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Comparison of Physical Activity, Functional Capacity and Quality of Life between Older Patients with Chronic Comorbidities and Healthy Peers: A Case of the State Hospital

Hikmet UÇGUN[1], Ömer BAYRAK[2], Mücahit TAŞDEMİR[3]
[1]Istanbul Atlas University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye
[2]Halic University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye
[3]Biga State Hospital, Department of Cardiology, Canakkale, Türkiye

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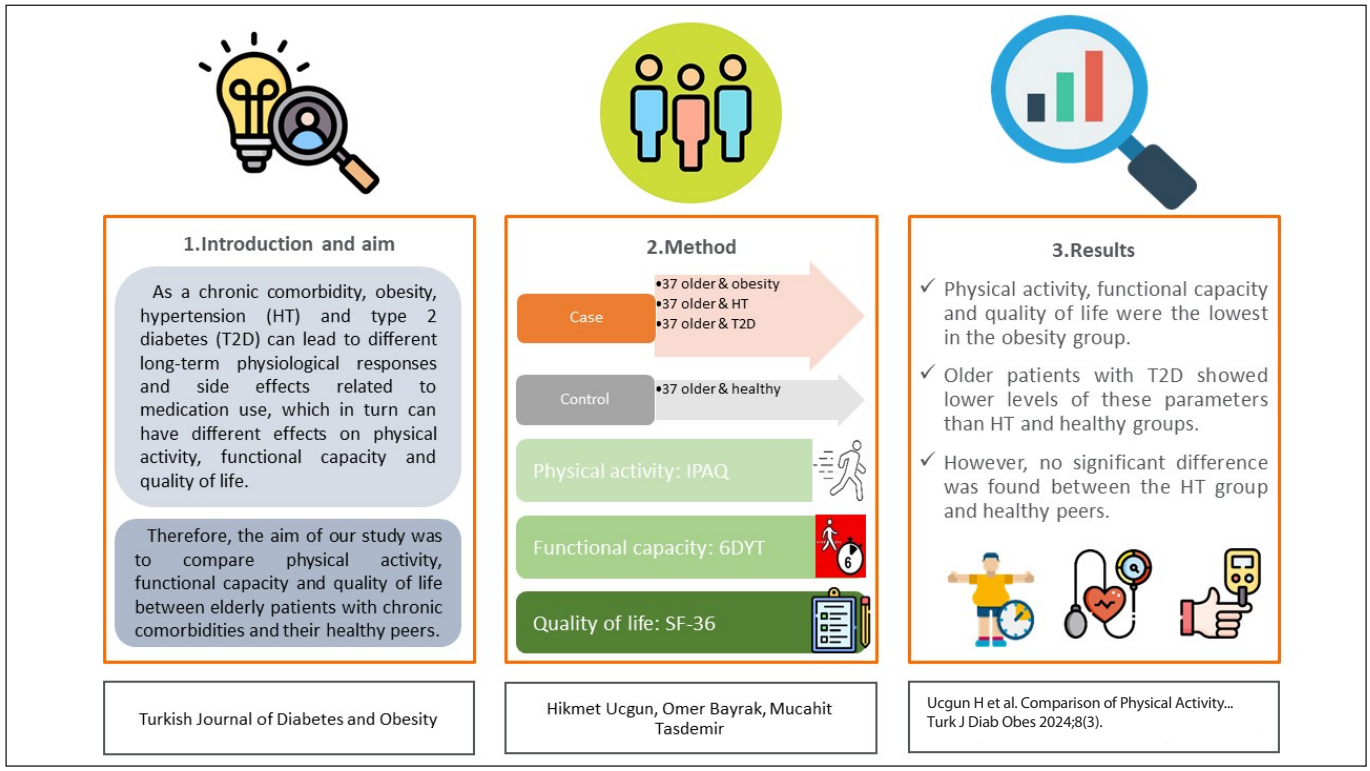
GRAPHICAL ABSTRACT



ABSTRACT

Aim: This study aimed to compare physical activity (PA), functional capacity (FC), and quality of life (QoL) among older patients with chronic comorbidities and their healthy peers in a state hospital setting.

Material and Methods: A total of 148 older adults, divided into groups of obesity, hypertension (HT), type 2 diabetes (T2D), and healthy, with 37 participants in each group, were included. PA, FC, and QoL were assessed using the International Physical Activity

ORCID: Hikmet Uçgun / 0000-0002-7211-1805, Ömer Bayrak / 0000-0002-7352-9269, Mücahit Taşdemir / 0000-0002-1358-2324

Correspondence Address / Yazışma Adresi:
Hikmet UÇGUN
Istanbul Atlas University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye
Phone: +90 (532) 161 62 71 • E-mail: hikmetucgun92@gmail.com

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Questionnaire-Short Form (IPAQ-SF), the 6-minute walk test (6MWT), and the SF-36 Quality of Life Questionnaire, respectively. The Kolmogorov-Smirnov test assessed variable distribution. Continuous variables were compared with one-way ANOVA, discrete variables with the Kruskal-Wallis test, and categorical variables with the chi-square test. Bonferroni and Mann-Whitney U tests were used for post-hoc pairwise comparisons.

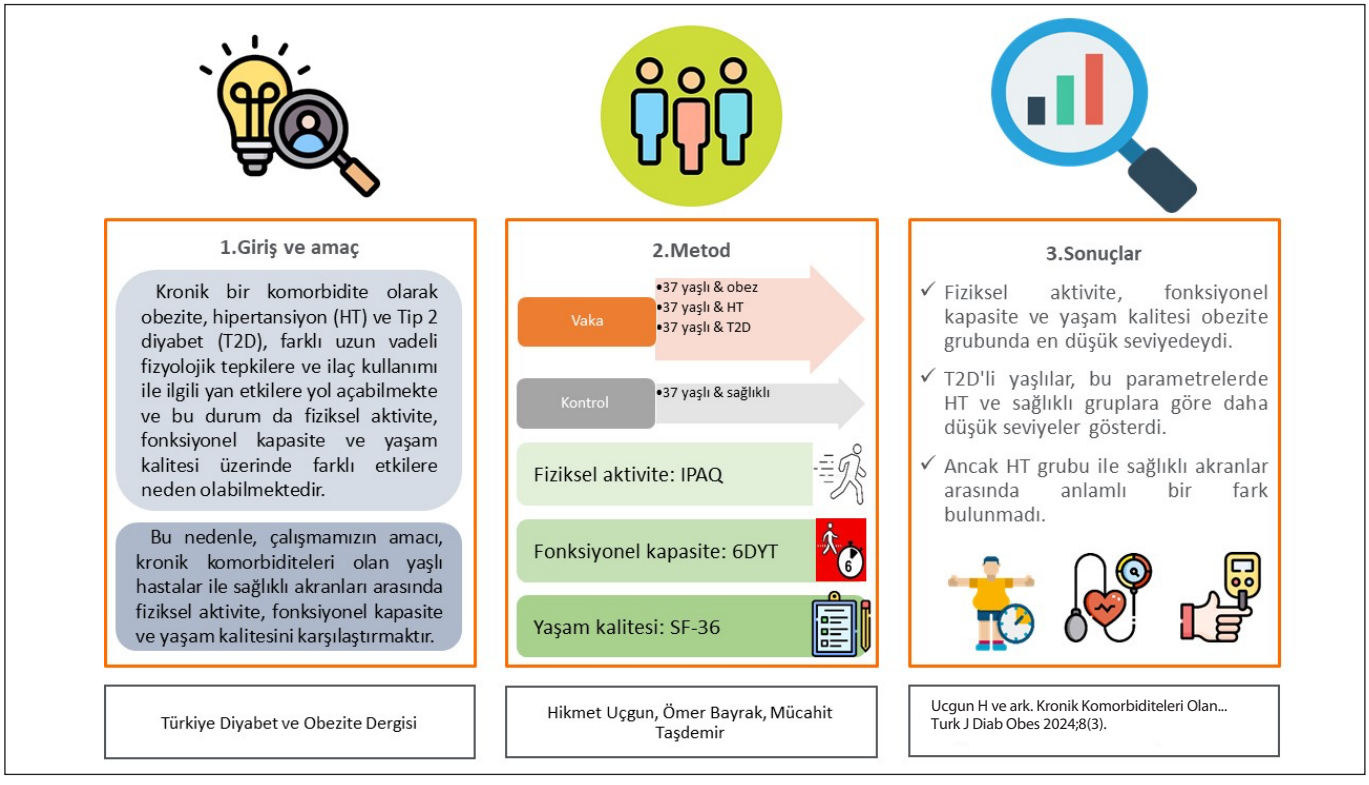
Results: The obesity group exhibited significantly lower PA and FC compared to all other groups (p=0.044). The QoL of the obesity group was also significantly lower than that of the HT and healthy groups (p=0.017). The HT group had significantly higher PA compared to the T2D group (p=0.046), with no significant difference between the HT and healthy groups (p=0.077). The FC in the HT group was significantly higher than in the T2D group (p=0.043) but not different from the healthy group (p=0.074). The QoL was significantly higher in the HT group compared to the T2D group (p=0.017), with no significant difference between the HT and healthy groups (p=0.803). The T2D group had significantly lower PA, FC, and QoL compared to the healthy group (p=0.040).

Conclusion: PA, FC, and QoL were lowest in the obese group. Older patients with T2D also showed lower levels in these parameters compared to HT and healthy groups, though no significant differences were found between the HT and healthy peers.

Keywords: *Diabetes, Functional capacity, Hypertension, Obesity, Physical activity, Quality of life*

Kronik Komorbiditeleri Olan Yaşlı Hastalar ile Sağlıklı Akranlar Arasında Fiziksel Aktivite, Fonksiyonel Kapasite ve Yaşam Kalitesinin Karşılaştırılması: Bir Devlet Hastanesi Örneği

GRAFİKSEL ÖZET



ÖZ

Amaç: Bu çalışma, bir devlet hastanesi örneğinde kronik komorbiditeleri olan yaşlı hastalar ile sağlıklı akranları arasında fiziksel aktivite (FA), fonksiyonel kapasite (FK) ve yaşam kalitesini (YK) karşılaştırmayı amaçladı.

Gereç ve Yöntemler: Çalışmaya, obezite, hipertansiyon (HT), tip 2 diyabet (T2D) ve sağlıklı olmak üzere dört gruba ayrılan, her grupta 37 katılımcı olmak üzere toplam 148 yaşlı birey dahil edildi. FA, FK ve YK, sırasıyla Uluslararası Fiziksel Aktivite Anketi-Kısa Formu (UFAA-KF), 6 dakika yürüme testi (6DYT) ve SF-36 Yaşam Kalitesi Anketi kullanılarak değerlendirildi. Kolmogorov-Smirnov testi

değişken dağılımını değerlendirmiştir. Sürekli değişkenler tek yönlü ANOVA ile, kesikli değişkenler Kruskal-Wallis testi ile ve kategorik değişkenler ki-kare testi ile karşılaştırılmıştır. Post-hoc ikili karşılaştırmalar için Bonferroni ve Mann-Whitney U testleri kullanılmıştır.

Bulgular: Obezite grubunun FA ve FK değerleri, diğer tüm gruplardan anlamlı derecede daha düşüktü (p=0,044). Ayrıca, obezite grubunun YK değerleri, HT ve sağlıklı gruplardan da anlamlı derecede daha düşüktü (p=0,017). HT grubunun FA değerleri, T2D grubuna göre anlamlı derecede daha yüksek bulunurken (p=0,046), HT ve sağlıklı gruplar arasında anlamlı bir fark bulunmadı (p=0,077). HT grubunun FK'si, T2D grubuna göre anlamlı derecede daha yüksek (p=0,043) olmasına rağmen sağlıklı gruptan farklı değildi (p=0,074). YK, HT grubunda T2D grubuna göre anlamlı derecede daha yüksekti (p=0,017), ancak HT ve sağlıklı gruplar arasında anlamlı bir fark bulunmadı (p=0,803). T2D grubunun FA, FK ve YK değerleri sağlıklı gruba kıyasla anlamlı derecede daha düşüktü (p=0,040).

Sonuç: FA, FK ve YK obezite grubunda en düşük seviyedeydi. T2D'li yaşlı hastalar, bu parametrelerde HT ve sağlıklı gruplara göre daha düşük seviyeler gösterdi, ancak HT grubu ile sağlıklı akranlar arasında anlamlı bir fark bulunmadı.

Anahtar Sözcükler: *Diyabet, Fiziksel aktivite, Fonksiyonel kapasite, Hipertansiyon, Obezite, Yaşam kalitesi*

INTRODUCTION

Worldwide, the aging population is growing, accompanied by a notable increase in the prevalence of chronic comorbidities like obesity, hypertension (HT), and type 2 diabetes (T2D) (1). In 2021, the World Health Organization (WHO) highlighted that more than 2 billion adults were categorized as overweight, with over 800 million falling into the obese category. Additionally, hypertension impacted 1.28 billion adults worldwide, while the prevalence of type 2 diabetes increased significantly, rising from 108 million in 1980 to 537 million in 2021 (2, 3). Recent findings indicate that nearly 50% of older adults are affected by obesity (4), approximately 52.9% experience hypertension (HT) (5), and around 27.5% live with type 2 diabetes (T2D) (6).

Obesity, HT, and T2D are closely linked conditions with a profound effect on health (7). Excess body fat, particularly visceral fat, increases the production of adipokines and inflammatory cytokines, which contribute to insulin resistance—a precursor to T2D. Insulin resistance, along with the resulting hyperinsulinemia, can stimulate sympathetic nervous system activity and increase renal sodium retention, both of which are significant factors in the development of HT (8, 9). Although HT, T2D, and obesity frequently occur together, each condition can also develop independently due to various risk factors and underlying pathophysiological mechanisms (10). According to the WHO, these conditions rank among the top five persistent risk factors contributing to global mortality and morbidity (11). These conditions are associated with various cardiovascular and metabolic complications, which are anticipated to negatively affect both quality of life (QoL) and functional capacity (FC) (12, 13).

Obesity, T2D, and HT can lead to complications in the cardiovascular and musculoskeletal systems, which in turn are likely to negatively affect physical activity (PA), FC, and QoL (14, 15). For example, obesity can place additional strain on joints due to excess body weight, leading to reduced mobility (16, 17), while T2D may impair walking capacity through peripheral neuropathy and vascular complications (18). HT could exacerbate symptoms during PA by increasing the cardiovascular load (19). Although obesity, T2D, and HT share commonalities and interconnected relationships, they differ in their distinct pathophysiological characteristics. For instance, obesity leads to mechanical stress on joints and organs due to excessive adipose tissue (20), while HT is marked by vascular stiffness and endothelial dysfunction (21), and T2D is associated with microvascular complications like diabetic nephropathy, and neuropathy (22, 23). Each condition, as a chronic comorbidity, can trigger a range of long-term physiological responses and medication-related side effects, potentially affecting PA, FC, and QoL in different ways. Therefore, comparing the PA, FC and QoL between older patients with chronic comorbidities and healthy peers in a state hospital setting was the purpose of our study.

MATERIALS and METHODS

Study Design

The present study was conducted as an observational cross-sectional study between January and June 2024. Participants meeting the inclusion criteria were selected using a purposeful sampling method. Thirty-seven older patients each with obesity, HT and T2D who were referred from the outpatient clinic of the Department of the Cardiology, Canakkale Biga State Hospital and thirty-seven healthy peers were recruited for the study. The study was approved by the Istanbul Atlas University Ethics Board (approval number: 2024/06-33), and the study was recorded on the ClinicalTrials.gov platform under the registration number NCT06535295. The study adhered to the ethical principles for human research outlined in the Declaration of Helsinki and all participants were informed by obtaining written informed consent.

Subjects

Our study encompassed four distinct groups: older patients diagnosed with obesity, those with HT, those with T2D, and healthy peers. Eligible older patients meeting the inclusion criteria were enrolled in the study. A total of 148 older adults were included in the study, with 37 participants allocated to each of the four groups. Details of both inclusion criteria and exclusion criteria are provided in Table 1.

Outcome Measures

Demographic and clinical characteristics of the participants were recorded. The PA, FC, and QoL were assessed with the International Physical Activity Questionnaire (IPAQ), 6-minute walk test (6MWT), and SF-36 Quality of Life Questionnaire, respectively. Following the assessing for eligibility of participants who met the inclusion criteria, all assessments were conducted face-to-face during clinical examinations by appointment. Three different researchers carried out the assessments, with each outcome measured by a distinct outcome assessor.

Physical Activity

The PA level was evaluated using the short form of the IPAQ (24). The scale comprises seven questions and provides data regarding the time spent sitting, walking, engaging in moderately vigorous activities, and the time spent in vigorous activities. The total score is determined by adding the time spent on walking, moderate, and vigorous activities, along with the frequency and duration of these activities. The assessment of sitting time is conducted as a distinct component. In order to be included in the evaluation of all activities, these activities must be performed for a minimum of 10 minutes at a time. A score is then obtained by multiplying the MET values, days, and minutes. In calculating the walking score, walking time was multiplied by 3.3 METs; in calculating the moderately vigorous activity score, it was multiplied by 4 METs; and in calculating the vigorous activity score, it was multiplied by 8 METs. Physical activity levels were categorised as physically inactive for a total score below 600 MET-min/week, minimally active for scores between 600 and 3000 MET-min/week, and active for scores exceeding 3000 MET-min/week. The Turkish versions of the IPAQ short and long forms have been proven to be reliable and valid tools for assessing PA (25).

Functional Capacity

The 6MWT is a relatively straightforward functional assessment tool that provides an overall evaluation of the pulmonary, cardiovascular, and neuromuscular systems' response to exercise. While it does not yield specific data for these systems, it permits the evaluation of exercise capacity at submaximal levels. As the majority of activities of daily living are undertaken at submaximal levels, this test offers a valuable opportunity to assess FC for such activities. The 6MWT test was conducted in a 30-meter straight corridor with a smooth floor. The corridor was marked at 3-meter intervals, and turning points were indicated with the use of cones. Subjects were required to walk continuously for the duration of the test, which lasted six minutes, and were permitted to rest if they experienced fatigue. Additionally, rest periods were incorporated into the six-minute duration. Prior to the commencement of the test, participants were informed that they should wear comfortable and appropriate attire, including footwear, and that those who utilized a walking aid should do so during the test. It was recommended that individuals refrain from engaging in strenuous PA for a minimum of two hours prior to the commencement of the test. Blood pressure, heart rate, and oxygen saturation were measured both at the beginning and end of the test, and the assessment of fatigue and respiratory distress was carried out using the Modified Borg Scale. The total

Table 1: Inclusion and exclusion criteria

	Inclusion Criteria	Group-Specific Exclusion Criteria	Common Exclusion Criteria
HT (n=37)	• Age of 65 years or older • Being diagnosed with HT • Regular use of antihypertensive medication	• Being diagnosed with any chronic comorbid disease other than HT	• History of unstable angina or myocardial infarction • Having a poor glycemic control • Having a diabetic neuropathy • Having a lower extremity musculoskeletal problem • Having a balance disorder condition • Having a cognitive impairment
T2D (n=37)	• Age of 65 years or older • Being diagnosed with T2D	• Being diagnosed with any chronic comorbid disease other than T2D	
Obesity (n=37)	• Age of 65 years or older • Body Mass Index (BMI) ≥30 kg/m²	• Being diagnosed with any chronic comorbid disease other than obesity	
Control (n=37)	• Age of 65 years or older • Not having any chronic condition diagnosis		

HT: Hypertension, **T2D:** Type 2 diabetes, **IFCC:** International Federation of Clinical Chemistry and Laboratory Medicine, **NGSP:** National Glycohemoglobin Standardization Program

distance traversed by each individual over the course of six minutes was documented at the conclusion of the test (26).

Quality of Life

The SF-36 Quality of Life Scale is one of the most frequently utilized QoL measurement scales in clinical practice. The SF-36 was developed by Ware and Sherbourne (27), and its validity and reliability were evaluated in our country (28). The scale comprises 36 items distributed across eight subscales, each scored on a scale from 0 to 100, with higher scores indicating a better QoL. Two summary scales are provided: the physical component summary scale and the mental component summary scale. The physical component summary scale is comprised of the physical function, physical role, body pain, and general health subscales, while the mental component summary scale consists of the vitality, social function, emotional role, and mental health subscales (27, 29). The ability to complete the scale in as little as five minutes, combined with its capacity to comprehensively evaluate both the positive and negative aspects of an individual's health status, are significant advantages. These features enhance the scale's practicality and its utility in various clinical and research settings.

Statistical Analysis

Statistical analyses were conducted using IBM SPSS v.26 (SPSS Inc., USA). The Kolmogorov-Smirnov test was applied to evaluate the distribution of variables. Descriptive statistics are reported as mean ± standard deviation or percentage (%). Continuous variables were compared using a one-way analysis of covariance (ANOVA), while discrete variables were analyzed with the Kruskal-Wallis test, and categorical variables with the chi-square test. For post-hoc comparisons, the Bonferroni test was used following one-way ANOVA, and the Mann-Whitney U test was applied after the Kruskal-Wallis test. Cronbach's alpha analysis was conducted to evaluate internal consistency of both IPAQ-SF Questionnaire and SF-36 Quality of Life Scale. The $p<0.05$ was accepted as the statistical significance value of all analyses.

The sample size calculation was made with the G*Power 3.1 (Universitaet Dusseldorf, Germany) program (30). The previous study assessing the QoL in adults with obesity, HT, and T2D using the EQ-5D-5L scale reported statistically significant differences between the groups (31). QoL scores were recorded as 55.1±23.2 for obesity, 48.2±21 for HT, and 49.8 ± 15.4 for T2D, with an effect size (ηp^2) of 0.363. Based on these findings, a total of 136 participants, with 34 allocated to each group (obesity, HT, T2D, and healthy controls), were initially calculated to achieve 95% power at a significance level of 0.05 (two-tailed). Participants were included in the study with a sample size calculated to account for at least a 10% increase, considering potential drop-outs. Thus, it was calculated to include 148 people, with 37 participants in each group.

RESULTS

A total of 229 older patients, including 52 with obesity, 65 with HT, 63 with T2D and 49 healthy older adults were assessed in terms of eligibility in the study. After determining the adults who were excluded from the study according to the exclusion criteria, a total of 148 (78 female, 70 male) adults were enrolled in the study, 37 in each group (Figure 1). Demographics and clinical characteristics of the participants were shown in Table 2. No significant differences were observed among the participants, except for body mass index (BMI) and the regular use of prescribed medications ($p>0.05$). These differences were naturally due to the higher BMI in the obesity group and the absence of any regular use of prescribed in the healthy group ($p=0.011$).

Comparison of PA, FC and QoL among the participants were given in Table 3. There were significant differences between the groups in all parameters of IPAQ-SF Questionnaire, 6MWT and SF-36 Questionnaire ($p<0.05$). In intragroup post hoc analyses, total, vigorous, moderate and walking scores of PA were significantly lower in the obesity group compared to the HT group ($p=0.012$, $p<0.001$, $p<0.001$, $p=0.006$, respectively). Similarly, total, vigorous, moderate and walking scores of PA were significantly lower in the obesity group compared to the T2D group ($p=0.031$, $p=0.042$, $p=0.044$, $p=0.028$, respectively). Similarly, all PA scores were significantly lower in the obesity group compared to the healthy group ($p<0.001$). The 6MWT distance was significantly lower in the obesity group compared to HT, T2D and healthy group ($p<0.001$, $p=0.026$, $p<0.001$, respectively). Additionally, it was found that all other scores of FC of obesity group were significantly lower than all other groups ($p<0.05$).

The obesity group's all subscale scores of the QoL were significantly lower compared to those of the HT group ($p<0.05$), and the healthy group ($p=0.010$, $p<0.001$, $p=0.007$, $p=0.015$, $p=0.013$, $p=0.013$, $p<0.001$, and $p=0.011$, respectively). Only role physical, vitality, and role emotional subscales of the QoL were significantly lower in the obesity group compared to the T2D group ($p=0.015$, $p=0.017$, and $p=0.014$, respectively).

The total, vigorous, moderate, and walking scores of PA were significantly higher in the HT group compared to the T2D group ($p=0.041$, $p=0.022$, $p=0.046$, and $p=0.039$, respectively). Likewise, the 6MWT distance of the HT group was significantly higher than that of the T2D group

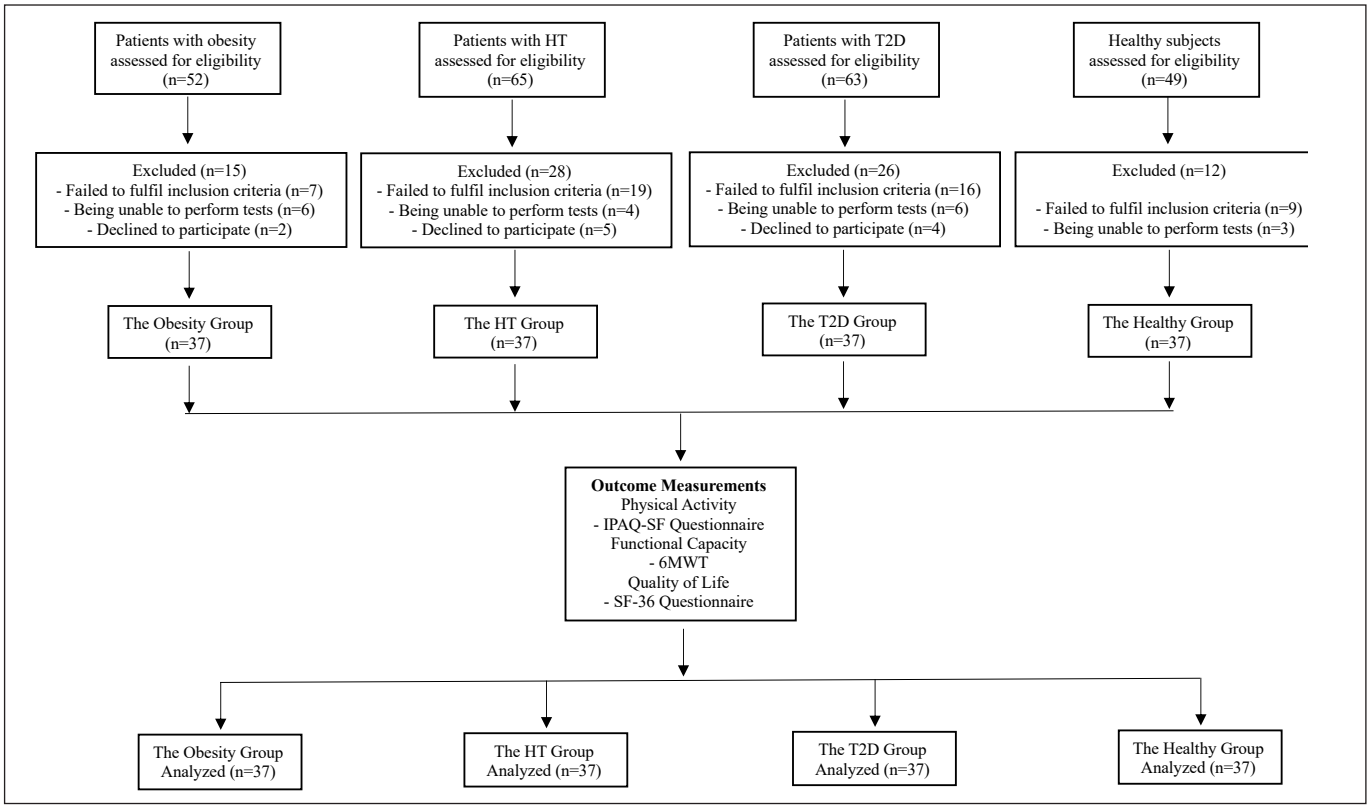


Figure 1: Flowchart of the study.

(p=0.043). In the HT group, the QoL subscales for physical functioning, role physical, bodily pain, general health, role emotional, and mental health were significantly higher compared to the T2D group (p=0.011, p=0.013, p=0.017, p=0.016, p=0.013, and p=0.017, respectively). Additionally, the total, vigorous, moderate and walking scores of PA (p<0.001, p=0.006, p=0.011, and p=0.028, respectively), 6MWT distance (p=0.046), and all subscale scores of the QoL (p<0.05) were significantly lower in the T2D group compared to the healthy group.

The internal consistency of total, vigorous, moderate, and walking scores of (PA) was excellent in the HT, T2D, and healthy groups (Cronbach's alpha > 0.90). In the obesity group, the internal consistency of these scores ranged from 0.77 to 0.90, indicating good internal consistency. Cronbach's alpha values for the all subscales of the QoL across the HT, T2D, obesity, and healthy groups ranged from 0.74 to 0.87, indicating good internal consistency.

DISCUSSION

The findings of the present study demonstrated that PA, FC and QoL were lower in obese older patients compared to older patients with HT and T2D and their healthy peers in a state hospital setting. Similarly, it has been shown that patients with T2D have lower PA, FC and QoL than older patients with HT and their healthy peers. One unanticipated finding was that there was no significant difference in PA, FC and QoL between older patients with HT and their healthy peers.

The reason for the decrease in PA in obese older adults may be a combination of physical, psychological and environmental factors (32, 33). It has been stated that obese older adults are more likely to suffer from chronic conditions and that older adults with at least one chronic comorbidities are significantly less active than their healthy peers. In healthy older adults over 75 years of age, the rate of physical inactivity is 26.8%, whereas it rises to 37.3% in their obese peers (34). In a recent review, it was emphasized that age-related loss of physical function characterized by decreased muscle strength and joint flexibility is exacerbated by obesity and significantly limits PA (32). Besides, dyspnea and fatigue, which occur with ageing and worsen with obesity, are among the primary factors limiting PA (35). Additionally, factors such as fear of injury and avoidance behaviors due to discomfort or pain during activity, or lack of social support may also cause obese older adults to have reduced PA levels compared to their healthy counterparts (36, 37). Thus, our result that PA was lower in the obesity group than all other groups is consistent with the literature. The cardiovascular load caused by obesity and the contribution of dyspnea and

Table 2. Demographics and clinical characteristics of the participants.

Characteristics	Obesity Group (n=37)	HT Group (n=37)	T2D Group (n=37)	Healthy Group (n=37)	p
Age (years±SD)	71.2±8.8	70.4±7.9	71.7±7.6	71.9±9.1	0.347
Gender, n (%)					
Male	17 (45.9)	19 (51.4)	16 (43.2)	18 (48.6)	0.807
Female	20 (54.1)	18 (48.6)	21 (56.8)	19 (51.4)	
BMI (kg/m²±SD)	31.5±2.9	23.6±2.7	24.8±3.6	24.2±1.8	0.011
Educational level, n (%)					
Illiterate	3 (8.1)	0	0	1 (2.7)	0.412
Primary	3 (8.1)	5 (13.5)	7 (18.9)	2 (5.4)	
Secondary	22 (59.6)	19 (51.4)	20 (54.1)	22 (59.5)	
University	9 (24.3)	13 (35.1)	10 (27.1)	14 (37.8)	
Employment status, n (%)					
Working	6 (16.2)	11 (29.7)	5 (13.5)	12 (32.4)	0.091
Not working	31 (83.8)	26 (70.3)	32 (86.5)	25 (67.6)	
Marital status, n (%)					
Married	26 (70.2)	21 (56.8)	18 (48.6)	24 (64.9)	0.144
Single	11 (29.7)	16 (43.2)	19 (51.4)	13 (35.1)	
Place of residence, n (%)					
Rural	7 (18.9)	4 (10.8)	2 (5.4)	5 (13.5)	0.451
Urban	30 (81.1)	33 (89.2)	35 (94.6)	32 (86.5)	
Smoking, n (%)					
Non-smoker	8 (21.6)	4 (10.8)	2 (5.4)	8 (21.6)	0.206
Ex-smoker	24 (64.9)	30 (81.1)	25 (67.6)	20 (54.1)	
Active-smoker	5 (13.6)	3 (8.1)	10 (27.1)	9 (24.3)	
Regular use of prescribed, n (%)					
Yes	3 (8.1)	33 (89.2)	36 (97.3)	2 (5.4)	<0.001
No	34 (91.9)	4 (10.8)	1 (2.7)	35 (94.6)	
Other chronic disease, n (%)					
Yes	1 (2.7)	2 (5.4)	1 (2.7)	2 (5.4)	0.895
No	36 (97.3)	35 (94.6)	36 (97.3)	35 (94.6)	
History of previous surgery, n (%)					
Yes	4 (10.8)	7 (18.9)	4 (10.8)	3 (8.1)	0.526
No	33 (89.2)	30 (81.1)	33 (89.2)	34 (91.9)	
Family history of related chronic disease, n (%)					
Yes	9 (24.3)	17 (45.9)	12 (32.4)	-	0.313
No	28 (75.7)	20 (54.1)	25 (67.6)	-	
Onset of clinical diagnosis (years±SD)	29.5±12.9	26.1±8.2	33.4±10.7	-	0.082

Note: Data are expressed as mean±standard deviation (SD) or n (%).
BMI: Body mass index, **HT:** Hypertension, **T2D:** Type 2 Diabetes.

fatigue may significantly reduce FC (38). Arranz et al., stated that decreased muscle strength, joint problems and musculoskeletal pain are also factors limiting factors limiting FC (39). Numerous studies have indicated that high BMI is associated with lower 6DYT distance (40) and that the obese group has lower values compared to their healthy peers (41). The observed reduction in FC within the obese group in our study, is likely attributable to analogous underlying mechanisms.

Table 3. Comparison of physical activity, functional capacity and quality of life among the participants.

	Obesity Group (n=37)	HT Group (n=37)	T2D Group (n=37)	Healthy Group (n=37)	p	Intra-group post hoc p values					
						Obesity vs. HT	Obesity vs. T2D	Obesity vs. Healthy	HT vs. T2D	HT vs. Healthy	T2D vs. Healthy
Physical Activity (IPAQ-SF Questionnaire±SD)											
Total physical activity score (MET-min/week)	977.4±1074.8	1984.6±2003.1	1299.4±1100.2	2107.42±1401.1	<0.001	0.012	0.031	<0.001	0.041	0.052	<0.001
Vigorous physical activity score (MET-min/week)	91.3±452.1	202.6±1111.7	140.8±884.4	251.3±207.2	0.004	<0.001	0.042	<0.001	0.022	0.077	0.006
Moderate physical activity score (MET-min/week)	202.7±707.3	451.3±804.8	363.8±687.9	501.32±102.9	0.003	<0.001	0.044	<0.001	0.046	0.060	0.011
Walking score (MET-min/week)	333.5±616.2	594.8±1077.6	495.9±875.4	672.4±772.2	0.003	0.006	0.028	<0.001	0.039	0.055	0.028
Functional Capacity (6MWT±SD)											
Distance (m)	309.3±62.5	426.4±27.8	361.8±30.6	447.7±51.4	<0.001	<0.001	0.026	<0.001	0.043	0.074	0.046
ΔSpO2 (%)	-2.6±1.72	-1.4±0.26	-1.9±1.86	-0.3±0.08	<0.001	<0.001	0.037	<0.001	0.044	0.026	<0.001
ΔDyspnea (MBS)	4.2±3.05	2.6±1.41	3.4±2.22	2.4±2.07	<0.001	<0.001	0.015	<0.001	0.056	0.112	0.040
ΔFatigue (MBS)	4.4±4.02	2.8±1.76	2.8±2.99	2.5±1.24	<0.001	<0.001	0.010	<0.001	1.000	0.088	0.061
Quality of Life (SF-36 Questionnaire±SD)											
Physical functioning	66.7±22.4	77.3±22.0	65.4±35.2	79.0±18.9	0.032	0.015	0.980	0.010	0.011	0.560	0.006
Role physical	58.2±24.5	80.6±20.7	69.1±34.1	84.8±14.5	<0.001	<0.001	0.015	<0.001	0.013	0.337	0.003
Bodily pain	66.6±23.2	72.0±19.4	67.2±33.7	78.3±27.3	0.030	0.017	0.941	0.007	0.017	0.128	0.014
General health	55.8±21.1	62.1±31.3	57.6±13.9	64.4±26.3	0.037	0.016	0.746	0.015	0.016	0.601	0.015
Vitality	60.5±28.4	69.2±29.5	66.6±23.8	72.1±23.6	0.025	0.011	0.017	0.013	0.077	0.485	0.017
Social functioning	78.2±11.3	84.5±23.3	82.9±24.6	89.7±28.7	0.033	0.009	0.109	0.013	0.053	0.088	0.015
Role emotional	65.3±36.2	88.6±35.2	78.2±34.3	93.4±31.1	<0.001	<0.001	0.014	<0.001	0.013	0.069	<0.001
Mental health	66.3±25.2	77.7±21.9	68.6±22.9	78.0±29.3	0.026	0.013	0.773	0.011	0.017	0.803	0.010

Note: Data are expressed as mean±standard deviation (SD).

6MWT: 6-min walking test, **HT:** Hypertension, **IPAQ_SF:** International physical activity questionnaire-short form, **MET:** metabolic equivalent unit, **MBS:** Modified Borg scale, **T2D:** Type 2 Diabetes.

On the other hand, age-related declines in physical health, mental well-being and social participation, which are important components of QoL, are exacerbated by obesity (42). Similar to our results, Dalle Grave et al. also demonstrated impaired QoL in obese individuals with high statistical power in all domains of SF-36 (43). Given the adverse impact of increased chronic conditions, reduced PA, restricted social participation, and diminished life expectancy on overall QoL, the significant decline in QoL among obese older adults is a predictable outcome (42-44).

One of the most unexpected outcomes of our study was that PA, FC, and QoL were significantly better in the HT group compared to the obese and T2D groups, and there was no difference with the healthy group. A systematic review has indicated that comorbidities such as obesity and diabetes significantly contribute to the reduction of PA; however, such an association has not been observed with HT (45). Similarly, no significant association between PA and hypertension has been reported in two recent studies (46, 47). Considering that impaired capillarization and vascular endothelium in chronic cardiovascular diseases is an important risk factor for PA, it has been suggested that the fact that HT does not cause a change in severity that disrupts these structures may be a possible explanation for the lack of association with PA. Older patients with HT often develop adaptations that allow them to maintain FC despite their condition. A study by Mota et al. suggests that long-term management of HT, especially through lifestyle modifications like PA, can mitigate the decline in FC (48). In addition, it has been stated that well-management of blood pressure may minimize the impact of HT on FC and prevent the progression of HT to more severe stages, which can be controlled through medication and lifestyle changes (49). In the present study, we found that older patients with HT had similar results with their healthy peers in QoL parameters, just as in the FC. The results of the present study align with the findings reported in the existing literature. Adherence to antihypertensive medication, effective management of blood pressure, and strong social support networks, are critical factors that help maintain a good QoL in older patients with HT (50). Another possible explanation is that the tools used to measure QoL may not capture subtle differences between HT and healthy individuals. The authors suggested that the SF-36 could be an example of such a scale and that the QoL scores of older patients with well-managed HT may not be distinguishable from those of healthy peers (51).

Physical inactivity is widely acknowledged as a major modifiable risk factor for T2D and its associated complications; hence, regular PA is recommended for both the prevention and management of the condition (52). Lidegaard et al. highlighted barriers to physical activity in T2D patients, including functional restrictions, logistical challenges such as insufficient time and limited awareness, as well as difficulties in goal setting and self-monitoring (53). Older patients with T2D have been shown to have low levels of PA due to diabetic complications such as neuropathy, retinopathy and cardiovascular problems and associated pain, discomfort and reduced mobility (54). Similarly, FC assessed by the 6MWT has also been shown to be lower in older patients with T2D compared to their healthy peers (55, 56). Reduction in muscle mass and strength due to the hyperglycemia and insulin resistance, chronic inflammation leading to musculoskeletal problems, neuropathy, and microvascular complications have been reported as possible factors of this decrease (55). In many studies showing decreased QoL in patients with T2D, in addition to chronic complications and physical deficiencies, social and environmental isolation, economic burden, depression, anxiety and loss of cognitive functions related to chronic hyperglycemia have been presented as the main causes (57, 58). Our results showed that PA, FC, and QoL were lower in patients with T2D compared to their healthy peers, possibly due to all these mechanisms and in relation to ageing. In chronic comorbidities, the common pathophysiological mechanism that directly impairs PA and FC, while indirectly diminishing QoL, is the progressive deterioration of the cardiovascular system (59, 60). Factors such as chronic hyperglycemia, increased oxidative stress, endothelial dysfunction, lipid abnormalities, and atherosclerosis, which are commonly observed in obesity and T2D but are either less pronounced or absent in HT, may account for the relative preservation of certain capacities in patients with HT compared to those with obesity and T2D, where these pathological processes are more pronounced and detrimental (59, 61).

The first limitation of the our study is that the assessments of PA and QoL were conducted solely through self-reported questionnaires, rendering the potential for inaccuracies in measurement and recall bias inevitable. Second limitation is that a disease-specific QoL questionnaire was not used. However, the SF-36 questionnaire is a validated tool, widely used in QoL studies, and has been successfully applied to older individuals. Third limitation is that the findings are based on a state hospital setting, which may limit the broader applicability of the results. Finally, the study utilized a cross-sectional design, which prevented the establishment of a causal relationship between chronic comorbidities and the outcome measures.

In a state hospital setting, it was found that PA, FC, and QoL were lowest in the obese group. Older patients with T2D also showed lower levels in these parameters compared to

HT and healthy groups, though no significant differences were found between the HT and healthy peers. Consequently, it is essential to assess PA, FC, and QoL in older patients with chronic comorbidities in a clinical setting, with particular attention to those with obesity and T2D.

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Author's Contributions
Conceptualization: **Hikmet Uçgun, Ömer Bayrak,** Methodology: **Hikmet Uçgun, Ömer Bayrak, Mücahit Taşdemir,** Formal analysis and investigation: **Hikmet Uçgun, Ömer Bayrak, Mücahit Taşdemir,** Writing - original draft preparation: **Hikmet Uçgun, Ömer Bayrak,** Writing - review and editing: **Hikmet Uçgun, Mücahit Taşdemir**

Conflict of Interest
The authors state that they have no conflicts of interest to disclose.

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Ethical Approval
The study received approval from the Istanbul Atlas University Ethics Board (approval number: 2024/06-33) and was recorded on the ClinicalTrials.gov website (registration number: NCT06535295).

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