.8
	2	117	33.2
	3	129	36.6
	≥4	86	24.4
Type of feeding	Oral	125	35.5
	Enteral	19	5.4
	Oral+enteral	114	32.4
	Parenteral	54	15.3
	Enteral+parenteral	40	11.4
Doing exercise	Yes	68	19.3
	Sometimes	198	56.3
	No	86	24.4
Difficulty in meeting personal care needs	Yes	71	20.2
	Sometimes	163	46.3
	No	118	33.5
Does the disease interfere with doing planned activities?	Yes	69	19.6
	Sometimes	241	68.5
	No	42	11.9
NRS-2002 malnutrition risk	Yes (≥3 points)	352	100
	No (<3 points)	-	-
Katz ADL scale	Independent	102	29.0
	Partially independent	126	35.8
	Dependent	124	35.2
ACIS total	82.83±13.88 (49-121)		
Physical adaptation	38.93±7.66 (12-55)		
Psychological adaptation	22.61±5.21 (11-35)		
Social adaptation	21.28±3.27 (14-31)		

ercised ($p < 0.001$). Moreover, the ACIS values decreased as difficulties in meeting personal care needs increased ($p < 0.001$). Similarly, an increase in disability status, which hindered the participants from carrying out planned activities, was associated with a significant decrease in the mean ACIS score ($p < 0.001$). As their disability status increased, their mean ACIS score decreased significantly.

In terms of other variables such as BMI, perceived adequate and balanced nutritional status, and independence in ADLs, there were no statistically significant differences in their mean ACIS scores ($p > 0.05$) (Table 4).

According to multivariate linear regression analysis (Table 5), several factors emerged as significant predictors of ACIS: age (B=0.573), disease duration (in years) (B=0.272), adequate perceived disease knowledge (B=8.112), and the absence of interference from the disease with planned activities (indicated by "no", B=3.888) were found to be significant positive predictors of ACIS, while hospitalization in the last 6 months (indicated by "yes", B=-3.547), the number of meals per day (B=-1.805), difficulty in meeting personal care needs (indicated by "some-

Table 3. Participants' characteristics related to nutrition and activities of daily living.

Characteristics		ACIS 82.83±13.88	p-value Post-hoc
Age groups	65-74 years	81.69±14.30	<0.05*
	≥75 years	87.19±11.17	
Sex	Women	82.60±12.70	0.80*
	Men	82.98±14.60	
Marital status	Married	82.72±13.99	0.67*
	Single	83.74±12.98	
Education status	Literate but not a graduate of any school/primary school	82.18±15.49	0.53*
	High school and higher education	83.17±12.97	
Employment status	Not working/ homemaker	80.75±10.29	0.27**
	Retired	83.45±13.39	
	Working	83.64±17.59	
People they lived with	Alone	82.49±13.88	0.91**
	Spouse	83.13±12.70	
	Spouse and children	83.16±10.52	
Perceived income status	Good	83.36±13.84	0.09***
	Moderate	82.17±14.46	
	Bad	78.30±11.71	
Smoking	Yes	81.16±12.94	0.30**
	No	82.70±15.18	
	Ex-smoker	84.17±13.88	
Alcohol consumption	Yes	80.21±13.75	0.47***
	No	83.07±13.82	
	Ex-drinker	86.33±15.52	
Polypharmacy	Yes (≥4 medications/day)	82.90±14.47	0.90*
	No (<4 medications/day)	82.70±12.70	
Disease duration	10 years[1]	78.89±12.25	<0.05**
	10-19 years[2]	84.67±15.48	1<2, 3
	≥20 years[3]	84.87±11.72	
Hospitalization in the last 6 months	Yes	78.65±13.64	<0.001*
	No	85.40±13.42	
Perceived health status	Good	83.54±13.63	0.32**
	Moderate	81.22±13.73	
	Bad	80.85±15.46	
Perceived disease knowledge	Adequate[1]	89.38±9.34	<0.001**
	Partially adequate[2]	81.90±14.36	1>2>3
	Inadequate[3]	72.09±12.87	

Notes: * – Independent samples t-test; ** – One-way ANOVA, Post-hoc: Tukey-B test; *** – Kruskal-Wallis H-test, Post-hoc: Bonferroni test.

Table 4. Participants' characteristics related to nutrition and activities of daily living.

Characteristics		ACIS 82.83±13.88	p-value Post-hoc
BMI classification	Underweight	82.33±13.35	0.08**
	Normal weight	88.14±7.50	
	Overweight	86.15±11.55	
	Obese	81.70±15.01	
Is the perceived nutritional status adequate and balanced?	Yes	84.08±11.86	0.63*
	No	82.33±13.45	
	Varies	82.50±15.19	
Number of meals per day	1	83.65±14.02	<0.05**
	2	85.91±11.63	4<1, 2, 3
	3	82.37±13.40	
	≥4	79.14±16.39	
Type of feeding	Oral	84.22±14.20	0.13**
	Enteral	83.89±5.07	
	Oral+enteral	80.21±14.69	
	Parenteral	85.52±13.96	
	Enteral+parenteral	81.83±13.88	
Doing exercise	Yes[1]	87.91±11.92	<0.05*
	Sometimes[2]	82.58±14.27	1>2,3
	No[3]	79.38±13.35	
Difficulty in meeting personal care needs	Yes[1]	75.83±12.20	<0.001*
	Sometimes[2]	82.44±15.01	1<2<3
	No[3]	87.58±11.12	
Does the disease interfere with doing planned activities?	Yes[1]	75.65±11.33	<0.001*
	Sometimes[2]	83.88±13.79	1<2<3
	No[3]	88.62±13.97	
Katz ADL scale	Independent	84.29±13.25	0.33*
	Partially independent	82.93±14.29	
	Dependent	81.55±13.94	

Notes: * – One-way ANOVA, Post-hoc: Tukey-B test; ** – Kruskal-Wallis H-test, Post-hoc: Bonferroni test.

times", B=-4.440 or "yes", B=-4.565), and NRS-2002 (B=-2.644) were identified as significant negative predictors of ACIS ($p < 0.05$). Despite significant differences in means, perceived disease knowledge (indicated by "partially adequate"), doing exercise, interference from the disease with planned activities (indicated by "sometimes"), and Katz ADL score were not significant predictors of ACIS ($p > 0.05$).

Discussion

The data we obtained revealed a significant relationship between participants' adaptation to chronic diseases, their ADLs, and nutritional habits. Our primary objective was to explore the relationship between malnutrition risk, ADLs, and adaptation to chronic diseases; however, the unforeseen observation that the entire participant sample exhibited malnutrition risk limited our ability to compare and analyze differences between those at risk and those not at risk. This unexpected homogeneity in malnutrition risk among participants hindered our original intention from investigating distinctions based on malnutrition risk. Despite this unexpected outcome, we proceeded to analyze the impact of various factors on participants' adaptation to chronic diseases,

Table 5. Relationship between certain variables and ACIS according to multiple linear regression analysis.

Models	B (95.0% CI for B)	β	t	p
Model ACIS				
Age	0.573 (0.099, 1.048)	0.173	2.375	<0.05
Disease duration, years	0.272 (0.061, 0.484)	0.136	2.530	<0.05
Hospitalization in the last 6 months				
No	Reference			
Yes	-3.547 (-6.490, -0.604)	-0.124	-2.370	<0.05
Perceived disease knowledge:				
Inadequate	Reference			
Partially adequate	-1.421 (-4.901, 2.059)	-0.051	-0.803	0.42
Adequate	8.112 (4.273, 11.951)	0.275	4.156	<0.001
Number of meals per day	-1.805 (-3.311, -0.299)	-0.114	-2.358	<0.05
Doing exercise:				
No	Reference			
Sometimes	-0.449 (-3.948, 3.050)	-0.016	-0.252	0.80
Yes	0.688 (-3.907, 5.282)	0.020	0.294	0.77
Difficulty in meeting personal care needs:				
No	Reference			
Sometimes	-4.440 (-8.834, -0.046)	-0.129	-1.988	<0.05
Yes	-4.565 (-7.809, -1.320)	-0.164	-2.767	<0.05
Does the disease interfere with doing planned activities?				
Yes	Reference			
Sometimes	-1.557 (-5.900, 2.786)	-0.045	-0.705	0.71
No	3.888 (0.486, 7.290)	0.130	2.248	<0.05
NRS-2002	-2.644 (-4.651, -0.636)	-0.186	-2.509	<0.05
Katz ADL score	-0.571 (-1.398, 0.255)	-0.067	-1.360	0.18

Notes: Adjust R^2=0.209, F=10.265, p<0.001. B - unstandardized coefficients; CI - confidence interval; β - standardized regression coefficient.

revealing significant associations with the frequency of exercise, fulfillment of personal care needs, interference of illnesses with planned activities, and the number of meals per day. A regression analysis demonstrated that while the age, disease duration, perceived disease knowledge, and interference from the disease with planned activities emerged as positive predictors of ACIS, hospitalization in the last 6 months, the number of meals per day, difficulty in meeting personal care needs, and NRS-2002 were identified as negative predictors of ACIS. Partially adequate perceived disease, doing exercise, occasional hindrance of planned activities due to the disease, and Katz ADL score were not significant predictors of ACIS.

The main challenges faced by older people stem from declining abilities, often attributed to chronic and degenerative diseases [25]. Chronic diseases affect daily life and take time to get used to them. It is important for people to adopt a lifestyle that aligns with their diagnosis as they navigate through this new phase of their lives [26]. According to our study results, the mean score the participants obtained on the ACIS was 82.83. In several studies in the literature, the mean ACIS score among adults with at least one chronic disease was reported as 83.64 [27], while for those hospitalized in the internal disease clinics, it was 84.99 [28]. Among individuals with at least one chronic disease and a hospitalization history, the mean score was higher -106.23 [29]; for patients diagnosed with diabetes mellitus and receiving treatment and follow-up in internal medicine clinics, it was 86.07 [30], whereas for those hospitalized in cardiology clinics, the mean score was 76.80 [31]. Likewise, in another study conducted on adults with at least one chronic disease, their mean ACIS score was 80.75 [33]. The findings of our study are consistent with the findings in the literature, and hospitalization in the last six months was found to be a negative predictor of ACIS.

Managing chronic diseases is time-consuming and rather difficult as it requires knowledge and planning skills [6]. The majority of participants in the present study lacked sufficient knowledge about their chronic disease. The comparison of the participants' knowledge levels and ACIS scores revealed a significant positive correlation, indicating that as participants' knowledge about their chronic disease increased, their ability to adapt to it improved. Similarly, in a study conducted on older people with chronic diseases, Punnapurath *et al.* found that participants' adaptation to the disease and adherence to treatment increased as their disease knowledge increased [33]. It can be said that an increase in disease knowledge plays a crucial role in both managing chronic disease and taking preventive measures.

A negative correlation was observed between participants' disease adaptation and variables such as age and disease duration [29]. This result indicates that negative aspects related to the disease tend to increase with advancing age and longer disease duration. Contrary to these findings, in our study, both older participants and those who had been living with a chronic disease for many years adapted

to the disease significantly better, which was probably due to the experience and knowledge gained through years of coping with chronic disease.

Chronic diseases can also affect people's ADLs, particularly severe cases may render individuals unable to perform these tasks independently, leading to dependency on others [34]. The majority (71%) of elderly participants in our study were fully or partially dependent according to the Katz ADL scale. As the degree of disability increased, there was a significant decrease in the individual's ability to adapt to chronic illness, and challenges in self-care emerged as a negative predictor of ACIS. Similarly, in a study by Mollaoğlu and Yanmiş, 69% of participants with chronic diseases were fully and partially dependent in performing ADLs [8]. Consistent with the findings of our study, in a study by Fong conducted on older people, disability rates in performing ADLs were higher in those who had major chronic disease [35].

In our study, an increase in the number of meals was found to be a negative predictor of ACIS. An increase in the number of meals may lead to an increase in total calorie intake. If individuals consume more calories with additional meals and this results in weight gain, the risk of chronic diseases such as obesity may increase. Shortening the intervals between meals can lead to sustained elevation of insulin levels, potentially increasing insulin resistance and setting the stage for metabolic problems such as type 2 diabetes mellitus [36]. The negative effect of increasing the number of meals on ACIS in our study is thought to be related to these reasons.

Older individuals experiencing challenges in adapting to chronic diseases may face an increased risk of malnutrition [2]. In our study, all participants were at risk of malnutrition based on the NRS-2002 assessment, which is an expected result as all participants presented with comorbidities and their mean age exceeded 70 years. However, there was no significant relationship between adaptation to chronic diseases and malnutrition. The literature shows that malnutrition negatively affects chronic disease management, albeit indirectly. Malnutrition increases individuals' dependence on others by affecting Katz ADL scores and quality of life [37, 38], potentially impeding the effective management of chronic diseases.

Limitations

This study, which comprehensively investigated adaptation to chronic diseases considering various factors, provides general validity as the sample included a large and diverse group of older individuals. Moreover, while assessing the risk of malnutrition emphasizes an important factor, the relationship between knowledge level and compliance highlights its importance in disease. Drawing attention to the effect of chronic diseases on ADLs and the potential for dependence increases the social and clinical relevance of the study. In addition, it provides a new perspective by challenging the results of some previous studies, indicating that the study offers an original and valuable contribution to the literature. On the other hand, our study has some limitations. The results cannot be generalized to older people in other regions or other hospitals as the study was conducted in a single center. Our study has a cross-sectional design; thus, causal relationships cannot be established. Adaptation to chronic diseases can be influenced by various factors, beyond those we examined in our analysis. Factors such as quality of life, fall risk, personality traits, and spiritual well-being can also be included in the research process and investigated in future studies. Additionally, intervention studies, such as disease management programs and community-based practices, could further contribute to the literature by increasing the adaptation of older individuals to chronic diseases.

Conclusions

Our study highlights the intricate relationship between adaptation to chronic diseases, malnutrition risk, and the performance of ADLs among older individuals with chest diseases. Our findings suggest a reciprocal relationship between the level of adaptation to chronic diseases and the participants' dependency in performing ADLs and their susceptibility to malnutrition. Increased dependency in ADLs corresponds to decreased adaptation to chronic diseases, while enhanced adaptation is associated with improved ADL performance. This parallel relationship is similarly observed in the connection between malnutrition and adaptation to chronic diseases. Importantly, our study underscores the critical significance of awareness and effective management of these factors in older individuals with chronic diseases. Recognizing and addressing dependency in ADLs, malnutrition risk, and overall adaptation are crucial elements for enhancing the quality of life for older individuals with chronic diseases. These insights emphasize the need for comprehensive strategies in clinical settings to empower older patients in effective managing chronic conditions.

Ethical Statement

This study was conducted in accordance with the Declaration of Helsinki and the ethical approval was obtained from the Research Ethics Committee of Dr. Suat Seren Chest Diseases and Surgery Training and Research Hospital, Izmir, Turkey, with the Committee reference number 207884496.

Informed Consent

Before investigation, informed consent was signed and obtained by each participant.

Data Availability

Data sharing is applicable upon request.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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