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# Assessment of Various Cutaneous Manifestations of Obesity in Paediatric Population Attending Tertiary Care Hospital

**Dr. Arth Koshia[1], Dr. Madhav Purohit[2*], Dr. Krishna Patel[3], Dr. Vaishali Makwana[4], Dr. Jayendra Dave[5]**
[1]Third Year Resident, Department of Dermatology, Venereology & Leprosy, C. U. Shah Medical College, Surendranagar, Gujarat, India
[2]Second Year Resident, Department of Dermatology, Venereology & Leprosy, C. U. Shah Medical College, Surendranagar, Gujarat, India
[3]First Year Resident, Department of Dermatology, Venereology & Leprosy, C. U. Shah Medical College, Surendranagar, Gujarat, India
[4]Assistant Professor, Department of Dermatology, Venereology & Leprosy, C. U. Shah Medical College, Surendranagar, Gujarat, India
[5]Head of the Department, Department of Dermatology, Venereology & Leprosy, C. U. Shah Medical College, Surendranagar, Gujarat, India

**Original Research Article**

***Corresponding author**
*Dr. Madhav Purohit*

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**Abstract:** The aim of this study was to determine the various cutaneous manifestations in obesity and analyse the relation with body mass index (BMI) in pediatric population. This was a prospective study in which children up to 15 years of age with body mass index (BMI) >30 kg/m2 were included in the study. After informed consent from the parents/attendants, demographic details, height, and weight were documented and all the cutaneous changes were carefully recorded in a predesigned proforma. A total of 100 children (male: 67, female: 33) were included in the study. The mean age of the participants was 13.5 ± 1.5 years and the mean BMI was 32.6 ± 1.36 kg/m2. Majority of the patients (77%) had Class I obesity (BMI 30.00–34.99) while 22% had Class II obesity (BMI 35.00–39.99). The most common cutaneous manifestations among the children were acanthosis nigricans (41%), striae (20%), fungal infections and intertrigo (19%), acrochordons (12%), acne (10%), hirsutism (8%), and viral and bacterial infections (7%). Other less common associations were psoriasis, xanthomas, corns, plantar hyperkeratosis, and miliaria. Obesity is associated significantly with certain dermatoses in children. As the prevalence of obesity is increasing each day, understanding of these dermatoses is necessary both for the pediatricians as well as for dermatologists for early diagnosis and better management leading to an improved life quality.
**Keyword**: Cutaneous Manifestations, Obesity, Paediatric, Tertiary Care Hospital.

## INTRODUCTION

Overweight and obesity are defined by the World Health Organization (WHO) as abnormal or excessive fat accumulation that may damages health [1]. The prevalence of obesity has increased manifold over the last few years in both the developed and developing nations. Obesity is a major epidemic of the 21st century. Obesity carries a significant impact on the physical and mental health. It is common in adults, but the prevalence among children has also been rising alarmingly now.

Obesity related symptoms in children & adolscents include psychosocial problems, increased cardiovascular disease risk factors, abnormal glucose metabolism, hepatic & GIT disturbances, sleep apnoea, and musculoskeletal problems.

The skin is a commonly affected organ in obesity. It 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. Obesity has been implicated to cause a wide range of dermatologic disorders including acanthosis nigricans, acrochordons, keratosis pilaris, hirsutism, striae distensae, chronic venous insufficiency, plantar hyperkeratosis, cellulitis, skin infections, hidradenitis suppurativa, and psoriasis & "Buried penis".

## METHODS

The prospective study was conducted in the tertiary care hospital between July 2016 to December 2017. A total of 100 patients (BMI>-30kg/m2) between age 3-15, with BMI >30 kg/ m2 were included in the study with due consent from their parents. Clinical photographs with predetermined proforma of Clinical evaluation with detailed history and cutaneous and systemic examination was noted for each patients. BMI calculation was done according to WHO criteria. The WHO uses body mass index (BMI) to classify underweight, overweight, and obesity. A BMI of 18.5–24.9 kg/m2 is taken as normal, BMI 25–29.9 kg/m2 overweight, and BMI >30 kg/m2 taken as obese. Obesity can be further characterized as by BMI as Class I (30–34.9 kg/m2), Class II (35–39.9 kg/m2), and Class III (>40 kg/m2) [6]. Waist circumference was also noted along with measurement of weight and height. For evaluation of underlying metabolic syndrome, certain lab investigations were carried out. This included fasting glucose, total cholesterol, and HDL and triglycerides levels. Fungal smears were carried out to rule out tinea pedis as a cause of plantar hyperkeratosis.

**Table-1: Classification of Obesity**

| Classification | BMI ($kg/m^2$) (cut-off points ) | |
|---|---|---|
| | Principal | Additional |
| Underweight | <18.50 | <18.50 |
| Severe thinness | <16.00 | <16.00 |
| Moderate thinness | 16.00-16.99 | 16.00-16.99 |
| Mild thinness | 17.00-18.49 | 17.00-18.49 |
| Normal range | 18.50-24.99 | 18.50-22.99 |
| | | 23.00-24.99 |
| Overweight | >25.00 | >25.00 |
| Preobese | 25.00-29.99 | 25.00-27.49 |
| | | 27.50-29.99 |
| Obese | >30.00 | >30.00 |
| Obese class I | 30.00-34.99 | 30.00-32.49 |
| | | 32.50-34.99 |
| Obese class II | 35.00-39.99 | 35.00-37.49 |
| | | 37.50-39.99 |
| Obese class III | >40.00 | >40.00 |

## RESULTS

A total of 100 children (male: 67, female: 33) were included in the study. The mean age of the participants was 13.5 ± 1.5 years and the mean BMI was 32.6 ± 1.36 kg/m2. Majority of the patients (77%) had Class I obesity (BMI 30.00–34.99) while 22% had Class II obesity (BMI 35.00–39.99). The most common cutaneous manifestations among the children were acanthosis nigricans (41%), striae (20%), fungal infections and intertrigo (18%), acrochordons (12%), acne (10%), hirsutism (8%), and viral and bacterial infections (7%). Other less common associations were psoriasis, xanthomas, corns, plantar hyperkeratosis, and miliaria.

**Table-2: Frequency of various dermatoses in different classes of obesity**

| **Dermatoses** | **n (%)** | | | **Total** |
|---|---|---|---|---|
| | **Class I Obesity (71)** | **Class II Obesity (27)** | **Class III Obesity (2)** | |
| Acanthosis nigricans | 22 | 18 | 01 | 41 |
| Striae | 13 | 07 | - | 20 |
| Intertrigo | 09 | 08 | 01 | 18 |
| Acrochordons | 10 | 02 | - | 12 |
| Acne | 04 | 06 | - | 10 |
| Hirsutism | 05 | 03 | - | 08 |
| Bacterial and viral infections | 05 | 02 | - | 07 |
| Keratosis pilaris | 02 | - | - | 02 |
| Xanthoma | 01 | - | - | 01 |
| Psoriasis | 01 | - | - | 01 |
| Corn | - | 01 | - | 01 |
| Plantar hyperkeratosis | 01 | - | 01 | 02 |
| Miliria | 03 | - | - | 03 |

## DISCUSSION

Obesity is now a global problem, spreading even to the developing world, where it is an increasing threat to health. Our survey found that adolescent boys were at greater risk of overweight and obesity than girls, particularly at age 15 for overweight and at age 12 for obesity. For girls, the risks were greater than for boys for overweight at age 14 and obesity at age 13.The cutaneous manifestations of obesity are directly related to the age of onset, duration, and severity of the underlying disease

Acanthosis nigricans (AN) was a finding that is consistent in all studies of obese persons. It is characterized by a hyperpigmented velvety cutaneous thickening affecting localized areas of the skin in obese persons. AN is a reliable cutaneous marker of hyperinsulinemia in obese individuals [4]. AN in the present study was present was found in 41 % of the obese school children, which was lower than what was reported from Brazil [7] (76%), Mexico [8] (64.2%), and USA[9] (74%), but higher than reported in Egypt11 (0.6%).

In this study, the prevalence of striae (20%), which is due to skin over-extension, was low compared to the what was reported in obese adults in Mexico (89%) and among children in Taiwan **[**11] (40%), but higher than in adult Egyptians [10**]** (0.8%). Stria can also present with few other conditions like–due to overuse application of potent topical steroid cream & pregnancy.

Skin infections are usually more in frequency in obese patients, mainly due to friction of skin in body folds resulting in maceration and superadded infection. 25% of patients had skin infections n the present study. 18% had intertrigo and 7% had bacterial & viral infections. Boza *et al*.[3] found a statistically significant association of obesity with infections. Folliculitis caused by excessive fat folds in an obese child and favoring humidity and maceration with bacterial overgrowth was found in 2% overweight and obese children in the study.

Acrochordons followed AN, being 8% in frequency. Boza *et al*. [3**]** reported it to be 12 %. Acrochordons, when correlated with diabetes and dyslipidemias revealed significant association ($p<0.05$). This association has already been established by various researches, so our result further augmented the already established association of skin tags with insulin resistance, hypertriglyceridemia and BMI.

Acne is another common manifestation of obesity and has been attributed to obesity induced hyperinsulinemia. Studies have reported a correlation between the degree of obesity and acne incidence. In our study, acne was a common presentation seen in 10% of the patients and was more frequent in Class II obesity.

Hirsutism was also a common manifestation in our study group seen more among patients with Class I obesity with 10% frequency. Ahsan *et al*. [5] also noted a correlation between obesity and hirsutism and reported a frequency of 16% in obese patients.

"Burried penis" is defined when penis is hidden within the fat inside the lower part of belly. Adolescents with buried penis are usually obese. He/she may experience dysuria, balanitis, and difficulty in proper hygiene. Most cases do not require any treatment. It usually improves spontaneously over time.

## CONCLUSION

We conclude that obesity is one of the major public health problems. It, directly or indirectly starts unfavorable processes in almost all organ systems. Therefore, only a multidisciplinary care may secure treatment and rehabilitation of obese patients.

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