Original Article

A Prospective Study Of Cutaneous Manifestations Of Obesity

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Abstract

BACKGROUND: In recent times obesity is considered a major health hazard with increasing prevalence. Age of onset of obesity, duration, and associated system conditions have a significant role in the cutaneous manifestations of obesity.

METHOD:A prospective study was conducted for 1 year. Patients above 18 years and below 70 years of age attending dermatology OPD at a tertiary care center in Kanchipuram whose body mass index (BMI) >30 kg/m2 were included in the study.After taking informed consent, basic details of about 100 obese patients, past treatment history, height, and weight were noted. Detailed dermatological examination was done and the observations were recorded.

RESULTS:The majority of the patients (72%) had Class I obesity (BMI of 30.00-34.99) while 19% had Class II obesity (BMI of 35.00-39.99), and 9% had Class III obesity (BMI of ≥ 40.00). Obesity was found to be more common in the female population.Acanthosis nigricans was the commonest cutaneous finding among all the age groups followed by skin tags. Infections were more common among the older age group whereas acne and hirsutism were more common among the younger age group.

CONCLUSION: A lot of cutaneous manifestations have been associated with obesity ranging from infections to metabolic conditions. Identifying these manifestations at an early stage, promoting lifestyle modifications for weight reduction and aesthetic treatment for the skin condition helps in a better outcome.

KEYWORDS: Acanthosis nigricans, Acrochordons, Body Mass Index, Infections, Overweight

INTRODUCTION:

Obesity is increasingly being recognized as an epidemic in many countries in recent years but the impact of obesity on the skin has received very minimal attention. Obesity can be defined as an abnormal accumulation of body fat that impairs quality of life thus increasing the risk of morbidity and prematuremortality. [1] Increased energy intake or decreased energy expenditure or a combination of both can result in obesity. [2]

According to the ICMR-INDIAB study, about 11.8% to 31.3% and 16.9%-36.3% of the population in India suffer from obesity and central obesity respectively. Age, gender, socio-economic status, geographical environment, etc. play an important role in the development of obesity. [3]

In the skin, obesity is known to cause a wide variety of manifestations such as acanthosis nigricans, acrochordons, keratosis pilaris, hirsutism, acne, striae distensae, chronic venous insufficiency, infections,psoriasis, horseshoe-

shaped plantar hyperkeratosis, hidradenitis suppurativa, corn foot, xanthoma, lichen planus, cellulite, adiposis dolorosa, tophaceous gout, seborrheic dermatitis, androgenic alopecia, stasis dermatitis, callus, delayed wound healing, keloids, scleredema, pilonidal sinus, miliaria and decubitus ulcer[4].All these manifestations can be attributed to alterations in the barrier functions of the skin, sebaceous and sweat gland hyperactivity, and lymphatic dysfunction. The excessive fat deposition also impairs the structure and functions of collagen fibers, affects wound healing, and interferes with micro and macrocirculation.

AIM OF THE STUDY:

To determine the various cutaneous manifestations in obese patients in different age groups based on body mass index (BMI).

OBJECTIVE:

- To study the clinical presentation of various dermatoses associated with obesity.
- Early diagnosis of the associated systemic diseases.

MATERIALS AND METHODS:

A prospective study was conducted for 1 year in which the patients above 18 years of age attending dermatology OPD at a tertiary care center in Kanchipuram whose body mass index (BMI) >30 kg/m^2 were included. All patients below 18 years and above 70 years of age, pregnant and lactating women, severely ill and immuno-compromised patients were excluded. After taking informed consent basic details of the patient, past history, and treatment history were noted. Height and weight were measured and BMI was calculated based on which obesity grades were determined. A complete dermatological examination was performed. All necessary and relevant investigations were done. Data were cleaned and those with missing values were removed before statistical tests were carried out. Statistical analysis was done using the SPSS 21 statistical software package (IBM Inc., Armonk, USA). Results were presented as percentages for qualitative data. A chi-square test was used for comparing qualitative variables between groups. A probability value of less than or equal to 0.05 was considered statistically significant. This study was conducted after gettingclearance from our institutionalethical committee.

RESULTS:

A total of 100 cases were studied, of which 62 were female and 38 were male. Of the total patients, 40% belonged to the 41-50 years age group, 30% in the 51-60 years age group, 15% belonged to the 31-40 years, 9% belonged to 61-70 years age group, and 6% belonged to the 18-30 years age group. Mean age in our study was 48.03 ± 9.858 (S.D)

As per WHO, a body mass index (BMI) of 18.5–24.9 kg/m^2 is considered normal, BMI 25–29.9 kg/m^2 is taken as overweight, and BMI >30 kg/m^2 is considered as obese. Obesity can further be classified based on BMI as Class I (30–34.9 kg/m^2), Class II (35–39.9 kg/m^2), and Class III (>40 kg/m^2).[5]

The majority of the patients (72%) had Class I obesity (BMI of 30.00-34.99) while 19% had Class II obesity (BMI of 35.00-39.99), and 9% had Class III obesity (BMI of ≥ 40.00).

About 90% of the people in the study had a sedentary lifestyle, 5% did light work, 3% did medium work and 2% of the people were doing heavy work.

Out of 62 females, 45 belonged to class I obesity,12 belonged to class II and 5 belonged to class III obesity (Table 1). In the case of males, 27 belonged to class I obesity,7 belonged to class II obesity and 4 belonged to class III obesity (Table 2).

A wide variety of cutaneous manifestations were seen in our study. It includes acanthosis nigricans, infections- bacterial and fungal, acrochordons, intertrigo, acne, hirsutism, striae, plantar hyperkeratosis,keratosis

pilaris, psoriasis, and venous stasis (Table 3).The distribution of cutaneous manifestations varied withBMI, age and the associated comorbidities in these individuals

Acanthosis nigricans (Figure 1) was the commonest skin finding among all the age groups followed by skin tags (Figure 2). Acne and hirsutism were more common in the younger age group whereas infections, plantar hyperkeratosis, psoriasis (Figure 3), and venous stasis (Figure 4) were more common in the older age group.

About 20 patients had a family history of obesity while 41 patients had associated systemic diseases (hypertension in 12, diabetes in 23, and diabetes with hypertension in 6 patients). In patients with systemic diseases, acanthosis nigricans and infections were the most common skin manifestations (Table 4).

FIGURES:

Figure 1: Acanthosis nigricans seen as thick, velvety hyperpigmentation over the neck

Figure 2: Acrochordons (skin tags) over the medial aspect of the right arm

Figure 3: A psoriatic plaque over the lumbosacral region of an obese woman

Figure 4: Venous stasis ulcer over the medial aspect of the ankle in an obese woman

TABLES:

GRADE OF OBESITY	PERCENTAGE OF FEMALES
CLASS I	**45 (72.5%)**
CLASS II	**12 (19.3%)**
CLASS III	**5 (8.2%)**

Table I: Percentage of females belonging to different grades of obesity

GRADE OF OBESITY	PERCENTAGE OF MALES
CLASS I	**27 (71.1 %)**
CLASS II	**7 (18.4%)**
CLASS III	**4 (10.5%)**

Table 2: Percentage of males belonging to different grades of obesity

S.NO	DERMATOSES	PERCENTAGE
1	**Acanthosis nigricans**	**53%**
2	**Skin tag**	**42%**
3	**Infections**	**39%**
4	**Striae**	**20%**

5	**Hirsutism**	**15%**
6	**Psoriasis**	**10%**
7	**Lichen planus**	**9%**
8	**Corn foot**	**7%**
9	**Acne**	**6%**
10	**Venous stasis**	**5%**
11	**Keloid**	**5%**
12	**Keratosis pilaris**	**3%**
13	**Hidradenitis suppurativa**	**3%**
14	**Plantar hyperkeratosis**	**1%**

Table 3: Overall percentage of dermatoses recorded in our study

ASSOCIATED SYSTEMIC DISEASE	ACANTHOSIS NIGRICANS	INFECTIONS	BOTH
DIABETES	12	4	2
HYPERTENSION	5	2	2
BOTH DIABETES & HYPERTENSION	2	1	1

Table 4: Frequency of acanthosis nigricans and infections in patients with associated systemic diseases

DISCUSSION:

Obesity poses to be a major health hazard that has a propensity to damage several organs in our body including the skin. Environmental factors; endocrine factors; genetic factors such as expression of melanocortin 4 receptor (MC4r) and brain-derived neurotrophic factor (BDNF) genes play an important role in the pathogenesis of obesity and its cutaneous manifestations.

Apart from cutaneous manifestations, obesity has also been strongly associated with other systemic conditions such as coronary heart disease, type II diabetes mellitus, hypertension, hyperlipidemia, atherosclerosis, osteoarthritis, polycystic ovarian syndrome, and obstructive sleep apnea. It also has an indirect association with anxiety, impaired social interaction, and depression. Increased risk of endometrial, breast, and colon cancer; gallbladder disease; pancreatitis, diverticulitis; infertility; urinary incontinence, and idiopathic intracranial hypertension has also been recognized in people with obesity.[6]

It has been proved that about 60% to 70% of the variance in BMI can be attributed to the environment and 30% to 40% of the variance in BMI can be attributed to genetics.[7]Inexpensive and abundant availability of high-calorie food along with advanced technology both at home and in the workplace has resulted in a drastic decrease in the physical activity of individuals. The interaction between environment and genetic factors plays an important role as the individuals may be genetically predisposed to become obese, but the obesity genotype may only be expressed under exposure to certain environmental conditions.

In our study, we observed that obesity and associated cutaneous manifestations were more common in women (62%) than in men which correlated with the studies done by Flegal et al. [8] This can be due to hormonal factors, lack of exercise, and reduced self-care especially post-childbirth.

About 53% of patients in our study had acanthosis nigricans (AN). Similar to the studies carried out by Hud et al [9] in our study also there was a significant association of AN with diabetes mellitus which was found

out using the chi-square test of independence where the p-value was found out to be .003. This association can be attributed to the increased prevalence of sedentary lifestyle, junk eating, and the evolving socio-economic status of our population. An increase in circulating levels of insulin and decreased sensitivity of insulin receptors in obese patients lead to stimulation of insulin-like growth factor receptors on keratinocytes and fibroblasts that result in acanthosis nigricans and acrochordons (42%) which were two major cutaneous manifestations observed in our study.[4]

Keratosis pilaris was present in only 3 % of the patients in our study. The occurrence of keratosis pilaris can also be attributed to insulin resistance. [10] Acne (6%) was found to be more common among the younger age group which was similar to observations made by Furquana Niaz et al. [11] Hyperandrogenism due to increased synthesis of testosterone by the adipose tissue and hyperinsulinemia that increases the production of ovarian androgens play a key role in the increased incidence of hirsutism (15%), acne vulgaris and androgenic alopecia in obese patients. [10]

In our study, many patients (25%) presented with a cluster of manifestations known as a metabolic syndrome or syndrome X which was originally documented by Reaven, that included insulin resistance, impaired glucose tolerance, abdominal obesity, reduced HDL-cholesterol levels, elevated triglycerides, and hypertension. [12] Prevalence of metabolic syndrome in our study correlated with the observations made by Uzuncakmak et al. [13]

About 39% of patients had skin infections, of which 20% had intertrigo, 12% had dermatophytosis and 7% had bacterial infections. A statistically significant association of obesity with infections was found out byBoza et al [14]. In our study, there was a significant association of infections in people with diabetes. This was also calculated by doing a chi-square test of independence where the p-value was found out to be .003. Adiponectin a potent immunosuppressive cytokine produced from the adipose tissue, poor hygiene,increased sweating, and maceration increases the risk of infections in obese individuals. [15]

About 20% of patients had striae distensae (Figure 5) in our study, the majority of them belonging to obesity class II and III.Boza et al and Ahsan et al have also reported a higher incidence of striae with increasing grades of obesity. [14,16] According to Arem and Kisher striae distensae is a form of dermal scarring in which the dermal collagen ruptures as a result of stretching. [17]

In our study, we found that the number of patients presenting with venous stasis (5%) and plantar hyperkeratosis (1%) were comparatively lesser than those presenting with other manifestations. ButAhsan et al have reported a significantly higher frequency of these manifestations in comparison to our study. [16] However, the findings can differ in different studies depending upon the study population, methodology, and size of the sample. Abnormal mechanical stress on the skin stimulates overactivity of the keratinization process resulting in plantar hyperkeratosis that helps to protect the skin and soft tissue layers from mechanical injury. [18] Raised intra-abdominal pressure resulting in impairment of venous and lymphatic return causes chronic lymphoedema and venous stasis. Pigmentation in chronic venous insufficiency can be attributed to the extravasation of red blood cells. [17]

Studies conducted by Sakai et al and Naldi et al showed a significant association with the occurrence and prognosis of psoriasis in obese individuals. [19,20] However, we were not able to assess the significance of the association of psoriasis (10%) with obesityprobably because of the smaller sample size. It is suggested that elaboration of proinflammatory cytokines by the adipocytes may have a role in the development of psoriasis in obese individuals.[21]

CONCLUSION:

The main purpose of the study was to identify the cutaneous manifestations of obesity at an earlier stage, promote lifestyle modifications, weight reduction, and cosmetic improvement with early intervention and management. Around 41% of the individuals in our study had systemic disease (Diabetes and Hypertension). Dermatological conditions like Acanthosis nigricans and infections in these obese patients paved the way for early screening anddiagnosis of underlying systemic diseases.

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