

## Obesity and Skin: Overview of the Moroccan Experience

Rachadi Z<sup>1\*</sup>, Sebbani M<sup>2</sup>, Rafi S<sup>3</sup>, Elansari N<sup>3</sup>, Amine M<sup>2</sup>, Hocar O<sup>1</sup>, Amal S<sup>1</sup><sup>1</sup>Department of Dermatology, Mohamed VI Medical University Hospital, FMPM – UCA, Marrakech- Morocco<sup>2</sup>Department of Public Health and Epidemiology, PCIM Laboratory, Mohamed VI Medical University Hospital, FMPM – UCA, Marrakech- Morocco<sup>3</sup>Department of Endocrinology, Mohamed VI Medical University Hospital, FMPM – UCA, Marrakech- MoroccoDOI: [10.36347/sjams.2020.v08i02.007](https://doi.org/10.36347/sjams.2020.v08i02.007)

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\*Corresponding author: Zineb Rachadi

## Abstract

## Original Research Article

**Background:** Obesity is one of the world's biggest health problems nowadays. However, the impact of obesity on the skin has received minimal attention. **Objective:** To study the prevalence of skin manifestations in obese patients and also the correlation between severity of cutaneous involvement and the degree of obesity. **Methods:** We performed a case series, descriptive study, among 115 obese patients (BMI  $\geq 30$  kg / m<sup>2</sup>). All participants had benefited from a complete dermatological examination. A biological assessment for a metabolic syndrome was performed. The data analysis was performed using Fisher exact test, p-value and OR. **Results:** Common dermatoses seen in obese patients were acanthosis nigricans, striae, acrochordons, and various infections. They were correlated with the degree of obesity. **Conclusion:** Our work confirms the link between the severity of obesity and the prevalence of certain dermatological pathologies. Early recognition of these lesions may also warn patients of a need for weight loss.

**Keywords:** Obesity, skin, acanthosis nigricans, striae, Morocco.

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## INTRODUCTION

Obesity is now considered as a major public health problem. The prevalence of obesity has increased over the past 30 years [1], leading to an alarming increase in skin diseases. In Morocco, according to the high commission of the plan, in 2016, 10 million Moroccans are overweight, including 3.6 million morbidly obese [2].

The effects of obesity are a result of two factors: greater adipose tissue mass and the secretion of various peptides from enlarged fat cells [3]. The products released from enlarged fat cells include peptide hormones, cytokines, and paracrine transmitters, which may lead to various disorders such as hyperinsulinemia, androgen excess, inflammation, and endothelial dysfunction [3]. In this way, obesity can alter skin physiology, leading to changes in the skin barrier, sweat glands, collagen structure, and wound healing, as well as alterations in inflammation and sebum production [4-8].

Despite various studies have been done internationally suggesting links between obesity and cutaneous disorders, no data are available from Morocco. The aim of the present study was to find out the prevalence of skin manifestations in obese patients

and also the correlation between severity of cutaneous involvement and the degree of obesity.

## METHODS

The study was conducted in the Departments of Endocrinology and Dermatology, Mohamed VI Medical University Hospital, Marrakech- Morocco from May 2016 to May 2018.

The sample of 115 obese (BMI  $\geq 30$  kg/m<sup>2</sup>) was included in the study. Obese group was divided into three Body Mass Index (BMI) classes: class I (BMI 30-34.9 kg/m<sup>2</sup>), class II (BMI 35-39.9 kg/m<sup>2</sup>) and class III (BMI  $\geq 40$  kg/m<sup>2</sup>).

The clinical evaluation included detailed history, cutaneous and systemic examination. The Clinical parameters included weight, height, blood pressure, and waist circumference. For evaluation of underlying metabolic syndrome, certain lab investigations were carried out. This included fasting glucose, total cholesterol, and HDL and triglycerides levels. In patients with abnormal nails or skin lesions suggestive of superficial fungal infections, we performed fungal scraping and culture. Fungal smears were carried out to rule out tinea pedis as a cause of plantar hyperkeratosis.

## STATISTICAL ANALYSIS

All the data were entered in a pre-designed proforma. The analysis was descriptive at first, and comparative at the second time. The qualitative variables were compared using the Fisher's exact test (frequencies of dermatoses among the three BMI groups of obese subjects), Odds Ratio (OR) were presented. A  $p < 0,05$  was considered significant.

## RESULTS

The study population consisted of 115 obese patients. 100 females (87%) and 15 male (13%). The mean of age was 38,33 y [8-68 years], the mean of was 40,67 [30-63 kg/m<sup>2</sup>]. Obesity groups were distributed as follows : Class I : 22 patients, class II : 39 patients,

class III : 54 patients. Systemic diseases in obese patient are presented in the Figure1. All co-morbid conditions like hypertension, diabetes, cardiopathy, and metabolic syndrome increase significantly with the degree of obesity.

The prevalence of dermatoses according to obesity grade are shown in Table 1, and the strength of association and statistical significance between dermatoses and the severity of obesity are shown in Table 2. The dermatoses that showed a significant association with obesity were acanthosis nigricans, chronic venous insufficiency, and various infectious especially onychomycoses and intertrigo. However, diabetes were more associated with acanthosis nigricans and onychomycosis.

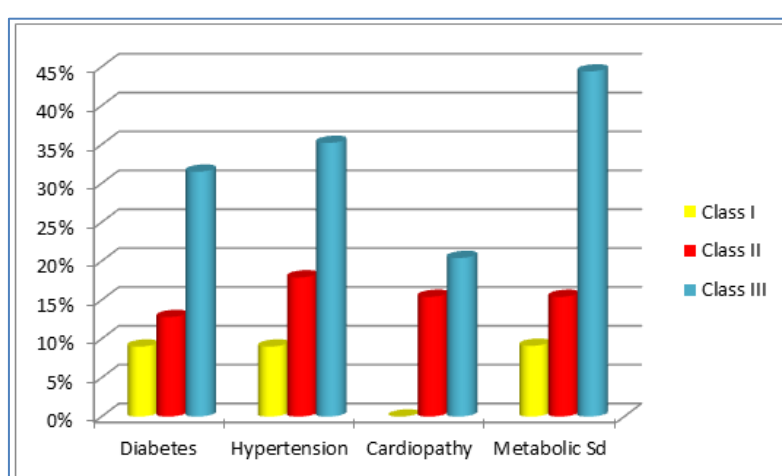


Fig-1: Prevalence of co-morbid conditions correlating with the degree of obesity

Table-1: Prevalence of dermatoses according to obesity grade

Dermatoses	Class I (N = 22)	Class II (N = 39)	Class III (N = 54)	p-value
	%	%	%	
Acanthosis nigricans	-	23	64,8	<0,001
Chronic venous insufficiency	27,3	46,2	75,9	NA*
Lymphedema	4,5	12,8	22,2	<0,001
Striae	63,6	79,5	96,3	0,001
Acrochordons	22,7	51,3	77,8	<0,001
Folliculitis	31,8	41	53,7	0,179
Boil	18,2	10,3	31,5	NA*
Erysipelas	9,1	7,7	14,8	NA*
Intertrigo	36,4	51,3	83,3	<0,001
Onychomycoses	18,2	23,1	55,6	0,001
Plantar hyperkeratosis	13,63	25,64	66	<0,001

\*NA : Not Applied

**Table-2: Strenght of association and statical significance between dermatoses and obesity grade**

Dermatoses	Class I + II (N = 61 )	Class III (N = 54 )	OR*	p-value**
	%	%		
Acanthosis nigricans	14,8	64,8	0,094	<0,001
chronic venous insufficiency	39,3	63,1	0,206	<0,001
Lymphedema	9,8	22,2	0,382	0,068
Plantar hyperkeratosis	18	68,5	0,101	<0,001
Striae	73,8	96,3	0,108	0,001
Acrochordons	41	77,8	0,198	<0,001
erysipelas	8,2	14,8	0,513	0,263
Intertrigo	45,9	83,3	0,170	<0,001
Onicomycoses	21,3	55,6	0,217	<0,001
*OR = Odds Ratio				
** Significance obtained by Fisher's exact test				

## DISCUSSION

Adipose tissue is a unique multifunctional organ serving not only as a simple storage of excess energy, but also as connective tissue, a metabolic organ, endocrine organ, and source of stem cells. Obesity represents adipocyte hypertrophy or hyperplasia, and it has been considered a serious worldwide pandemic [9]. Obesity is responsible for changes in skin barrier function, sebaceous glands and sebum production, sweat glands, lymphatics, collagen structure and function, wound healing, microcirculation and macrocirculation, and subcutaneous fat [10].

The results from this study showed that obesity is associated with a large number of dermatological diseases. Striae were the most prevalent dermatosis in obese patients, seen in 84 % obese population in our study. Also it was correlated with the increase in the degree of obesity ( $p = 0,001$ ). This may be related to excessive tension on the skin caused by excessive weight [11].

Acanthosis nigricans (AN) was observed in 38 % of patients. Besides obesity, certain other comorbid conditions like endocrine disorders, diabetes, hyperinsulinemia and metabolic syndrome are also associated with acanthosis nigricans [12]. Hud *et al.* [13] noted that acanthosis nigricans was observed in fully 74% of patients with obesity correlating positively with obesity severity.

The link between obesity and skin infections is recognized in the literature [14]. Obesity increases the incidence of cutaneous infections, including candidiasis, intertrigo, folliculitis, furunculosis, erythrasma, tinea cruris, and folliculitis. Less common infections include erysipelas, cellulitis, necrotizing fasciitis, and gas gangrene. Although none of the following infectious complications are specific to obesity. Previous studies [15] have documented increased incidence within this population and clinical relevance. Changes in the skin barrier function, as well as alterations in the vascular microcirculation and the

immune system, have been proposed as possible explanations altering host–organism dynamics and leading to fungal and bacterial infections in overweight or obese individuals [16]. 67% of patients had skin infections in the present study. Of these, 37 % had onychomycosis, 45 % had intertrigo and 25% had bacterial infections. A heightened awareness of these infections could lead to earlier diagnosis and treatment in an at-risk population [10].

Our study also found the greater prevalence of chronic venous insufficiency (CVD) in this population, and showed a statical signification with the severity of obesity (OR = 0,206;  $p$ -value <0,001) Obesity has been supposed to be one of the main risk factors for Venous Insufficiency. Several studies have related CVD to obesity, and although many of them have shown a strong positive association, there still remains the question as to its role as a primary cause or as an aggravating factor in venous reflux. It has been observed that the CVD is more severe in obese patients, who frequently present more ulcers; these findings are consistent with the hypothesis that obesity worsens the clinical manifestations of CVD instead of starting it [17-19].

There is strong evidence for the role of obesity in cancer risk [20]. However, limited information is available on the potential link between obesity and either melanoma or non-melanoma skin cancers. In terms of the pathophysiological link between obesity and skin cancer, there is evidence that obesity-induced inflammation interacts with inflammation resulting from UV radiation to induce a state favorable to carcinogenesis. S. Pothiwala and al [21] have found in their prospective cohort that a BMI of 30 or greater is associated with a significantly lower risk of squamous cell carcinoma (SCC) and basal cell carcinoma (BCC) compared with a BMI in the range of 18.5–24.9. Overall, we did not find any strong association between BMI and the risk of melanoma.

Skin care in obese patients deserves special attention, not only because such patients have diseases that are susceptible to treatment, but also due to higher morbidity in this population [22]. Dermatoses as acrochordons and pseudoacanthosis nigricans are related to endocrine disorders and should be investigated [23]. Attention needs to be paid to the increased risk of skin infections and lymphedema in the obese patients. Dermatologists need to be aware of the skin diseases related to obesity and their impact on the patient's life.

## CONCLUSION

Our work confirms the link between the severity of obesity and the prevalence of certain dermatological pathologies, which is consistent with the results of the series of the literature. An understanding and a thorough knowledge of these skin disorders are necessary for dermatologists, because several dermatoses are treatable, thus improving the quality of life of the patient.

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