



A CLINICAL STUDY ON CUTANEOUS MANIFESTATIONS OF OBESITY AMONG PATIENTS ATTENDING TERTIARY CARE HOSPITAL

Dermatology

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ABSTRACT

Background: Obesity is one of the major public health problem leading to a wide range of metabolic, cutaneous, cardiovascular and musculoskeletal disorders. Knowledge about the various cutaneous manifestations of obesity is important as they can be prevented and treated. **Objectives:** To study the various cutaneous manifestations of obesity and correlate the cutaneous manifestations of obesity with Body mass index(BMI). **Materials and methods:** A descriptive cross-sectional was conducted in the dermatology outpatient department of a tertiary care hospital. Demographic details, history, physical and cutaneous examination findings were recorded in a pre-set proforma. The study was approved by Institutional Review Board. **Results:** Out of 200 patients included in the study, 64(32%) were males and 136(68%) were females. Most of the patients belonged to 31-40years age group(39%) and class-1 obesity(46%) whereas least number of patients were seen in >60years of age(4.5%) and class-3 obesity(12%). Acanthosis nigricans(64.5%) was the most common cutaneous manifestation followed by acrochordons(58%), striae distensae(49.5%), frictional hyperpigmentation(33.5%) and fungal infections(26%). All these conditions correlated with the BMI. **Conclusion:** This study highlights the various cutaneous changes seen in obesity. These manifestations not only affect quality of life but also serve as markers for metabolic and systemic disorders. Early recognition and management improves the patient outcome.

KEYWORDS

Obesity; Body mass index

INTRODUCTION

Obesity is a major epidemic of the 21st century caused due to accumulation of excess adipose tissue in the body to an extent that impairs both physical and psychosocial health and wellbeing. In both developed and developing countries, there is an alarming increase in obesity.¹ Obesity has multiple effects on nearly every system of the body, which has lead to increase in morbidity and mortality.²

Obesity is due to imbalance between energy intake and energy expenditure.³ Various factors, such as diet, physical activity, genetics, drugs, and the environment contribute to the causation. Obesity has role in the pathogenesis of cardiovascular, metabolic, musculoskeletal, carcinogenic and cutaneous diseases.⁴

Obesity is implicated in a wide spectrum of dermatologic diseases which affects the barrier function of skin, sweat glands, sebaceous glands, lymphatics, collagen structure and function, wound healing, micro/macrocirculation and subcutaneous fat. The most common skin manifestations associated with obesity are listed in Table 1.^{5,6}

The skin care of obese patients needs special attention, as they not only affect the quality of life but also serve as markers for metabolic and systemic disorders. Hence, this study was conducted to know the various cutaneous manifestations of obesity and their correlation with Body Mass Index(BMI).

Objectives

1. To study the various cutaneous manifestations of obesity
2. To correlate the cutaneous manifestations of obesity with Body mass index(BMI)

MATERIALS AND METHODS

Study Design: Descriptive cross-sectional study

Study Period: September 2023 to February 2024 (6 months)

Study Place: Outpatient department of Dermatology, Venereology and Leprosy at Chigateri General Hospital and Bapuji Hospital, attached to J.J.M. Medical College, Davangere.

Ethical Considerations: Approval from Institutional Ethics Committee was obtained, before starting the study.

Sample Size: Formula used for sample size calculation,

$$n = \frac{Z^2 p q}{d^2} \quad \text{where,}$$

Z α : Standard normal deviation equal to 1.96 at 5% level of significance

with 95% confidence level.

p: prevalence of obesity=11.8%

q = 100-p = 88.2 %

d = allowable error = 5%

Power of the study(1- β)=80%

Sample size, n = 160

Considering the non-response rate as 10%, the minimum sample size is 176.

Table 1: Cutaneous manifestations associated with obesity

Insulin resistance	Mechanical disorders	Infections	Inflammatory skin diseases	Metabolic abnormalities
Acanthosis nigricans Acrochordons Keratosis pilaris Hirsutism Acne vulgaris	Striae distensae Plantar hyperkeratosis Cellulite Adiposis dolorosa Lymphedema and stasis dermatitis Chronic venous insufficiency Ulcers(decubitus ulcers and other wounds)	Bacterial: Folliculitis/furuncle Fungal: Candidiasis/dermatophytosis Mixed infection: Intertrigo	Hidradenitis suppurativa Psoriasis Lichen planus Seborrheic dermatitis Atopic dermatitis	Xanthoma Xanthelasma

A total of 200 patients meeting the inclusion and exclusion criteria were included in the study.

Inclusion Criteria:

- Patients with age >18yrs, having BMI > 30kg/m²
- Patients who give consent to participate in the study

Exclusion Criteria:

- Pregnant and lactating women
- Patients on systemic steroid therapy
- Patients who do not give consent to participate in the study

After obtaining informed consent, a descriptive cross-sectional study was conducted at the outpatient department of Dermatology, Venereology and Leprosy at Chigateri General Hospital and Bapuji Hospital, attached to J.J.M. Medical College, Davangere, from September 2023 to February 2024. A detailed history was taken and complete systemic and dermatological examination was carried out in all patients. Height, weight, BMI, blood pressure were recorded. Laboratory investigations like complete blood count, blood sugar, lipid profile, blood urea, serum creatinine, liver function tests, KOH

mount, pus for culture and sensitivity were carried out wherever necessary.

BMI was calculated as weight in kilograms divided by the square of height in metres and patients were classified according to WHO (Table 2).^{7,8}

Table 2: Classification of obesity according to World Health Organisation

Classification	BMI (kg/m ³)
Underweight	<18.50
Normal	18.50 – 24.99
Overweight	>25
Preobese	25 – 29.99
Class 1 obesity	30 – 34.99
Class 2 obesity	35 – 39.99
Class 3/ morbid obesity	>40

Statistical Analysis: The data collected was entered into Microsoft excel sheet and was analysed using SPSS version 25.0. Categorical variables were expressed as frequencies, percentages and quantitative variables as mean±SD. Chi-square test and Fischer exact tests were used to test the significant association between study parameters. P<0.05 was considered as statistically significant.

RESULTS

A total of 200 patients were included in the study. There were 64 (32%) males and 136 (68%) females with male to female ratio of 1:2. Most of them 78(39%), belonged to 31-40years age group. Least number of patients 9(4.5%), were seen in >60years age group. Majority of them belonged to class-1 obesity i.e. 92(46%), followed by class-2 and class-3 obesity with 84(42%) and 24(12%) patients respectively. Most common co-morbid condition associated with obesity was diabetes mellitus(40.5%)(Table 3).



Fig 1: Acanthosis nigricans with acrochordon

Table 3: Demographic data

	Frequency (n=200)	Percentage (%)
Gender		
Male	64	32
Female	136	68
Age group(years)		
18-30	48	24
31-40	78	39
41-50	42	21
51-60	23	11.5
>60	9	4.5
Obesity class(kg/m²)		
Class 1	92	46
Class 2	84	42
Class 3	24	12
Associated co-morbidities		
Diabetes mellitus	81	40.5
Hypertension	45	22.5

Acanthosis nigricans (64.5%) is the most common cutaneous manifestation found among obese patients followed by acrochordons (58%), striae distensae (49.5%), frictional hyperpigmentation (33.5%) and fungal infection(26%). These conditions increased in severity as the BMI increased. Other conditions which showed direct correlation with the severity of obesity were intertrigo, hirsutism, acne vulgaris

and chronic venous insufficiency. Conditions like keratosis pilaris, bacterial infections, plantar hyperkeratosis, hidradenitis suppurativa, psoriasis, seborrheic dermatitis, lichen planus, xanthelasma did not show significant correlation with BMI (Table 4).



Fig 2: Acrochordon



Fig 3: Psoriasis

Table 4: Cutaneous manifestations of obesity and their relation to body mass index

Cutaneous manifestations	Total (n=200)	Male (n=64)	Female (n=136)	Class-1 obesity (n=92)	Class-2 obesity (n=84)	Class-3 obesity (n=24)
Acanthosis nigricans	129(64.5%)	38(59.3%)	91(66.9%)	55(59.7%)	54(64.2%)	20(83.3%)
Acrochordon	116(58%)	30(46.8%)	86(63%)	51(55.4%)	47(55.9%)	18(75%)
Keratosis pilaris	10(5%)	3(4.6%)	7(5%)	6(6.5%)	3(3.5%)	1(4%)
Hirsutism	24(12%)	0(0%)	24(17.6%)	7(7.6%)	13(15.4%)	4(16.6%)
Acne vulgaris	31(15.5%)	10(15.6%)	21(15.4%)	13(14%)	12(14%)	6(25%)
Striae distensae	99(49.5%)	36(56%)	63(46.3%)	34(36.9%)	41(48.8%)	24(100%)
Plantar hyperkeratosis	18(9%)	9(14%)	9(6.6%)	5(5.4%)	6(7%)	7(29%)
Chronic venous insufficiency	30(15%)	13(20.3%)	17(12.5%)	8(8.6%)	10(11.9%)	12(50%)
Bacterial: Folliculitis/furuncle	24(12%)	11(17%)	13(9.5%)	14(15%)	8(9.5%)	2(8.3%)
Fungal: Candidiasis/dermatophytosis	52(26%)	31(48.4%)	21(15.4%)	24(26%)	18(21.4%)	10(41.6%)
Mixed infection: Intertrigo	36(18%)	14(21.8%)	22(16%)	14(15%)	16(19%)	6(25%)
Hidradenitis suppurativa	3(1.5%)	2(3%)	1(0.7%)	1(1%)	2(2.3%)	0(0%)
Psoriasis	12(6%)	5(7.8%)	7(5%)	5(5.4%)	6(7%)	1(4%)
Seborrheic dermatitis	32(16%)	14(21.8%)	17(12.5%)	15(16.3%)	11(13%)	6(25%)
Lichen planus	7(3.5%)	4(6%)	3(2%)	3(3%)	4(4.7%)	0(0%)
Xanthelasma	38(19%)	13(20.3%)	25(18.3%)	13(14%)	20(23.8%)	5(20.8%)

Frictional hyperpigmentation	67(33.5%)	26(40.6%)	41(30%)	25(27%)	26(30.9%)	16(66.6%)
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DISCUSSION

Obesity is a global public health issue, affecting millions of individuals and contributing to a wide range of medical conditions. Beyond its well-known associations with metabolic, cardiovascular, and musculoskeletal disorders, obesity also has significant effects on the skin. Cutaneous manifestations in obese individuals can serve as early indicators of underlying systemic conditions and can severely impact quality of life.

In our study, majority(39%) of the obese patients belonged to 31-40years age group. Boza et al.⁹ study showed increased incidence of obesity in 40-49years age group. This difference may be attributed to the changing lifestyle and diet. Sex ratio in our study is similar to study by Kalra et al.¹⁰ The distribution of patients across different obesity classes was consistent with the findings of Al-Mutairi's study, with majority of cases falling within class-1 and class-2 obesity.¹¹ Most common co-morbidity in our study was diabetes mellitus which is similar to a study by Khan et al.¹²

In our study, various cutaneous manifestations like acanthosis nigricans, acrochordons, striae distensae, frictional hyperpigmentation, fungal infections, intertrigo, hirsutism, acne vulgaris and chronic venous insufficiency significantly correlated with BMI. A significant association between obesity and skin conditions, such as acanthosis nigricans, keratosis pilaris, striae distensae, bacterial infections and their correlation with BMI were demonstrated in. Hud et al., Katz et al., and Burke et al. studies.^{13,14,15}

Acanthosis nigricans(64.5%) was the most common cutaneous manifestation of obesity in our study, that was significantly more in females(66.9%). It was significantly associated with class-3 obesity(83.3%). Boza et al. reported the association of obesity and acanthosis nigricans.⁹ Hyperinsulinemia increases circulating insulin-like growth factor(IGF) receptors, which is responsible for keratinocyte and dermal fibroblast proliferation in acanthosis nigricans.¹⁶

Acrochordons were seen in 58% in our study. The frequency was more in females and significant correlation with BMI was present. This is similar to Ahsan et al. and Boza et al. studies.^{17,19} Usually acrochordons are seen in association with acanthosis nigricans.¹⁸

Striae distensae was seen in 49.5% of cases in our study and were significantly associated with class-3 obesity(100%). Striae was common in males(56%). Ahsan et al. and Boza et al. demonstrated association between striae and grades of obesity.^{17,19} Mechanical, hormonal and genetic factors are involved in the pathogenesis. Striae results from dermal connective tissue damage followed by alignment of new collagen in response to local stress forces.¹⁹ Simkin and Arce found high levels of urinary adrenocorticosteroids in obese patients with striae as compared to obese patients without striae.²⁰

Factors like friction, moisture predispose obese individuals to infections. Among infections(36%), fungal infections were commonest(26%), followed by bacterial infections(12%). Intertrigo was seen in 18% cases. This is similar to study by Ahsan et al. fungal infections correlated with BMI in contrast to the study by Ahsan et al.¹⁷ This shows that frequency of infections are influenced by class of obesity.

Frictional hyperpigmentation is due to increase skin folds in obesity. It accounted to 33.5% in our study.²¹ Plantar hyperkeratosis is regarded as a physiological response to mechanical trauma.²² It was seen in 9% cases. Ahsan et al. reported a frequency of 16% in their study.¹⁷ Dermatological manifestations of hyperandrogenism i.e., acne and hirsutism were found in 15.5% and 12% of the total study population. Hyperandrogenism in obesity is due to adipose tissue, which converts testosterone to its active form dihydrotestosterone, and hyperinsulinemia. Keratosis pilaris was present in 5% patients which is lesser compared to that of earlier studies(21.15%).²³ An excess formation and/or buildup of keratin around individual hair follicles traps the growing hairs because of which hair is unable to reach the surface leading to individual follicular bumps.²⁴ Psoriasis was seen in 6% of patients in our study as compared to 10% in study by Ahsan et

al.¹⁷ The increased incidence and severity of psoriasis seen in obese individuals in this study is supported by studies done by Fleming et al. and Ganguly et al.^{25,26} Seborrheic dermatitis was seen in 16% cases. Adipocyte elaboration of proinflammatory cytokines may exacerbate these conditions.

CONCLUSION

In conclusion, the study of cutaneous manifestations in obese patients highlights the significant impact of obesity on skin health. These manifestations not only affect quality of life but also serve as markers for metabolic and systemic disorders, such as diabetes and cardiovascular diseases. Early recognition and management of these skin conditions, alongside weight management strategies, are essential in improving patient outcomes.

Limitations

The primary limitation of the study is that it was conducted over a relatively short period. Additionally, the study population was hospital based, so generalizing the findings to broader population might be difficult.

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