# Evaluation of Body Composition in Patients with Psoriasis

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**Abstract**

Objective: Psoriasis is a chronic inflammatory skin disease with a complex etiopathogenesis including genetic predisposition, immune dysfunction and environmental factors. Chronic inflammation leads to the development of vascular and metabolic disorders. The bioimpedance method is an easy and useful method for evaluating of body composition. In this study, it was aimed to investigate body composition, demographic, clinical and laboratory data in patients with psoriasis and to compare them with healthy controls.

**Material and Methods:** Sociodemographic characteristics of the participants, duration of disease, concomitant systemic diseases, family history of psoriasis, presence of psoriatic arthritis and current treatments were questioned. Body composition of the participants was determined by Tanita Body Composition Analyzer type BC-418 (Tokyo, Japan), and in blood samples glucose, total cholesterol, HDL, LDL, triglyceride and insulin levels were determined by autoanalysers.

**Results:** HOMA-IR, triglyceride, BMI, metabolic age and fat percentage were significantly higher in the psoriasis group, whereas the control group had higher body density, lean mass, mineral percentage and total body fluid. In this study, it was found that as the insulin resistance, BMI and fat ratio increased, the severity of the disease increased in patients with psoriasis. Also BMI increased in patients with longer disease duration. Topical and conventional therapies had no significant effect on laboratory and body composition parameters.

**Conclusion:** In the light of the data obtained in this study, it was concluded that some metabolic markers and body composition parameters were negatively affected in patients with psoriasis and were associated with disease severity.

**Key words:** psoriasis, disease severity, BMI, body composition, fat percentage, insulin resistance

## ПСОРИАЗҒА ШАЛДЫҚҚАН НАУҚАСТАР АҒЗАСЫНЫҢ КОМПОЗИЦИЯЛЫҚ ҚҰРАМЫН БАҒАЛАУ

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**ТҰЖЫРЫМДАМА**

**Мақсаты:** Псориаз – бұл күрделі этиопатогенезі бар терінің созылмалы қабынба ауруы, ол генетикалық бейімділікті, иммундық дисфункцияны және қоршаған орта факторларын қамтиды. Созылмалы қабыну тамырлы және метаболиттік зақымданудың дамуына алып келеді. Биоимпедансты әдіс ағзаның композициялық құрамын бағалаудың жеңіл және тиімді әдісі болып табылады. Бұл зерттеудің мақсаты ағзаның композициялық құрамын, псориазға шалдыққан науқастардың демографиялық, клиникалық және зертханалық деректерін зерттеу және бақылау тобындағы дені сау пациенттерінің деректерімен салыстыру болып табылады.

**Материалдар мен әдістер:** Бұл зерттеуде зерттеуге қатысушылардың әлеуметтік-демографиялық сипаттамалары, аурудың ұзақтығы, жанама жүйелі аурулар, псориазға генетикалық бейімділік, псориазды артриттің болуы және ағымдағы емдеу қарастырылды. Зерттеуге қатысушылар ағзасының композиялық құрамы Tanita ағзаның композиялық құрамының талдауышы, BC-418 үлгісі (Токио, Жапония) көмегімен зерттелді, ал қан үлгілеріндегі глюкоза деңгейі, жалпы холестерин, ТЖЛП (тығыздығы жоғары липопротеиндер), ТТЛП (тығыздығы төмен липопротеиндер), триглицеридтер және инсулин автоматты талдауыштар көмегімен анықталды.

**Нәтижелері:** Инсулинге төзімділік индексі, триглицеридтер деңгейі, ағза салмағының индексі, метоболиттік жас және псориазбен ауыратын науқастар ағзасындағы майдың пайыздық құрамы айтарлықтай жоғары болды, ал бақылау тобындағы пациенттерде ағза тығыздығы деңгейінің, майлы емес тіндердің салмағы, ағзадағы сұйықтың минералды құрамы мен жалпы көлемі жоғары болды. Зерттеу нәтижесінде инсулинге төзімділік, ағза салмағының индексі және майдың құрамы жоғарлаған сайын псориазбен ауыратын науқастарда аурудың ауырлығы жоғарылай түскені айқындалды. Сондай-ақ ағза салмағы индексі ұзақ уақыт бойы ауырып жүрген пациенттерде арта түскен. Жергілікті және дәстүрлі терапия зертханалық деректерге және ағзаның композициялық құрамының параметрлеріне айтарлықтай әсер еткен жоқ.

**Қорытынды:** Осы зерттеуден алынған деректерге сүйене отырып, ағзаның композициялық құрамының кейбір метоболиттік маркерлері

мен параметрлері псориазға шалдыққан науқастарда нашарлай түсті және аурудың ауырлығына байланысты болды деген пікірге келдік.

**Негізгі сөздер:** псориаз, аурудың ауырлығы, ағза салмағының индексі, ағзаның композициялық құрамы, майдың пайыздық мазмұны, инсулинге төзімділік

## ОЦЕНКА КОМПОЗИЦИОННОГО СОСТАВА ТЕЛА У БОЛЬНЫХ ПСОРИАЗОМ
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### РЕЗЮМЕ
**Цель:** Псориаз - это хроническое воспалительное заболевание кожи со сложным этиопатогенезом, включающим генетическую предрасположенность, иммунную дисфункцию и факторы окружающей среды. Хроническое воспаление ведет к развитию сосудистых и метаболических нарушений. Биоимпедансный метод является легким и полезным для оценки композиционного состава тела. Целью настоящего исследования является изучение композиционного состава тела, демографических, клинических и лабораторных данных больных псориазом и их сопоставление с данными здоровых пациентов контрольной группы.

**Материалы и методы:** В данном исследовании рассматривались социально-демографические характеристики участников исследования, продолжительность болезни, сопутствующие системные заболевания, генетическая предрасположенность к псориазу, наличие псориатического артрита и текущее лечение. Композиционный состав тела участников исследования определяли с помощью анализатора композиционного состава организма Tanita, модель BC-418 (Токио, Япония), а уровень глюкозы, общий холестерин, ЛПВП, ЛПНП, триглицериды и инсулин в образцах крови определяли с помощью автоматических анализаторов.

**Результаты:** Индекс инсулинорезистентности, уровень триглицеридов, индекс массы тела, метаболический возраст и процентное содержание жира в организме пациентов группы больных псориазом были значительно выше, в то время, как у пациентов контрольной группы были повышенные уровни плотности тела, массы нежировых тканей, минерального содержания и общего объёма жидкости в организме. В результате исследования выявлено, что по мере того, как увеличивались инсулинорезистентность, индекс массы тела и содержание жира, увеличивалась степень тяжести заболевания у больных псориазом. Также индекс массы тела увеличивался у пациентов с большей длительностью заболевания. Местная и традиционная терапии не повлияли значительно на лабораторные данные и параметры композиционного состава тела.

**Заключение:** Исходя из данных, полученных в настоящем исследовании, мы пришли к выводу о том, что некоторые метаболические маркеры и параметры композиционного состава тела ухудшались у больных псориазом и были связаны с тяжестью заболевания.

**Ключевые слова:** псориаз, тяжесть заболевания, индекс массы тела, композиционный состав тела, процентное содержание жира, инсулинорезистентность

## Introduction

Psoriasis is a chronic inflammatory disease characterized by erythematous squamous papules and plaques. Immune mechanisms play a role in its pathogenesis. Genetic predisposition, physical trauma, stress, infections and various drugs are thought to be effective in the etiology [1].

In recent years, the incidence of insulin resistance and metabolic syndrome has been shown to increase in patients with psoriasis. It has been stated that this condition can be explained by chronic systemic inflammation and secreted proinflammatory cytokines. In conclusion, many comorbidities such as obesity, atherogenesis, hypertension, cardiovascular disease, Type 2 Diabetes Mellitus have been reported to be more frequent in psoriasis patients [2].

Bioelectrical impedance analysis (BIA) based on differences in electrical conduction depending on the structure of body tissues; it is a commonly used method for body composition analysis [3]. The aim of this study was to evaluate the body composition of patients with psoriasis using the BIA method and to compare them with clinical and biochemical parameters.

## Material and Methods

The study was approved by the local ethics committee and informed consent obtained from participants. Forty-eight patients with plaque type psoriasis diagnosed by clinically and histopathologically and 42 healthy controls without any known disease were included in the study. Local ethics approval was obtained for the study. Sociodemographic characteristics of the participants, duration of the disease, presence of concomitant systemic disease, history of psoriasis in the family, treatments (topical, phototherapy, methotrexate, acitretin, cyclosporin, biological agent] were investigated. Patients younger than 18 years of age, patients receiving biological agents, those receiving systemic therapy for less than three months and patients having guttate, pustular and erythrodermic psoriasis were not included in the study. Psoriasis Area and Severity Index (PASI) score was calculated by performing detailed dermatological examinations. The presence of psoriatic arthritis was evaluated by Clasification Criteria for Psoriatic Arthritis (CASPAR). Blood samples were taken from 8-12 hours fasting period. Glucose, total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride and insulin levels were determined by autoanalysers. From the results obtained, the value of Homeostatic Model Assessment-Insulin Resistance (HOMA-IR) indicating insulin resistance was calculated using HOMA-IR = fasting glucose (mg/dL) x fasting insulin (uIU/mL)/405 formula. HOMA-IR was accepted as normal if it was below 2.5 mg/dL, and insulin resistance was accepted if the HOMA-IR value was above 2.5 mg / dL.

The body weight was measured with lightweight clothes and the size of the body mass index (BMI) was measured with the weight/height2(kg/m2) formula. Tanita Body Composition Analyzer type BC-418 (Tokyo, Japan) was used for body composition determination. Data related to the person (age, gender, height) were uploaded to the device and the volunteer was asked to step on with bare feet. The body's fat mass, lean mass, protein, mineral and total body water percentage were calculated with the help of computer software owned by the device.

## Statistical Analysis

SPSS v.17.0 package program was used for statistical evaluation of obtained data in study (SPSS Inc, Chicago, Illinois, USA). While continuous data were summarized as mean, standard deviation, categorical data were summarized

in terms of number and percentage. Chi-square test was used to evaluate the relationship between two categorical variables. Pearson correlation test was used to evaluate the relationship between two continuous variables. Independent T test was used to compare continuous variables between groups. P values below 0.05 were considered statistically significant.

## Results

A total of 90 people were included in the study, 48 of whom had psoriasis and 42 of whom were controls. Demographic characteristics and bioimpedance analysis results of the participants are given in Table 1. The mean duration of disease was 9.8 ± 10.1 (min-max: 1-60) years. 39.6% of the patients (n=19) had a history of psoriasis in their family and 16.7% (n=8) had arthritis. Concerning the accompanying diseases 12.5% (n=6) of the cases had only diabetes, 2.1% (n=1) had only hypertension (HT) and 8.3% (n=4) had diabetes - hypertension (HT) coexistence.

8.3% of the patients described the history of hyperlipidemia. Current treatments were investigated. 56.2% (n=27) of the patients were receiving topical treatment whereas 20.8% (n=10) were receiving phototherapy, 10.4% (n=5) methotrexate, 8.3% (n=4) acitretin and 4.2% (n=2) cyclosporin. According to PASI values of cases; 64.6% (n=31) had mild, 25% (n=12) moderate, 10.4% (n=5) had severe involvement. The laboratory values of the groups are given in Table 2. The body composition parameters of the groups are given in Table 3. There was a positive correlation between PASI and HOMA-IR, BMI and fat percentage (p and r values were respectively 0.000,0.435; 0.000, 0.556; 0.000, 0.537). There was also a positive correlation between BMI and disease duration (p=0.014, r=0.263). Psoriasis group was evaluated according to topical and phototherapy-systemic treatment. BMI, body density, metabolic age, basal metabolic rate and body composition parameters did not differ significantly between the groups (p> 0.05).

**Table 1**  Demographic characteristics and bioimpedance analysis results of the participants

|  | Psoriasis group | Control group | p |
|---|---|---|---|
|  | (n=48) | (n=42) |  |
| Gender<br>　　Female<br>　　Male | 30(62.5%)<br>18(37.5%) | 24(57.1%)<br>18(42.9%) | 0.268* |
| Age (year) | 39.6±13.9 | 34.9±11.0 | 0.084** |
| BMI (kg/m2) | 26.9±5.3 | 23.5±4.9 | 0.003** |
| Age of metabolism (year) | 40.7±15.7 | 30.0±10.7 | 0.001** |
| Basal metabolic rate (Kcal) | 1763.3±227.1 | 1769.8±224.7 | 0.895** |
| Body density (kg/L) | 1.03±0.3 | 1.05±0.2 | 0.009** |

BMI:Body mass index
* The chi-square test was used. ** Student t test was used. The statistical significance level was p <0.05.

**Table 2**  Laboratory values of groups

|  | Psoriasis group | Control group | p |
|---|---|---|---|
|  | (n=48) | (n=42) |  |
| HOMA-IR (mg/dL) | 3.4±4.3 | 1.4±0.9 | 0.005 |
| Total cholesterol (mg/dL) | 180.8±39.7 | 168.9±29.5 | 0.124 |
| HDL (mg/dL) | 52.6±11.6 | 52.6±11.8 | 0.973 |
| LDL (mg/dL) | 104.2±32.1 | 101.1±25.1 | 0.632 |
| Triglyceride (mg/dL) | 164.5±109.7 | 118.4±61.0 | 0.020 |

HOMA-IR: Homeostatic Model Assessment-İnsulin Resistance, HDL: High density lipoprotein, LDL: Low density lipoprotein
* Student t test was used. The statistical significance level was p <0.05.

**Table 3**  Body composition parameters of groups

| Body composition parameters | Psoriasis group | Control group | p* |
|---|---|---|---|
|  | (n=48) | (n=42) |  |
| Fat mass (%) | 28.5±10.7 | 22.7±9.1 | 0.008 |
| Fat-free mass (%) | 71.5±10.7 | 77.3±9.1 | 0.008 |
| Protein (%) | 14.2±2.2 | 15.2±1.8 | 0.027 |
| Mineral (%) | 4.9±0.9 | 5.5±0.8 | 0.002 |
| Total body fluid (%) | 52.6±8.0 | 56.6±6.7 | 0.015 |

* Student t test was used. The statistical significance level was p <0.05.

## Discussion

Psoriasis is considered to be a multisemic disease beyond being a skin disease [4]. Psoriasis is associated with comorbidities such as obesity/metabolic syndrome, autoimmune diseases, psychiatric diseases, cardiovascular diseases, sleep apnea, non-alcoholic liver fat and chronic obstructive pulmonary diseases in which the inflammation is prominent in the immunopathogenesis [5].

In a US study, 51% of psoriasis patients had one or more comorbidity. Hyperlipidemia with 27% and hypertension with 25% were reported as the most common comorbidities among all comorbidities [6]. In a study of 418 psoriasis patients in our country, the frequency of diabetes was reported as 9.3% [7]. The most common comorbidity in this study was diabetes. 12.5% (n=6) of the patients had only diabetes and 8.3% (n=4) had diabetes-HT coexistence. When compared to the literature, the high rate of diabetes detection can be explained with the increasing frequency of the disease over the years.

In one study, 71% of psoriasis patients with obesity or overweight described weight change after the onset of the disease. The authors suggest that obesity occurs in the course of psoriasis and the inflammatory process that leads to psoriasis contributes to the development of obesity [8]. Similar to the literature, a positive correlation was found between the disease duration and BMI in this study. Studies have shown that BMI correlates with the prevalence and severity of psoriasis [9, 10]. As BMI increased, the risk of psoriasis was predicted to be increased and BMI> 25 was accepted as poor prognostic factor in patients with existing psoriasis [10]. In this study, BMI and fat percentage were significantly higher in the psoriasis group. There was a positive correlation between the severity of psoriasis and BMI.

It has been shown that obese psoriasis patients respond to systemic therapies, especially to biological therapies less than patients with normal weight. Side effects such as hyperlipidemia, hepatotoxicity, and nephrotoxicity due to systemic treatment have been shown to be more frequent in these patients [11]. While obesity and high BMI are known to adversely affect the treatment of psoriasis, it has also been reported that biologic therapies cause an increase in body weight in patients [12]. In a study by Tamer et al., the effect of conventional and biological treatments on body composition was investigated.

After three months of treatment, except for etanercept a significant increase in body weight and BMI values was determined in the groups using infliximab, adalimumab, methotrexate and cyclosporine [13]. In this study, the group with psoriasis was evaluated according to only topical and phototherapy-systemic treatment. BMI and body composition parameters did not make a significant difference between groups. It is the limitation of the study that body compositions before treatment were not determined in patients receiving phototherapy-systemic treatment.

In meta-analysis studies, a significant relationship was found between psoriasis and diabetes prevalence and / or incidence [14]. Insulin resistance, defined as a decrease in sensitivity to the metabolic effects of insulin, increases with the presence of an important proinflammatory cytokine, TNF-α, in the pathogenesis of psoriasis. The fact that PASI values in psoriasis patients with metabolic syndrome were higher than those without metabolic syndrome confirmed that insulin resistance affects the severity of psoriasis [15].

Consistent with the literature, insulin resistance was significantly higher in the psoriasis group in this study and there was a positive correlation between insulin resistance and disease severity.

Triglycerides are stored in the adipose tissue as an energy source. In addition, a carbohydrate-rich diet increases blood triglyceride levels [16]. In this study, when the lipid profile was compared, only triglyceride produced a significant difference between the groups. This may be related to the percentage of fat found to be significantly higher in psoriasis patients. When the laboratory parameters were evaluated according to the treatment status, there was no significant difference between the groups. The relatively low number of patients who received acitretin and cyclosporine treatments, which had a significant effect on the lipid profile, was associated with this condition.

The BIA method is one of the most effective methods used in the assessment of body composition because of its ease of measurement, its reproducibility, its rapid delivery and its non-invasive nature [17]. Parameters such as fat mass and body muscle mass obtained by the bioimpedance analysis method have been shown to be related to some metabolic markers [18]. In this study, a significant positive correlation was found between HOMA-IR and fat mass and there was a significant negative correlation with lean mass.

Since the basal metabolic rate is the largest component of the total energy spent, it may provide some clues about the patient's energy metabolism, physical performance, healthy tissue mass and disability status [19]. In this study, the basal metabolic rate was not significantly different between the groups, whereas the metabolic age was significantly higher in patients with psoriasis. This was associated with greater BMI and fat percentage in patients with psoriasis.

In this study, increased insulin resistance, BMI and fat ratio were found to exacerbate the disease in patients with psoriasis and in those with longer disease duration, the BMI increased. In the patient group where no biological agent was used, topical and phototherapy-systemic treatments of patients did not have a significant effect on the body components. In conclusion, the data obtained in this study support the fact that psoriasis is not only a disease affecting the skin and joints. Having more information on psoriasis in every aspect will provide to evaluate patients in a multifaceted way.

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