

Original Research Article

A cross-sectional descriptive clinical study of dermatological manifestations in obesity

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ABSTRACT

Background: Obesity is major health hazard in the western world, however studies on skin manifestations in obese patients are limited. Most common co-morbid conditions associated with obesity are hypertension, Type 2 Diabetes Mellitus, dyslipidaemia, degenerative joint diseases etc. Skin conditions such as acrochordons, acanthosis Nigricans can be easily made out on inspection and seen most commonly with obesity. It is important for the clinicians to routinely screen patients for obesity and co-morbid conditions. The aims were to study the prevalence of various skin disorders in obese patients and the frequency of skin changes in various obesity classes and to study the presence of metabolic syndrome and its association with leptin and insulin levels in those patients with acanthosis Nigricans and skin tags.

Methods: Cross-sectional descriptive study done on 100 patients with a BMI >30 and waist circumference >90 cm (in males) and >80 cm (in females).

Results: Acanthosis Nigricans was the most prevalent skin condition (65%) and the association statistically was significant ($p=0.012$). Association of Skin tags (second commonest, in 42%) with $p=0.012$. Acanthosis Nigricans and skin tags among the various skin conditions studied like psoriasis, striae-distensae, fissure-feet, pyoderma, intertrigo, varicose veins, seborrheic dermatitis, Hand-feet eczema, osteoarthritis, candidiasis was significantly associated with obesity.

Conclusions: Acanthosis Nigricans and skin tags among the various skin conditions studied had a strong correlation with obesity and metabolic syndrome which may be a marker for atherosclerosis and cardiovascular risk. It was also noted that in patients with Acanthosis Nigricans and skin tags, who had metabolic syndrome, there was an elevation of the plasma leptin levels and fasting plasma insulin levels but not significant with a $p=0.25$.

Keywords: Obesity, Skin tags, Acanthosis Nigricans, Leptin, BMI

INTRODUCTION

Obesity is a well-known major health hazard which is a major comorbid condition found in patients with hypertension, diabetes mellitus, hypercholesteremia and

osteoporosis. Obesity is defined as body mass index (BMI) of 30kg/m² or more. Obesity causes skin diseases in different ways and certain skin diseases are aggravated by obesity. Skin conditions such as achrochordons, acanthosis nigricans, hirsutism can be easily diagnosed

on inspection and are commonly associated with obesity.² Thus, it is important for physicians to routinely identify, evaluate and treat the patients for obesity and associated morbid conditions. Acanthosis nigricans and pseudoacanthosis nigricans are the most common manifestations found in the obese individuals. Dermatologists need to be aware of skin diseases related to obesity, so that they can advise the patients regarding early monitoring and treatment of symptoms and associated risk factors like diabetes and dyslipidaemias. The effect of obesity on skin has received minimal attention so far. So the present study is done to find out the prevalence of various skin changes occurring in obese patients, to determine the frequency of the various skin changes occurring in the different obesity classes and to work up the obese patients with acanthosis nigricans and skin tags for the presence of metabolic syndrome and to study their association to the leptin levels and insulin levels.¹

METHODS

Study type: Interventional clinical study.

Study design: Open label, prospective clinical study.

Study period: January 2017 to June 2017.

Study sample: 100 obese patients.

Study place: Outpatient department of Dermatology and Venereology, Tertiary care centre, Karaikal.

Ethical considerations

Approval from Institutional Ethical Committee was obtained, before starting the clinical study. Written informed consent was obtained in local vernacular language from every patient before enrolment.

Inclusion criteria

Inclusion criteria were all adult patients, of both sexes; BMI >30.0 and/or waist circumference >90 cm in males and >80 cm in females.

Exclusion criteria

Exclusion criteria were patients with obesity due to congenital syndromes; age less than 15 years (pediatric age group); non-consenting patients.

A detailed patient history was taken. Morphology of the skin lesions, sites and number of lesions were noted. A complete systemic and dermatological examination was carried out in all the patients. Blood pressure was measured. Scraping of KOH mount and bacterial culture were done when needed. Height was recorded in centimetres, weight in kilograms and waist circumference in centimetres. The specific blood investigations done apart from the routine investigations were – blood sugar:

fasting and post-prandial, fasting lipid profile, fasting serum insulin and fasting serum leptin.

Reading and interpretation of results

Body mass index (kg/height² in cm):

- Class 1: BMI 30.0-34.9
- Class 2: BMI 35.0-39.9
- Class 3: BMI >40.

Fasting Blood sugar levels >100 mg/dl were taken as abnormal.

Fasting serum insulin levels were taken as normal if present between 2.6-24.9 U/ml.

Fasting serum leptin levels were determined by an enzyme immunoassay method using the LEPTIN ELISA KIT (manufactured by Diagnostics Biochem Canada Inc.). Reference range in males is between 2.0-5.6 ng/ml and in females is between 3.7-11.1 ng/ml.

Criteria for metabolic syndrome

According to the new IDF definition, for a person to be defined as having the metabolic syndrome they must have: central obesity i.e. waist circumference (in south Asians) in males >90 cm and in females >80 cm, plus any of the two following four factors :

Raised triglycerides >150 mg/dl

Reduced HDL, in men <40 mg/dl, in women <50 mg/dl

Raised blood pressure >130/85 mmHG

Raised FBS >100 mg/dl

Statistics

Data was entered simultaneously using Microsoft excel worksheets designed and coded properly. The data collected was analysed using appropriate statistical tests, with the help of Epi-info version 3.5.1 and SPSS version 17. Chi-square and Fischer exact tests have been used to test the significant association between the study parameters. P<0.05 was considered to be significant.

RESULTS

100 patients aged 18 years and above satisfying the inclusion criteria were drawn from the outpatient department of Dermatology and Venereology, tertiary care centre, Karaikal.

In our study the mean age of study participants was 54 (Table 1). Most of the male obese patients were coolies and farmers and most of the female obese patients were

housewives (Table 1). Most common co-morbid conditions associated with obesity were diabetes and hypertension (Table 1). Grade one obesity was found in greater proportion both in male and female obese patients (Table 1).

Table 1: Baseline characteristics.

Baseline characters of obese patients	Total sample (100)
Mean age	54
Occupation Male	Coolie, farmers
Occupation female	Housewives
Diabetes mellitus	40 patients (40%)
Elevated fasting blood sugar	36%
Elevated post prandial blood sugar	28%
Systemic hypertension	21%
Male grade 1 obesity	44%
Male grade 2 obesity	42%
Male grade 3 obesity	14%
Female grade 1 obesity	66%
Female grade 2 obesity	24%
Female grade 3 obesity	10%

Table 2: Commonest skin lesions found in obese patients.

Most common skin lesion	No. of patients	P value
Acanthosis nigricans	65	0.012*
Association with metabolic syndrome	31	0.014*
Association with fasting leptin levels and fasting insulin levels	34	0.251

P value<0.05 is significant*

Table 3: Frequency and percentage of obese patients with Acanthosis Nigricans.

Table 1	Frequency	Percent	Cumulative percent
Valid percent	65	65.0	65.0
Absent	34	34.0	34.0
Total	100	100	100

Table 4: Frequency and percentage of obese patients with acrochordons.

Table 2	Frequency	Percent	Cumulative percent
Valid percent	42	42	42
Absent	58	58	58
Total	100	100	100

Table 5: Frequency and percentage of obese patients with dermatophyte infection.

Table 3	Frequency	Percent	Cumulative percent
Valid percent	20	20	20
Absent	80	80	80
Total	100	100	100

Table 6: Frequency and percentage of obese patients with psoriasis.

Table 4	Frequency	Percent	Cumulative percent
Valid percent	18	18	18
Absent	82	82	82
Total	100	100	100

Table 7: Other common skin manifestations in obese patients.

Skin disease	No: of patients	Frequency present	Frequency absent
Folliculitis	16	16%	84%
Candidiasis	11	11%	89%
Intertrigo	8	8%	92%

Acanthosis nigricans was the most common skin lesion found among obese patients (Table 2). Among them 31 obese patients had metabolic syndrome (Table 2). Other common skin manifestation found in greater proportion next to acanthosis nigricans were acrochordons (Table 4), dermatophyte infections (Table 5), psoriasis (Table 6), folliculitis (Table 7), candidiasis (Table 7) and intertrigo (Table 7).

DISCUSSION

Acanthosis Nigricans is the commonest dermatological manifestation of obesity. Acanthosis Nigricans is brown or black, poorly defined, velvety, hyper-pigmentation of the skin found usually in body folds such as the axilla, groin, posterior neck, navel, forehead but can also be seen on the elbows, knuckles, and face, particularly in ethnic skin. The hyperpigmentation observed is secondary to acanthosis and papillomatosis of the epidermis rather than pigment-producing cells. Increased insulin levels will increase the circulating IGF which is responsible for keratinocyte and dermal fibroblast proliferation in acanthosis nigricans.¹

Hud et al found that 74% of an obese population exhibited acanthosis nigricans along with elevated plasma insulin levels.² Obese patients with acanthosis nigricans starts with insulin resistance such as diabetes mellitus and metabolic syndrome.³ Insulin resistance is also associated with cutaneous virilism.⁴ Hyperinsulinemia causes excess

circulating androgens, which leads to acromegaly, hypothyroidism, hirsutism and acne vulgaris. The clinical triad of polycystic ovaries, hirsutism, and acanthosis nigricans is commonly seen in obese individuals. In obese women with hyperandrogenism and hirsutism, acanthosis nigricans most commonly affects the vulva.⁵ Increased levels of circulating insulin will down regulate the insulin receptors.⁶ These “classic” insulin receptors regulate glucose uptake, cell growth, DNA synthesis, and protein and fat metabolism via tyrosine kinase activity. Keratinocytes and fibroblasts both express insulin-like growth factor (IGF) receptors that are also capable of binding insulin and have growth promoting effects.⁷ Decreased numbers of functional insulin receptors cause a shift to increased binding to IGF receptors contributing to the development of acanthosis nigricans.⁸

Acanthosis nigricans plaques may lighten up and go away by treating insulin resistance. Treatment with a MNT (medicated nutrition therapy) and weight reduction can improve the insulin resistance state, thus decreasing the severity of the skin disease.⁹ Other treatments that have been reported to help clear acanthosis nigricans include metformin, octreotide, retinoids, topical calcipotriol and laser therapy.

Acrochordons are small, pedunculated soft brown benign neoplasms most commonly seen on the neck, axillae and groin of obese individuals and the most common associated findings seen with this skin condition is acanthosis nigricans.¹⁰ In general, acrochordons are more significantly associated with diabetes mellitus than with obesity. Kahana et al did not find an increased incidence with obesity but did report that those patients with acrochordons had carbohydrate metabolism impairment and he found that presence of multiple skin tags was strongly associated with skin tags.¹¹ This link between skin tags and insulin resistance may serve as a marker of atherosclerosis and cardiovascular disease. Simple scissor excision, electrodesiccation and cryotherapy are successful therapeutic options.

Striae distensae, stretch marks, are linear atrophic plaques distributed perpendicular to the force of greatest tension and the common sites of occurrence are breasts, buttocks, abdomen, and thighs. They start as erythematous phase and turn violet, then finally becomes white depressed plaques. The exact pathogenesis of striae involves mechanical, hormonal, and genetic factors. They are commonly seen in obese patients and in other clinical conditions like pregnancy, Cushing’s syndrome, and usage of topical corticosteroid.¹² Hsu et al diagnosed striae in 40% of children with moderate to severe obesity, and with higher incidence in those with a longer duration of obesity.¹³ Simkin and Arce found high levels of urinary adrenocorticosteroids in obese patients with striae as opposed to obese patients without striae.¹⁴ The clinical appearance of striae in obese patients was found to be lighter, narrower, and less atrophic than in patients with Cushing’s syndrome.

Striae can also be termed as “scars” which results from dermal connective tissue injury followed by newly generated collagen alignment in response to local stress forces.¹⁵ Light and electron microscopy reveals elastolysis, mast cell degranulation, and macrophage engulfment of elastic tissue in the early stage.¹⁶ Histopathology shows densely packed eosinophilic thin collagen bundles parallel to epidermis, effacement of rete ridges, and lack of adnexal structures, thus reinforcing striae as forms of scars.¹⁷

Plantar hyperkeratosis of the soles in obesity was first defined by Garcia-Hidalgo et al in 1999.¹⁸ The horseshoe-shaped hyperkeratosis on the posterior portion of the sole was the commonest skin finding in those weighing more than 176% of expected weight. High plantar pressure and increased forefoot width is seen during walking and standing. Abnormal transference of weight during walking will alter the alignment of the foot leading to increased stress over bony prominences. The plantar hyperkeratosis may be regarded as a physiologic response to this mechanical trauma.¹⁹ Weight loss will reduce the increased mechanical stress and should be the primary treatment. Protective insoles may reduce symptoms.

Increased incidence of candidiasis, intertrigo, candida folliculitis, furunculosis, erythrasma, tinea cruris, and folliculitis are seen in obese patients. Less common infections include erysipelas, cellulitis, necrotizing fasciitis, and gas gangrene. Although none of the following infectious complications are specific to obesity, previous studies have documented increased incidence of these conditions within obese population and clinical relevance. Appropriate treatment along with surgical debridement and weight reduction are warranted.

Psoriasis-Recent data shows a significantly higher prevalence of obesity among psoriasis patients than in the general population. Inverse psoriasis appears to be particularly associated with obesity and sometimes can be indistinguishable from intertrigo in obese patients.²⁰ High frequency of overweight and obesity is also noticed in the psoriatic population.²¹ Interestingly, data from the Utah Psoriasis initiative suggests that obesity results as a consequence of psoriasis rather than a risk factor for triggering onset of disease.²² Obesity increases the morbidity of psoriasis. Sakai et al analysed a cohort of 169 psoriasis patients over more than 10 years and found that elevated BMI (25) was significantly associated with long-term prognosis of psoriasis.²³ Other studies have also found a significant association between obesity and psoriasis morbidity.²⁴

In our study we noted that, acanthosis nigricans had a significant association with obesity. Acanthosis nigricans and skin tags presence had a strong correlation to the presence of metabolic syndrome with a $p=0.014$. It was noted that in patients with acanthosis nigricans and skin tags, who were found to have metabolic syndrome, had elevated fasting plasma leptin levels and elevated fasting plasma insulin levels but it was insignificant with a $p=0.251$.

Limitations

We couldn't find a statistically significant correlation between fasting leptin levels, fasting plasma insulin levels and skin manifestations in obese patients which may be due to small sample size or should be studied further.

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