




Original Article

## A CLINICAL STUDY ON THE DERMATOLOGICAL MANIFESTATIONS OF OBESITY AT A TERTIARY CARE CENTRE

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### ABSTRACT

**Background:** Obesity is a growing public health problem and is frequently associated with a variety of dermatological manifestations resulting from metabolic, hormonal, inflammatory, and mechanical factors. The skin often reflects underlying systemic alterations in obese individuals and may serve as an early indicator of metabolic abnormalities.

**Objectives:** To study the spectrum of dermatological manifestations in obese patients attending a tertiary care centre and to analyze their distribution in relation to demographic factors and severity of obesity.

**Materials and Methods:** This hospital-based cross-sectional study was conducted in the Department of Dermatology of a tertiary care centre over a period of 12 months. A total of 150 obese patients (BMI  $\geq 30$  kg/m<sup>2</sup>) were included. Demographic details, BMI classification, associated comorbidities, and dermatological findings were recorded using a structured proforma. Data were analyzed using descriptive statistics.

**Results:** Most patients belonged to the 31–50-year age group, with a female predominance. Class I obesity was the most common BMI category. Acanthosis nigricans was observed in nearly two-thirds of patients, followed by skin tags, striae distensae, intertrigo, and fungal infections. Cutaneous manifestations were more frequent and severe with increasing BMI, and a substantial proportion of patients had associated metabolic comorbidities, particularly diabetes mellitus and hypertension.

**Conclusion:** Obesity is associated with a wide range of dermatological manifestations that may serve as visible markers of underlying metabolic dysfunction. Early identification of these cutaneous signs can facilitate timely diagnosis and comprehensive management of obese patients.

**Keywords:** Obesity; Dermatological manifestations; Body mass index; Metabolic syndrome.

### INTRODUCTION

Obesity is a chronic, multifactorial metabolic disorder characterized by excessive accumulation of adipose tissue that adversely affects health. It has emerged as a major public health challenge globally, with a rapidly rising prevalence in both developed and developing countries. According to the World Health Organization, obesity significantly increases the risk of non-communicable diseases such as type 2 diabetes mellitus, cardiovascular disease, hypertension, and certain malignancies.<sup>1</sup>

The skin, as an active endocrine and immunological organ, frequently reflects the systemic consequences of obesity. Excess adipose tissue contributes to a state of chronic low-grade inflammation, insulin resistance, altered adipokine secretion, and hormonal imbalance. These metabolic and hormonal changes, combined with mechanical factors such as skin folds and friction, predispose obese individuals to a variety of dermatological manifestations.<sup>2,3</sup>

Insulin resistance plays a central role in the pathogenesis of several obesity-related skin conditions. Hyperinsulinemia stimulates keratinocyte and dermal fibroblast proliferation through insulin-like growth factor receptors, leading to

characteristic skin changes such as acanthosis nigricans and acrochordons.<sup>4</sup> Additionally, increased androgen levels and altered immune responses contribute to conditions such as acne, hidradenitis suppurativa, and recurrent infections.<sup>5</sup>

Mechanical factors are equally important in obese individuals. Increased body mass leads to excessive skin folds, which create warm and moist environments favorable for maceration, inflammation, and microbial growth. Consequently, conditions such as intertrigo, fungal infections, and secondary bacterial infections are commonly encountered in this population. Striae distensae result from rapid stretching of the skin and altered collagen structure associated with weight gain.<sup>6</sup>

Several dermatological conditions associated with obesity may serve as visible markers of underlying metabolic abnormalities. Early recognition of these manifestations can prompt timely evaluation for insulin resistance, metabolic syndrome, and other obesity-related comorbidities.<sup>7</sup> Therefore, dermatological examination plays an important role in the holistic assessment of obese patients.

Despite the growing burden of obesity, data on the clinical spectrum of its dermatological manifestations in tertiary care settings remain limited, particularly in developing countries. Understanding the pattern and frequency of skin changes associated with obesity can aid clinicians in early diagnosis, patient counseling, and integrated management. In this context, the present study was undertaken to evaluate the dermatological manifestations of obesity among patients attending a tertiary care centre.

## **MATERIALS AND METHODS**

### **Study Design**

This was a **hospital-based cross-sectional clinical study** conducted to evaluate the spectrum of dermatological manifestations in obese patients attending a tertiary care centre.

### **Study Setting**

The study was carried out in the **Department of Dermatology, Venereology and Leprology** of a tertiary care teaching hospital that provides dermatological services to both urban and rural populations.

### **Study Duration**

The study was conducted over a period of **12 months**.

### **Study Population**

All patients attending the dermatology outpatient department during the study period who fulfilled the diagnostic criteria for obesity were screened for inclusion.

### **Sample Size**

A total of **150 obese patients** were included in the study based on feasibility and outpatient attendance during the study period.

### **Inclusion Criteria**

- Patients aged **18 years and above**
- Body Mass Index (**BMI  $\geq 30$  kg/m<sup>2</sup>**)
- Patients presenting with one or more dermatological manifestations
- Willingness to provide **written informed consent**

### **Exclusion Criteria**

- Pregnant and lactating women
- Patients with endocrine disorders causing secondary obesity
- Patients receiving long-term systemic corticosteroids or immunosuppressive therapy
- Patients with incomplete clinical data or unwilling to participate

### **Data Collection**

After obtaining informed consent, data were collected using a **structured and pre-designed proforma**. The following parameters were recorded:

- **Demographic details:** age, gender
- **Anthropometric measurements:** height, weight, and calculation of BMI
- **Duration of obesity**
- **Associated comorbidities:** diabetes mellitus, hypertension, dyslipidemia
- **Dermatological findings:** type, site, and number of skin manifestations

### Measurement of Body Mass Index

Body mass index was calculated using the formula:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Based on BMI, patients were categorized<sup>8</sup> as :

- **Class I obesity:** 30–34.9 kg/m<sup>2</sup>
- **Class II obesity:** 35–39.9 kg/m<sup>2</sup>
- **Class III obesity:** ≥40 kg/m<sup>2</sup>

### Clinical Examination

A complete **general physical and dermatological examination** was performed for all patients. Dermatological manifestations were diagnosed based on clinical morphology and distribution. Multiple skin conditions, if present in a single patient, were recorded separately. Relevant investigations were carried out when necessary to confirm the diagnosis.

### Laboratory Investigations

Routine laboratory investigations such as fasting blood glucose and lipid profile were reviewed when available, particularly in patients with suspected metabolic abnormalities. Microbiological or histopathological investigations were performed in selected cases when clinically indicated.

### Statistical Analysis

Data were entered into **Microsoft Excel** and analyzed by SPSS version 20 using descriptive statistical methods. Results were expressed as **frequencies and percentages** and presented in tables.

## RESULTS

A total of **150 obese patients** were included in the study. The results are presented under demographic profile, BMI distribution, dermatological manifestations, and associated comorbidities.

Obesity was most commonly observed in middle-aged adults, with a female predominance as shown in Table 1.

**Table 1: Age and Gender Distribution of Study Participants (n = 150)**

Age Group (years)	Male n (%)	Female n (%)	Total n (%)
18–30	14 (9.3)	18 (12.0)	32 (21.3)
31–50	30 (20.0)	46 (30.7)	76 (50.7)
>50	18 (12.0)	24 (16.0)	42 (28.0)
<b>Total</b>	<b>62 (41.3)</b>	<b>88 (58.7)</b>	<b>150 (100)</b>

Class I obesity constituted the largest proportion of patients attending the dermatology outpatient department.

**Table 2: Distribution of Patients According to BMI Category**

BMI Category (WHO)	Number (n)	Percentage (%)
Class I (30–34.9 kg/m <sup>2</sup> )	72	48.0
Class II (35–39.9 kg/m <sup>2</sup> )	48	32.0
Class III (≥40 kg/m <sup>2</sup> )	30	20.0
<b>Total</b>	<b>150</b>	<b>100</b>

Acanthosis nigricans was the most frequently observed dermatological manifestation among obese patients as shown in Table 3.

**Table 3: Dermatological Manifestations Observed in Obese Patients**

Dermatological Manifestation	Number (n)	Percentage (%)
Acanthosis nigricans	93	62.0
Skin tags (Acrochordons)	72	48.0
Striae distensae	54	36.0
Intertrigo	48	32.0

Dermatological Manifestation	Number (n)	Percentage (%)
Fungal infections	42	28.0
Acne	30	20.0
Hidradenitis suppurativa	18	12.0

Cutaneous markers of insulin resistance were commonly observed across all BMI categories, with higher frequency in severe obesity as shown in Table 4.

**Table 4: Distribution of Major Skin Manifestations According to BMI Category**

Manifestation	Class I n (%)	Class II n (%)	Class III n (%)
Acanthosis nigricans	36 (50.0)	33 (68.8)	24 (80.0)
Skin tags	30 (41.7)	24 (50.0)	18 (60.0)
Striae distensae	18 (25.0)	18 (37.5)	18 (60.0)
Intertrigo	16 (22.2)	16 (33.3)	16 (53.3)

Infective dermatoses were more commonly observed in areas of skin folds as shown in Table 5.

**Table 5: Distribution of Infective Dermatoses in Obese Patients**

Type of Infection	Number (n)	Percentage (%)
Fungal infections	42	28.0
Bacterial infections	18	12.0
Viral infections	10	6.7

A significant proportion of obese patients had associated metabolic comorbidities as shown in Table 6.

**Table 6: Associated Comorbidities in Study Participants**

Comorbidity	Number (n)	Percentage (%)
Diabetes mellitus	66	44.0
Hypertension	60	40.0
Dyslipidemia	48	32.0
Polycystic ovarian syndrome	22	14.7

## DISCUSSION

Obesity is increasingly recognized as a multisystem disorder with significant dermatological involvement. The present clinical study highlights the broad spectrum of cutaneous manifestations associated with obesity in patients attending a tertiary care centre, reflecting the combined effects of metabolic dysregulation, hormonal imbalance, chronic inflammation, and mechanical factors.

In this study, a **female predominance** was observed among obese patients. Similar findings have been reported in earlier studies, which may be attributed to hormonal influences, higher prevalence of obesity among women, and increased health-seeking behavior for dermatological and cosmetic concerns.<sup>9,10</sup> The majority of patients belonged to the **31–50-year age group**, which corresponds to the period when obesity-related metabolic disturbances and their cutaneous manifestations become clinically evident.

**Acanthosis nigricans was the most frequently observed dermatological manifestation**, occurring in nearly two-thirds of patients. This finding is consistent with previous studies that identify acanthosis nigricans as a key cutaneous marker of insulin resistance and hyperinsulinemia.<sup>11</sup> Increased insulin levels stimulate keratinocyte and dermal fibroblast proliferation through insulin-like growth factor receptors, resulting in the characteristic velvety hyperpigmentation seen predominantly in flexural areas.

**Skin tags (acrochordons)** were also commonly encountered in this study. Several authors have reported a strong association between skin tags, obesity, and metabolic syndrome.<sup>12</sup> Their frequent occurrence in obese individuals suggests that they may serve as visible markers of underlying metabolic abnormalities.

**Striae distensae** were observed in a significant proportion of patients, particularly those with higher BMI. Rapid weight gain leads to stretching of the skin with disruption of collagen and elastin fibers, resulting in striae formation. Similar observations have been documented in other clinical studies evaluating dermatological changes associated with obesity.<sup>13</sup> **Intertrigo and fungal infections** were commonly seen, especially in areas of skin folds. Obesity predisposes individuals to these conditions due to increased friction, moisture retention, impaired skin barrier function, and altered immune responses. Previous studies have consistently demonstrated a higher prevalence of infective dermatoses among obese patients.<sup>14</sup>

Although less frequent, the presence of **hidradenitis suppurativa** is clinically important. Obesity is a well-established risk factor for this condition, contributing to follicular occlusion and chronic inflammation. Weight reduction has been shown to improve disease severity and treatment outcomes in affected individuals.<sup>15</sup>

A substantial proportion of patients in the present study had associated **metabolic comorbidities** such as diabetes mellitus, hypertension, and dyslipidemia. This observation reinforces the close relationship between obesity, metabolic syndrome, and dermatological manifestations. The skin often serves as an external indicator of internal metabolic dysfunction, enabling early detection and comprehensive management.<sup>16</sup>

Overall, the findings of this study are comparable with earlier Indian and international reports and emphasize the importance of thorough dermatological evaluation in obese patients. Recognition of obesity-related skin manifestations can aid in early diagnosis of systemic comorbidities and facilitate a multidisciplinary approach to patient care.<sup>17</sup>

## CONCLUSION

Obesity is associated with a variety of dermatological manifestations resulting from metabolic, hormonal, and mechanical factors. Acanthosis nigricans and skin tags were the most common cutaneous findings, serving as important clinical indicators of insulin resistance. Infective and inflammatory dermatoses were frequently observed in areas of skin folds. Early recognition of these skin changes can aid in timely detection of metabolic comorbidities and improve overall patient management.

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