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Original Article

Determination of Body Composition Analysis in Association with Pain and Functional Status of Patients with Chronic Mechanical Low Back Pain

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Fariba Eslamian[1], Neda Dolatkhah[2], Mahya Pourostadi[3], Ali Pirani[3]

[1] Associate Professor, Physical Medicine and Rehabilitation Research Center, Aging Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran
[2] Assistant Professor, Physical Medicine and Rehabilitation Research Center, Aging Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran
[3] Department of Physical Medicine and Rehabilitation, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Keywords
Mechanical low back pain; Functional ability; Body composition

Abstract

Background: Low back pain (LBP) is a social health problem in different societies. Due to its resulting disabilities, costs incurred by the health system, and the inconsistency of existing studies on back pain and body composition analysis (BCA) indices, we decided to study the relationship between body composition, LBP intensity and physical status.

Methods: In a case-control study among patients referring to the physical medicine and rehabilitation outpatient clinic of Imam Reza Tabriz teaching hospital, 55 subjects with LBP in the case group and 55 subjects without LBP in the control were enrolled in the study and body composition parameters including body mass index (BMI), lean body mass (LBM), percentage of body fat (PBF), mass of body fat (MBF), and visceral fat mass (VFM) were determined. The Modified Oswestry Low Back Pain Questionnaire was used to assess the physical function of the subjects in the case group.

Results: There was no significant difference in age and sex between the two groups. The two groups were homogeneous in terms of demographic and baseline variables as well as BCA. In the case group, 30.9% had low disability, 58.2% moderate disability, and 10.9% had high disability. The BMI was not significantly correlated with disability and LBP intensity. The MBF in legs, arms, and trunk had a positive and significant relationship with the walking disability parameter (P = 0.021), but other body composition parameters had no significant relationship with functional ability.

Conclusion: According to the findings, higher PBF and MBF of the upper and lower limbs of the right, left, and trunk, were associated with greater disability in walking in people with LBP. However, no significant relationship was found between LBP intensity and BCA indices including BMI.

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Introduction

Low back pain (LBP) is a health problem in many societies that has preoccupied the patients, physicians, and health care policy-makers. Low back pain results in disability

Corresponding Author: Fariba Eslamian
Email: fariba_eslamian@yahoo.com

over time in about 1% of the US population.[1] Based on the results of a systematic review and meta-analysis, the prevalence of LBP in Iran during 1 year was 51.6% [95% confidence interval (CI): 42.9-60.3%],[2] which is a high rate. In addition, the incidence of LBP increases with age and is more common among women.[3] Chronic LBP is defined as pain that lasts more than 12 weeks[1] and is one of the most common causes of chronic pain syndrome. About 10-15 percent of LBPs are chronic and are the leading causes of disability among the group suffering from this complication.[4]

Most of the individuals who suffer from LBP experience mental and physical problems, such as reduced physical and social functioning, reduced general health, and permanent or recurrent pain throughout their lives, which decrease their quality of life (QOL).[5] Numerous studies have been carried out on the causes of LBP; however, its exact pathology has not yet been elucidated. Given the LBP complications, timely treatment and prevention of recurrence of complications and disabilities are of great importance. Therefore, LBP relief and reduction of disability and dysfunction are important priorities of treatment.

Recent investigations have shown the association of body composition analysis (BCA) including muscle and fat mass with a variety of health problems, and there is ample evidence of the role of body composition in body health disorders. For example, age-related muscle tissue loss along with fat mass increase has been associated with an increased risk of disability and mortality.[6,7] Moreover, based on the reports, maintaining muscle mass is associated with reduced risk of cardiovascular diseases (CVDs) including dyslipidemia and diabetes mellitus (DM).[8,9] Additionally, some researchers have examined the association of body composition with musculoskeletal pain, and have shown that higher fat mass and decreased muscle mass are associated with musculoskeletal pain.[10-12]

Numerous studies have been conducted on the physical characteristics of patients with LBP. In some studies, LBP has been associated with overweightness/obesity.[13,14] However, other studies have not clearly demonstrated this relationship.[15] The association of LBP with high body fat mass (BFM) has also been reported.[16,17] Other studies have suggested a link between LBP and muscle atrophy.[18,19] However, Endo et al. could not find a relationship between BCA and LBP in either women or men.[20]

Due to its resulting disabilities, costs incurred by the health system, lack of determination of the precise pathology of the mechanical LBP, as well as the inconsistency of studies on LBP and BCA, the researchers in the present study decided to conduct a study on the relationship between body composition and LBP. To the best of the researchers' knowledge, despite the high prevalence of LBP in Iran, no study has been conducted to investigate the relationship between body composition and LBP among patients with nonspecific chronic LBP. Therefore, the researchers hope this study will help treat and prevent chronic mechanical LBP and the resulting complications, disabilities, and dysfunction so that both people and the health system will benefit from it.

Methods

This descriptive-analytical study was performed as a case-control study in the physical medicine clinic of Imam Reza Hospital of Tabriz University of Medical Sciences, Tabriz, Iran. Using convenience sampling method, 55 eligible individuals with non-specific chronic LBP were selected and included in the study. The subjects in the control group were selected from among the individuals referring to the clinic and the patients' companions, who did not have LBP, and matched by age, gender, and body mass index (BMI).

The present study was performed with the aim to evaluate the relationship between BCA and pain and functional impairment in patients with chronic mechanical LBP. The relationship between BMI and LBP was investigated based on the visual analogue scale (VAS). For this purpose, using the study by Koyanagi et al.,[21] OR = 3.33 was considered as a significant effect size in a BMI of above 35 and LBP. Considering 0.05 as the first type error, 80% as the test power, and two-sided sample size test using G*Power software version 3.1.9.2 (written by Franz Faul, University of Kiel, Germany), the sample size was calculated to be 47 individuals. Considering a 15% possible drop rate, 55 was estimated as the volume of the final sample.

The study inclusion criteria included age ≥ 20 years, BMI ≥ 18.5 kg/m^2, diagnosis of mechanical LBP by a specialist physician, a history of at least 3 months of LBP, and willingness to participate in the study.

The exclusion criteria were unwillingness to participate in or continue the study, acute and semi-acute LBP, underlying injuries and abnormalities affecting LBP such as disc herniation, rheumatism, sciatica, spondylolysis, narrowing of the spinal canal, osteoporosis, bone spurs in vertebras, hip and vertebral fractures, previous surgeries, tumor, infection, cauda equina syndrome (CES), lordosis, scoliosis, flatback syndrome, diagnosed renal or liver diseases, and malignancy.

The demographic characteristics questionnaire (including age, sex, and weight) was completed by the researcher for all patients through interviews. Patients were also asked for information regarding the onset of LBP and its causes, discopathy, osteoarthritis, and unspecified muscle cramps.

A body composition measuring instrument (Inbody 370, Inbody, Seoul, Korea) was used to measure body composition. This device is capable of measuring protein mass, minerals, mineral tissue, adipose tissue, lean body mass (LBM), total body water (TBW), body age, basal metabolic rate (BMR), waist-to-hip ratio, and subcutaneous fat level. It operates through electrical impulses and resistance to electrical currents in body tissues. Based on this resistance, the body tissue ratios are determined and compared with the normal values defined for the device. This device has a high efficiency in performing BCA such as fat percentage, water content, muscles, bones, minerals, leanness and weight shortage, obesity and overweightness, BMI, and measurement of local fat in body organs. Measurements were performed after 8 to 10 hours of fasting with an empty bladder. The respondents were asked to come to the measurement location by a vehicle, not to have intense physical activity 24 hours before the test, and not to use caffeinated beverages at least 12 hours before the test. They were given a 20-minute rest before the test.[22]

The physical activity of the subjects was classified into 3 levels of light, moderate, and severe. The light activity level was for individuals who have a sedentary lifestyle and perform household chores such as cooking and sewing, as well as those with jobs such as computer and laboratory works. The moderate level was associated with cleaning the house and taking care of children. The severe level included high speed walking, cycling, swimming, and running.[23]

The Modified Oswestry Low Back Pain Questionnaire was employed to assess the QOL impairments and functional impairments of the participants. The questionnaire consists of 10 sections examining the severity of pain, personal care, lifting things, walking, sitting, standing, sleeping, social life, traveling, and changes in pain levels. In each section, the dysfunction was rated from 0 (optimal performance without pain) to 5 (inability to perform activities due to severe pain). The Oswestry Disability Index (ODI) score was equal to the sum of the scores of the 10 sections multiplied by 2 with an overall value of 0 to 100. An ODI score of 0 indicated that the subject was healthy and able to perform daily activities without pain. Moreover, the scores of 0-20, 21-40, 41-60, 61-80, and 80-100, respectively, indicated low, moderate (mild), high, severe, and completely acute disability in which the individual was unable to perform any movement.

In previous studies, the reliability of the pain severity and Oswestry questionnaires were, respectively, reported as 91% and 84% and confirmed.[24,25] The questionnaires were self-report questionnaires and the patients expressed their feelings about the questions by selecting the desired option.

After screening, the collected data were analyzed in the two parts of descriptive and analytical statistics. In the descriptive statistics, depending on the nature of the data, mean and standard deviation (SD) or relative and absolute frequency were exploited to describe the data. In the analytical statistics section, the chi-square test (an accurate test in small samples) was utilized for qualitative data, and the independent t-test (Mann-Whitney, in the case of lack of establishment of assumptions for the one-sided independent t-test) and one-way analysis of variance (ANOVA) (Kruskal-Wallis test, in the case of lack of establishment of assumptions for one-way ANOVA) were used for quantitative data. Pearson correlation coefficient was used to investigate the relationship between functional status and other quantitative variables. Analysis of covariance (ANCOVA) (a kind of regression analysis) was used to control the confounding factors. Furthermore, the logistic regression analysis was employed to examine the factors affecting LBP (mild and severe LBP). The significance level was considered as 0.05% in all tests and R software (version 3.4.3, R Foundation for Statistical Computing, Vienna, Austria) was used for analysis.

Ethical considerations: In order to comply with ethical principles, the present study was performed after obtaining an informed consent from the subjects following the explanation of the study goals and procedure, assuring them of the confidentiality of their information and the possibility to withdraw from the study in case of their unwillingness. In all stages of the study, the researchers adhered to the ethical principles of the Medical Ethics Declaration of the Ministry of Health, Treatment, and Medical Training, and no cost was imposed on the subjects. This study was approved by the ethics committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.056).

Results

In this descriptive-analytic, case-control study, the relationship between LBP and body composition was examined in 55 patients in Group A (case) and 55 healthy subjects in Group B (control).

Description of demographic and baseline information of patients: The description of the patients' baseline information, such as marital status, educational level, BMI, occupation, underlying diseases (CVDs, autoimmune diseases, thyroid, DM, and hypertension), medicine use, dietary supplementation, and smoking, and their comparison between the groups and P-values are presented in tables 1 and 2. There was no significant difference between the two groups in the above cases and the two groups were homogeneous in terms of demographic and baseline variables.

Description of severity of disability in patients (based on the Oswestry questionnaire): The severity of the patients' disability was calculated based on the 10 items of severity of pain, personal care, lifting things, sitting, standing, walking, sleeping, sexual relationship, social life, and travelling, which are presented in Tables 3 to 5. Given the Oswestry questionnaire results, 30.9%, 58.2%, and 10.9% of the subjects had low, moderate, and high disability, respectively.

Description of characteristics of body composition analysis: The details of the BCA, including body fat percentage (BFP), mean body fat, and BFM in the upper and lower right and left limbs, waist to hip ratio, visceral fat mass, TBW, and LBM, and its comparison between the case and control groups and the P-values are presented in tables 1 and 2.

Table 1. Demographic and baseline characteristics of the subjects

Variable		n (%)
Gender	Female	85 (77.3)
	Male	25 (22.7)
Marital status	Single	22 (20.0)
	Married	88 (80.0)
Education level	Below diploma	58 (52.7)
	Diploma	27 (24.5)
	Academic education	25 (22.7)
Occupational status	Unemployed	73 (66.4)
	Employed	37 (33.6)
BMI (kg/m^2)	Underweight	4 (3.6)
	Normal	27 (24.5)
	Overweight	44 (40.0)
	Obese	35 (31.8)
Smoking	Yes	8 (7.3)
	No	102 (92.7)
History of previous disease	Coronary artery diseases	2 (1.8)
	Fatty liver	11 (10.0)
	Chronic obstructive pulmonary disease (COPD)	3 (2.7)
	Autoimmune diseases	1 (0.9)
	Hypothyroidism	8 (7.3)
	Hypertension	12 (10.9)
	DM	4 (3.6)
Taking medication	Yes	34 (30.9)
	No	76 (69.1)
Taking nutritional supplements	Yes	2 (1.8)
	No	108 (98.2)
	Mean ± SD	**Range**
Age (year)	39.65 ± 10.00	20.00-59.00
BMI (kg/m^2)	27.93 ± 5.78	16.70-44.00
PBF	32.10 ± 7.86	12.80-46.40
MBF	24.38 ± 9.50	6.80-48.90
MBF of right arm	1.43 ± 0.64	0.30-3.26
MBF of left arm	1.44 ± 0.62	0.30-3.16
MBF of right leg	4.45 ± 1.77	1.24-9.62
MBF of left leg	4.43 ± 1.74	1.25-8.79
MBF of trunk	12.69 ± 4.92	3.54-25.54
LBM	8.48 ± 4.53	33.70-71.60
TBW	35.38 ± 6.75	4.50-51.60
VFM	3.29 ± 1.78	0.70-8.90
WHR	0.86 ± 0.07	0.70-1.02

DM: Diabetes mellitus; BMI: Body mass index, PBF: Percentage of body fat; MBF: Mass of body fat; LBM: Lean body mass; TBW: Total body water; VFM: Visceral fat mass; WHR: Waist-to-hip ratio

Table 2 results indicate that the two groups did not have statistically significant differences, and were considered homogeneous. The results presented in tables 6 and 7 revealed that none of the BCA indices significantly correlated with the functional status of patients with chronic LBP. According to the obtained Pearson correlation coefficients, the ODI was not significantly correlated with any of the components of the BCA. In the case group, BMI had a direct and significant relationship with all components of the BCA except TBW.

In the control group, BMI had a direct and significant relationship with all components of the BCA.

On the basis of Spearman's correlation coefficients, walking had a direct and significant relationship with BFP, BFM, left arm fat mass, lower extremity fat mass, and trunk fat mass.

Since no significant relationship was found between BMI and performance status ($P = 0.639$; $r = 0.065$), the researchers reexamined the presence of a relationship with the classified status of the performance status scale (Table 8).

The results of the Kruskal-Wallis test were also indicative of the lack of any significant correlation between ODI and BCA components.

Based on the results, BMI had a direct and significant relationship with all components of the BCA in the study subjects except TBW in patients with LBP.

Discussion

The current study was undertaken with the aim to determine the BCA indices in patients with mechanical LBP and its relationship with pain severity and their functional status. Most of the indices of the BCA did not have a significant relationship with pain and functional status in patients with chronic mechanical LBP referred to the physical medicine and rehabilitation clinic within 1 year. However, the BFP, BFM, lower extremity fat mass, and trunk fat mass were significantly correlated with the walking disability subscale, so increasing each of the above indices significantly increased the walking disability subscale.

Table 2. Demographic and baseline characteristics of the participants in the study by group

Variable	Class	Group		P
		Case	Control	
		n (%)	n (%)	
Gender	Female	43 (78.2)	42 (76.4)	0.820##
	Male	12 (21.8)	13 (23.6)	
Marital status	Single	11 (20.0)	11 (20.0)	> 0.999##
	Married	44 (80.0)	44 (80.0)	
BMI (kg/m^2)	Underweight	2 (3.6)	2 (3.6)	0.395##
	Normal	14 (25.5)	13 (23.6)	
	Overweight	18 (32.7)	26 (47.3)	
	Obese	21 (38.2)	14 (25.5)	
Education level	Reading and writing	27 (49.1)	31 (56.4)	0.714*
	Diploma	14 (25.5)	13 (23.6)	
	Above diploma	14 (25.5)	11 (20.0)	
Occupational status	Unemployed	36 (65.5)	37 (67.3)	0.840*
	Employed	19 (34.5)	18 (32.7)	
	Retired	0 (0.0)	0 (0.0)	
Going on a diet	No	55 (100.0)	55 (100.0)	--
	Yes	0 (0.0)	0 (0.0)	
Taking medication	No	38 (96.1)	38 (69.1)	--
	Yes	17 (30.9)	17 (30.9)	
Taking nutritional supplements	No	54 (98.2)	54 (98.2)	--
	Yes	1 (1.8)	1 (1.8)	
Smoking	No	51 (92.7)	51 (92.7)	--
	Yes	4 (7.3)	4 (7.3)	
	Quitted	0 (0.0)	0 (0.0)	
CVDs	No	54 (98.2)	54 (98.2)	> 0.999**
	Yes	1 (1.8)	1 (1.8)	
Autoimmune diseases	No	54 (98.2)	55 (100.0)	> 0.999**
	Yes	1 (1.8)	0 (0.0)	
Thyroid disease	No	51 (92.7)	51 (92.7)	> 0.999**
	Yes	4 (7.3)	4 (7.3)	
Hypertension	No	48 (87.3)	50 (90.9)	0.541*
	Yes	7 (12.7)	5 (9.1)	
DM	No	53 (96.4)	53 (96.4)	--
	Yes	2 (3.6)	2 (3.6)	
		Mean ± SD	Mean ± SD	
Age (year)		39.65 ± 9.85	39.64 ± 9.71	0.992#
BMI (kg/m^2)		28.28 ± 5.60	27.57 ± 5.99	2.525#
PBF		32.41 ± 7.99	31.78 ± 7.79	0.675#
MBF		24.87 ± 9.98	23.88 ± 9.39	0.590#
MBF of Right Arm		1.50 ± 0.67	1.36 ± 0.61	0.258#
MBF of Left Arm		1.51 ± 0.64	1.37 ± 0.58	0.231#
MBF of Right leg		4.53 ± 1.75	4.37 ± 1.91	0.656#
MBF of Leftleg		4.51 ± 1.73	4.35 ± 1.76	0.632#
MBF of trunk		12.81 ± 4.94	12.58 ± 4.95	0.811#
LBM		49.87 ± 8.72	49.18 ± 8.29	0.671#
TBW		35.22 ± 7.52	35.54 ± 5.95	0.802#
VFM		3.34 ± 1.76	3.23 ± 1.80	0.738#
WHR		0.87 ± 0.07	0.90 ± 0.07	0.588#

CVDs: Cardiovascular diseases; DM: Diabetes mellitus; BMI: Body mass index; PBF: Percentage of body fat; MBF: Mass of body fat; LBM: Lean body mass; TBW: Total body water; VFM: Visceral fat mass; WHR: Waist-to-hip ratio
Independent t-test; ## Exact test; * Chi-square test; ** Fisher's exact test

Table 3. Indices of the Oswestry questionnaire subscales in patients with chronic mechanical low back pain (LBP) referred to the physical medicine clinic of Imam Reza Hospital of Tabriz, Iran, in 2017-2018

Subscale	Median	Lowest	Highest	Range
Pain intensity	2	1	3	1
Personal care	1	0	4	1
Lifting things	2	0	4	2
Walking	1	0	3	1
Sitting	2	0	4	1
Standing	2	0	4	1
Sleeping	0	0	3	1
Sexual relationship	0	0	3	1
Social life	1	0	4	1
Traveling	1	0	4	1

Iizuka et al., in their study on 273 patients with LBP, reported no association between LBP and body composition, which was consistent with the results of the present study. Thus, BMI, TBW, BFM, and BMI did not have a significant relationship with severity of pain and disability.[26]

Table 4. Indices of the Oswestry questionnaire scales in patients with chronic mechanical low back pain (LBP) referred to the physical medicine clinic of Imam Reza Hospital of Tabriz, Iran, in 2017-2018

Scale	Rate	Mean	SD	Minimum	Maximum
ODI	55	27.49	10.57	8	60

ODI: Oswestry disability index; SD: Standard deviation

In addition, in a study by Okamoto et al. on 1768 patients, there was no association between BMI and LBP, one of the reasons of which was the lack of assessment of individuals with obesity for a long time.[27]

Table 5. Classified Oswestry questionnaire scales in patients with chronic mechanical low back pain (LBP) referred to the physical medicine clinic of Imam Reza Hospital of Tabriz, Iran, in 2017-2018

Scale	Class	n (%)
ODI	Low disability (0-20)	17 (30.9)
	Moderate disability (21-40)	32 (58.2)
	High disability (41-60)	6 (10.9)

ODI: Oswestry disability index

Table 6. Relationship between the Oswestry questionnaire subscales and physical composition analysis components in patients with chronic mechanical low back pain (LBP) referred to the physical medicine clinic of Imam Reza Hospital of Tabriz, Iran, in 2017-2018

Oswestry questionnaire subscales	Test result	BFP	BFM	Right arm body fat mass	Left arm body fat mass	Right lower body fat mass	Left lower body fat mass	Trunk fat mass	LBM	TBW	Visceral adipose tissue	Waist to hip ratio
Pain intensity	P	-0.138	-0.120	-0.167	-0.128	-0.134	-0.130	-0.126	-0.015	-0.080	-0.209	-0.180
	P	0.313	0.383	0.224	0.353	0.330	0.346	0.358	0.913	0.560	0.126	0.188
Personal care	P	0.000	0.031	-0.053	0.015	0.020	0.027	0.023	-0.043	-0.131	-0.126	-0.185
	P	0.998	0.821	0.699	0.914	0.887	0.843	0.867	0.756	0.342	0.361	0.177
Lifting things	P	0.144	0.149	0.050	0.114	0.143	0.162	0.144	-0.099	-0.183	-0.024	-0.114
	P	0.296	0.279	0.717	0.406	0.298	0.236	0.293	0.474	0.181	0.860	0.407
Walking	P	.333*	.335*	0.254	0.314*	.328*	.352**	.339*	-0.031	-0.102	0.169	-0.067
	P	0.013	0.012	0.062	0.020	0.015	0.008	0.011	0.822	0.457	0.218	0.627
Sitting	P	-0.067	0.008	0.000	0.002	-0.004	-0.002	0.007	0.099	0.146	-0.012	-0.102
	P	0.625	0.954	0.999	0.987	0.978	0.986	0.960	0.473	0.288	0.929	0.458
Standing	P	0.089	0.137	0.143	0.128	0.136	0.127	0.135	0.041	0.093	0.129	0.063
	P	0.516	0.318	0.299	0.351	0.323	0.354	0.325	0.764	0.502	0.350	0.646
Sleeping	P	0.139	0.127	0.085	0.132	0.104	0.119	0.126	-0.029	-0.083	0.016	-0.109
	P	0.312	0.355	0.537	0.338	0.449	0.388	0.361	0.834	0.547	0.909	0.429
Sexual relationship	P	0.270*	0.249	0.171	0.232	0.230	0.242	0.245	-0.049	-0.155	0.075	0.011
	P	0.046	0.067	0.212	0.088	0.091	0.075	0.072	0.722	0.259	0.589	0.939
Social life	P	-0.042	-0.035	-0.090	-0.056	-0.037	-0.028	-0.037	0.020	-0.023	-0.097	-0.116
	P	0.759	0.798	0.515	0.683	0.789	0.837	0.786	0.886	0.867	0.483	0.400
Traveling	P	0.073	0.109	0.122	0.108	0.095	0.096	0.108	0.034	0.081	0.076	-0.053
	P	0.595	0.427	0.375	0.434	0.489	0.486	0.433	0.807	0.557	0.581	0.701

BFP: Body fat percentage; BFM: Body fat mass; LBM: Lean body mass; TBW: Total body water

Table 7. Relationship between body composition analysis (BCA) indicators, and the functional status and body mass index (BMI) of the participants in the study by group

Scale	Test result	BFP	BFM	Right arm body fat mass	Left arm body fat mass	Right lower body fat mass	Left lower body fat mass	Trunk fat mass	LBM	TBW	Visceral adipose tissue	Waist to hip ratio
Oswestry	r	0.112	0.130	0.093	0.143	0.126	0.138	0.131	0.025	-0.106	-0.009	-0.125
	P	0.418	0.343	0.500	0.298	0.360	0.315	0.342	0.856	0.439	0.948	0.362
BMI Case	r	0.796**	0.925**	0.826**	0.869**	0.933**	0.931**	0.931**	0.432**	0.219	0.848**	0.696**
	P	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.109	0.000	0.000
BMI	r	0.824**	0.950**	0.781**	0.879**	0.919**	0.930**	0.941**	0.407**	0.419**	0.942**	0.802**
Control	P	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.001	< 0.001	< 0.001

BFP: Body fat percentage; BFM: Body fat mass; LBM: Lean body mass; TBW: Total body water

Most of the referring individuals had recently developed obesity and had not yet presented musculoskeletal pain.[27] In a similar study, Toda et al. also found that BMI, LBM, and waist-to-hip ratio were not significantly associated with LBP.[28] In a study carried out by Daneshjoo and Dadgar in Iran on 182 patients with LBP, it was found that there was no significant relationship between LBP and BMI; however, there was a significant relationship between LBP and physical activity.[29]

Few studies have used the Oswestry questionnaire, while the use of this questionnaire in the present study showed a significant relationship between walking (in at least one subgroup) and BCA components. For example, in a study on 146 women aged 35-55 years, 74 and 72 of whom were, respectively, in the premenopausal and postmenopausal periods, Koley and Sandhu found that increasing BFP resulted in LBP among the postmenopausal subjects, and had a significant relationship with all 10 variables of the Oswestry questionnaire.[30]

Moreover, in the study by Hussain et al., a significant relationship was reported between fat mass volume and LBP severity and disability.[17] In another study by Urquhart et al., it was found that higher body fat was directly correlated with greater severity of LBP.[31] In a systematic review study by Walsh et al., it was found that with increase in BFM, LBP also increased.[32] In the study by Vincent et al. on 55 individuals within the age range of 60-85 years, people with a BMI above 35 (very high obesity range) had significantly higher LBP in walking and climbing stairs compared to those with a BMI of 25-29.9 (overweight range).[33]

Table 8. Body composition analysis (BCA) indicators in different classes of functional status in patients with chronic mechanical low back pain (LBP) referred to the physical medicine clinic of Imam Reza Hospital of Tabriz, Iran, in 2017-2018

BCA components	Low disability (0-20)		Moderate disability (21-40)		High disability (41-60)		P
	Mean	SD	Mean	SD	Mean	SD	
BFP	32.57	2.09	31.92	1.47	34.62	1.54	0.883
BFM	25.18	2.34	24.25	1.83	27.25	2.49	0.594
Right arm body fat mass	1.52	0.17	1.49	0.12	1.48	0.22	0.917
Left arm body fat mass	1.50	0.16	1.49	0.12	1.62	0.17	0.798
Right lower body fat mass	4.60	0.42	4.40	0.33	5.00	0.46	0.530
Left lower body fat mass	4.56	0.41	4.39	0.33	5.07	0.52	0.489
Trunk fat mass	12.99	1.18	12.47	0.94	14.07	1.31	0.599
LBM	50.09	1.77	49.58	1.75	50.80	2.68	0.935
TBW	36.06	1.27	35.68	1.26	30.37	5.43	0.722
Visceral adipose tissue	3.52	0.44	3.34	0.32	2.85	0.54	0.780
Waist to hip ratio	0.87	0.02	0.87	0.01	0.85	0.01	0.692

BFP: Body fat percentage; BFM: Body fat mass; LBM: Lean body mass; TBW: Total body water; SD: Standard deviation

However, BMI did not play a significant role in the physical activity capability of the indivduals.[33] Koyanagi et al. conducted a study on the relationship between BMI and LBP among 42,000 participants from 9 different countries.[21] They found that people with a BMI above 35 experienced higher levels of LBP, but this was true only in Finland, the Netherlands, Russia, Spain, and South Africa. However, the participants from India, China, Ghana, and Mexico often did not have such an experience. The reason for this was the difference in meanings of LBP in different cultures.[21]

Shabiri et al. reported that LBP increased with reduction in muscular endurance, but there was no significant relationship between BMI and severity of LBP.[34] In another study, it was noted that the trend of degeneration of the paraspinal muscles, which is an important factor in chronic LBP, increases with pelvic tilt in both sexes and with increasing age, weight, and pelvic tilt only in women.[35] In another study by Guo et al., it was found that with a BMI above 24 and waist-to-hip ratio above 0.85, LBP increased in higher ages due to the increased lumbar lordosis and sacral angles.[36] Furthermore, Irandoust and Taheri believed that LBP is a multifactorial disorder, and not only physical factors, but also psychological factors are involved in its incidence.[37]

Although the variables were not significant in previous studies with large sample sizes, the low sample size seems to be one of the causes of the insignificance of the variables. Another cause is the low age range in the present study, as the average age was below 40 years; this is an age in which lumbar pains and degenerative processes are not prevalent. In previous studies, most average ages were above 50 years, but still, most of them lacked significant correlations. The third reason may be the fact that there was no patient with a BMI level of more than 30, which includes the obese or highly obese individuals, in the current study and the patients were mostly in the overweight range. Thus, it may be due to this that BMI and other parameters did not have a relationship with severity of LBP. As one study has shown in this regard, obese and overweight individuals are at higher risk for lumbar spinal stenosis (LSS), as, in recent decades, obesity has been considered as a cause of LSS.[37] In the present study, the neurologic causes of LBP such as secondary radiculopathy to canal stenosis were not examined.

Limitations: The small sample size was one of the limitations in this study. Low age range, BMI below the obesity level, and limiting the cause of LBP to mechanical type were other influencing factors in the lack of a relationship between the variables.

The study did not assess the mental status of the patients. Due to the absence of previous medical records, only the patients' statements about their functional status were considered as the basis of action.

Conclusion

In this study, higher PBF, MBF, and mean fat mass of the right and left lower limbs and trunk were associated with greater inability to walk among individuals with LBP, but overall there was not a significant relationship between LBP and body composition, including BMI. It is suggested that future studies be conducted with a large sample size with an equal number of men and women. Moreover, the consideration of the neurological causes of LBP and separate exploration of the relationship between different causes and body composition parameters are suggested. Ultimately, the inclusion and investigation of all body types, including lean, normal, overweight, obese, and highly obese types, is recommended.

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Conflict of Interest

Authors have no conflict of interest.

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