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Cutaneous manifestations in obesity: A prospective observational study in a tertiary care centre

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Abstract

Background: Obesity is a global epidemic which affects all age groups and all races of human beings. Obesity is associated with a large number of systemic comorbidities and also multiple cutaneous manifestations which are directly related to the age of onset and duration of obesity. The aims of this study are to assess the age wise and sex wise distribution of cutaneous manifestations in obese patients. To study the distribution of cutaneous manifestations according to grade of obesity and also other comorbidities associated with obesity.

Material and Methods: All patients who have BMI ≥ 30 kg/m², showing any type of cutaneous manifestation, presenting to the of DVL dept. of KIMS hospital, Narketpally from the time period of October 2014 to September 2016 were included after taking consent. A detailed history was elicited in each case with particular reference to cutaneous complaints including duration, history of evolution, progression and treatment modalities if any. A detailed general physical, systemic examination and dermatological examination with appropriate investigations like routine blood investigations, skin biopsy and other special investigations wherever necessary was done.

Results: Acanthosis nigricans was the most commonly encountered disorder in the study group seen in 44(55%) followed by infections in 35(43.7%). Plantar hyperkeratosis was common in grade 3 in 3(42.8%) patients followed by grade 1 in 14(35%) and grade 2 in 11(33.3%) patients. All the common dermatoses of obesity were more prevalent in higher grades of obesity that is grade 3 followed by grade 2 and 1. Comorbidities noted in the study were osteoarthritis in 22.5% (18), hypertension in 18.7% (15), diabetes mellitus in 15% (12), hypothyroidism and polycystic ovarian disease in 8.7% (7) patients.

Conclusion: Obesity is significantly associated with multiple dermatoses. Procuring a thorough knowledge of these disorders is necessary both for the physicians, dermatologists and health care providers for early diagnosis and management as many of these conditions are treatable, leading to an improved quality of life. As the prevalence of obesity is increasing each day, early recognition of these lesions is vital, cautioning the patients for a need of weight reduction.

Keywords: Obesity, dermatoses, prevalence, acanthosis nigricans

Introduction

Obesity is a chronic disease characterized by excess body fat. Obesity is widely recognized as a pandemic, with potential disastrous consequences on human health [1]. More than 40 million adults worldwide were classified by World Health Organization (WHO) as obese in 2005, with a projected increase to 700 million by 2015. However as of 2014, The World Health Organization claimed that 1.9 billion individuals over the age of 18 years were overweight. Of these over 600 million were obese [2].

Obesity is emerging as an important health problem in India with increased urbanization and modernization. Twenty two million Indians are obese. The National Family Health Survey (NFHS) in 2012 showed highest number of obesity cases in India were seen in Punjab state with 30.3% males and 37.5% females being obese and lowest in Tripura state with 5.2% males and 5.3% females being obese. And in Andhra Pradesh state, 17.6% of adult males and 22.7% adult females were obese [3].

Obesity is a chronic multifactorial disease representing a major health problem. Obesity has been tagged by the World Health Organization as the new crisis in public health because of increasing evidence that the condition easily leads to a host of life-threatening diseases like atherosclerosis, diabetes, cancer, asthma, arthritis etc. [4]. An enormous amount of scientific research has been done on obesity but there is as yet no consensus on what constitutes

obesity, what are its exact causes and contributing factors, and how exactly does obesity deteriorate into serious medical cases.

Obesity is responsible for changes in skin barrier function^[5], sebaceous glands and sebum production, sweat glands, lymphatic, collagen structure and function, wound healing, micro and macro circulation and subcutaneous fat. Moreover, obesity is implicated in a wide spectrum of dermatological diseases like acanthosis nigricans and acrochordons which are related to insulin resistance, hirsutism due to hyperandrogenism, striae distensae due to skin over-distension, stasis dermatitis due to chronic venous insufficiency, keratosis pilaris, plantar hyperkeratosis, cellulites, fungal and bacterial infections due to excess fat folds that favours humidity and maceration, hidradenitis suppurativa, adiposis dolorosa, lymphedema and psoriasis^[6].

We have undertaken this study at the outpatient department of DVL of our institute, which is located in a rural area, with the aim of identifying the cutaneous manifestations in obese patients, as there is lack of similar study in our state and also very few in the South Indian population.

Effects of obesity on skin have received minimal attention so far. Most of the literature is in form of case reports and few studies related to specific dermatoses. Some of the studies which are present are on urban population. As most of the patients presenting to our hospital are from rural area with an agricultural background, this study is being carried out to find the distribution of cutaneous manifestations in obese patients attending a tertiary care center, KIMS, Narketpally

Materials and Methods

The present prospective observational study was conducted in the Department of DVL, Kamineni Institute of Medical Sciences, Narketpally from October 2014 to September 2016. A total of 80 cases, who have BMI more than or equal to 30kg/m², showing any type of cutaneous manifestation

attending the Dermatology OPD of KIMS hospital, Narketpally from the time period of October 2014 to September 2016 were selected for the study. Cases with BMI ≥ 30 kg/m², both genders, and age ≥ 15 years were included. All pregnant women and lactating mothers, severely ill and immune-compromised patients, and Obesity secondary to drugs were excluded. Informed consent was obtained from all the study participants and study protocol was approved by Institutional Ethics Committee, KIMS, Narketpally.

Data Collection

All patients who have BMI ≥ 30 kg/m², showing any type of cutaneous manifestation, presenting to the of DVL dept. of KIMS hospital, Narketpally were included after taking consent. A detailed history was elicited in each case with particular reference to cutaneous complaints including duration, history of evolution, progression and treatment modalities if any. A detailed general physical, systemic examination and dermatological examination with appropriate investigations like routine blood investigations, skin biopsy and other special investigations wherever necessary was done.

Statistical Analysis

A standard proforma was used to collect the patient information. Data was tabulated in Microsoft Excel 2010 Worksheet and data analysis was done using IBM SPSS 19.0 (Chicago, IL, USA). Fisher's exact test was used for statistical analysis.

Results

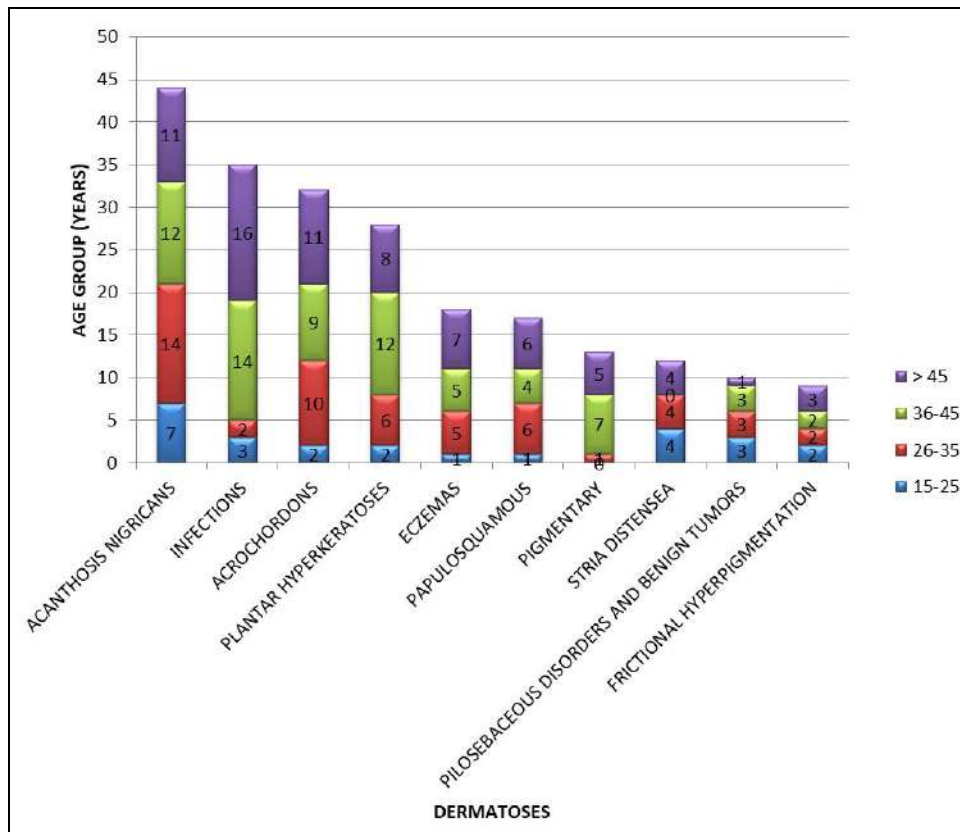
A total of 80 patients (22 males and 58 females) with BMI ≥ 30 kg/m², after meeting the inclusion and exclusion criteria were enrolled in the study. Among 80 study cases 40(50.0%) belonged to grade 1, 33(41.25%) belonged to grade 2 and 7(8.75%) belonged to grade 3 obesity. The age group of patients studied ranged from 15 to 70 years.

Table 1: Age and sex wise distribution of study cases (n=80)

Parameters	Grade 1 N=40 (50.0%)	Grade 2 N=33 (41.25%)	Grade 3 N=7 (8.75%)	Total no of cases N=80 Percentage (%)
Age (In years)				
15-25	6(15%)	4(12.1%)	0	10(12.5%)
26-35	12(30%)	10(30.3%)	1(14.3%)	23(28.75%)
36-45	10(25%)	11(33.3%)	2(28.6%)	23(28.75%)
>45	12(30%)	8(24.3%)	4(57.1%)	24(30%)
Gender				
Males	13(32.5%)	7(21.2%)	2(28.5%)	22(27.5%)
Females	27(67.5%)	26(78.8%)	5(71.5%)	58(72.5%)

Acanthosis nigricans was the most commonly encountered disorder in the study group seen in 44(55%) and it is seen maximum in the age group of 26 to 35 years. Infections

were the next most common disorders seen in 35(43.7%) patients and most common age group involved was above 45 years.



Graph 1: Age wise distribution of dermatoses in study group (n=80)

Table 2: Sex wise distribution of dermatoses in study group (n=80)

Disorder	Male (n=22) (%)	Female (n=58) (%)	Total (n=80) (%)	Odds ratio	P-value
Acanthosis Nigricans	13 (59.1)	31 (53.44)	44 (55)	1.25	0.84
Infections	14 (63.6)	21 (36.2)	35 (43.7)	3.08	0.05*
Acrochordons	11 (50)	21 (36.2)	32 (40)	1.76	0.38
Plantar hyperkeratoses	5 (22.72)	23 (39.65)	28 (35)	0.44	0.24
Eczemas	8 (36.4)	10 (17.2)	18 (22.5)	2.44	0.18
Papulosquamous disorder	2 (9.1)	15 (25.9)	17 (21.2)	0.28	0.18
Pigmentary disorders	2 (9.1)	11 (19)	13 (16.2)	0.42	0.46
Stria distensae	4 (18.2)	8 (13.8)	12 (15)	1.38	0.88
Frictional Hyperpigmentation	0	9 (15.5)	9 (11.25)	0.00	0.11

Table 3: Distribution of common skin disorders according to gender and grade of obesity in study group.

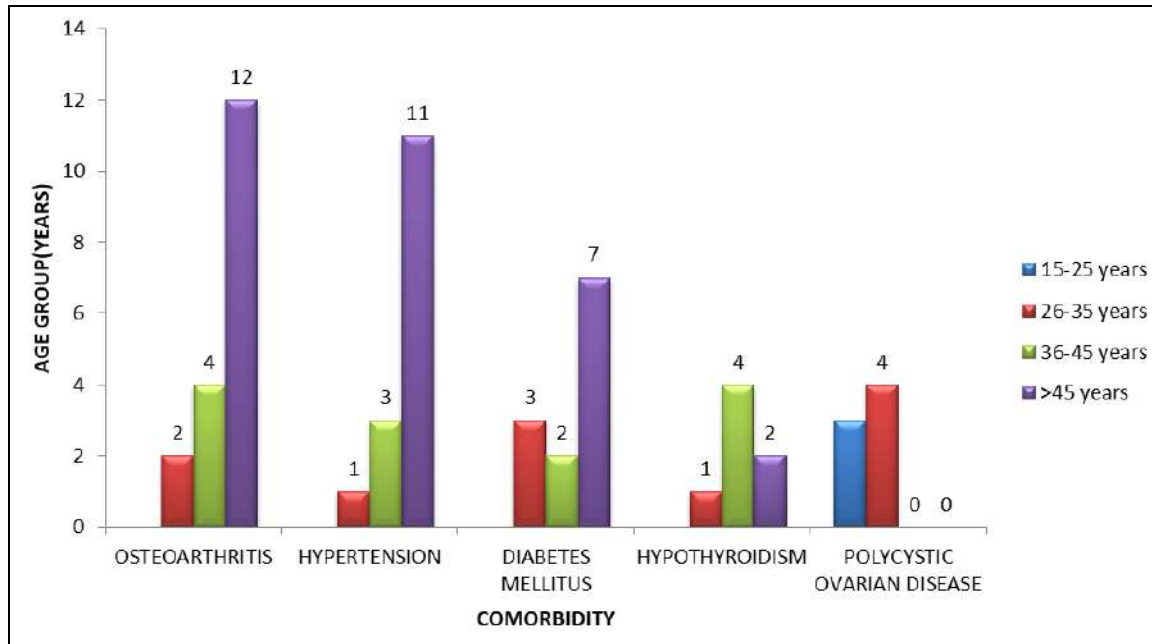
Disorder	Grade 1 (n=40)		Grade 2 (n=33)		Grade 3 (n=7)	
	Male N=13 (%)	Female N=27 (%)	Male N=7 (%)	Female N=26 (%)	Male N=2 (%)	Female N=5 (%)
Acanthosis Nigricans	8 (61.5)	12 (44.4)	4 (57.1)	16 (61.5)	1 (50)	3 (60)
	Total= 20 (50%)		Total=20 (60.6%)		Total=4 (57.1%)	
Acrochordons	7 (53.8)	10 (37)	3 (42.8)	8 (30.7)	1 (50)	3 (60)
	Total=17 (42.5%)		Total=11 (33.3%)		Total=4 (57.1%)	
Plantar hyperkeratoses	4 (30.7)	10 (37)	1 (14.2)	10 (38.4)	0	3 (60)
	Total=14 (35%)		Total=11 (33.3%)		Total=3 (42.8%)	
Striae distensae	3 (23)	4 (14.8)	1 (14.2)	2 (7.6)	0	2 (40)
	Total=7 (17.5%)		Total=3 (9%)		Total=2 (28.5%)	
Frictional Hyperpigmentation	0	2 (7.4)	0	5 (19.2)	0	2 (40)
	Total=2 (5%)		Total=5 (15.1%)		Total=2 (28.5%)	

Table 4: Distribution of papulosquamous disorders conditions according to gender and grade of obesity in study group.

Disorders	Grade 1 (n=40)		Grade 2 (n=33)		Grade 3 (n=7)		Total N=80 (%)
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	
Psoriasis	2 (5)	1 (2.5)	0	4 (12.1)	0	0	7 (8.7)
Lichen simplex chronicus	0	2 (5)	0	3 (9)	0	1 (14.2)	6 (7.5)
Lichen planus	0	3 (7.5)	0	1 (3)	0	0	4 (5)
Total	2 (5)	6 (15)	0	8 (24.2)	0	1 (14.2)	17 (21.2)

Table 5: Distribution of pigmentary disorders according to gender and grade of obesity in study group.

Disorders	Grade 1 (n=40)		Grade 2 (n=33)		Grade 3 (n=7)		Total (n=80) (%)
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	
Melasma	0	4(10)	0	3(9.1)	0	0	7(8.7%)
Vitiligo	1(2.5)	0	1(3)	0	0	0	2(2.5%)
Facial melanosis	0	1(2.5)	0	1(3)	0	0	2(2.5%)
Macular amyloidosis	0	1(2.5)	0	1(3)	0	0	2(2.5%)
Total	1(2.5)	6(15)	1(3)	5(15.1)	0	0	13(16.2%)



Graph 2: Distribution of comorbidities associated with obesity according to age in the study group

Table 6: Distribution of comorbidities according to gender and grade of obesity.

Comorbidity	Grade 1 (N=40)		Grade 2 (N=33)		Grade 3 (N=7)	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
Osteoarthritis	1(2.5)	7(17.5)	1(3)	5(15.1)	0	4(57.1)
	Total=8(20%)		Total=6(18.2%)		Total=4(57%)	
Hypertension	2(5)	3(7.5)	2(6)	5(15.1)	0	3(42.8)
	Total=5(12.5%)		Total=7(21%)		Total=3(42.8%)	
Diabetes mellitus	0	4(10)	2(6)	4(12.1)	0	2(28.5)
	Total=4(10%)		Total=6(18.2%)		Total=2(28.5%)	
Hypothyroidism	0	2(5)	0	5(15.1)	0	0
	Total=2(5%)		Total=5(15.1%)		Total=0	
Polycystic ovarian disease	0	4(10)	0	3(9.1)	0	0
	Total=4(10%)		Total=3(9.1%)		Total=0	

Discussion

Obesity, previously considered as a health problem of industrialized and developed countries, has been accepted and recognized as an emerging public health problem of developing countries like India now. Cutaneous manifestations of obesity show statistically significant relationship with increasing BMI. The present study included 80 patients who had various dermatoses. Both males and females with age more than 15 years and BMI equal to or above 30kg/m² were include in the study. In this study we used WHO classification of obesity based on BMI considering all patients with BMI between 30kg/m² to 34.99kg/m² as Grade-1 obese, 35kg/m² to 39.99kg/m² as Grade-2 obese and equal to or above 40kg/m² as Grade-3 obese. This is comparable to study done by Boza JC *et al*^[8] and Divyashree RA *et al*^[9] who used the same WHO classification of obesity based on BMI. The present study

included 80 patients with mean age 39.71 years. Mean age in Boza JC *et al*^[8] and Niaz F *et al*^[10] study were 49.66 years and 43.6 years respectively which is more. In the present study, male to female ratio was 1:2.6, which is comparable to the study group of Boza JC *et al*^[8] and Divyashree RA *et al*^[9] which is 1:2.8 and 1:2.85 respectively.

In this study, Acanthosis nigricans was seen in 55% of patients which is comparable with the study done by Niaz F *et al*^[10] and Ashan U *et al*^[11] in which it is seen in 49% (96) and 63% (59) respectively. Study by Boza JC *et al*^[8] and Al Mutairi N^[12] acanthosis was seen in 27.6% and 33% which is less than this study. In this study, plantar hyperkeratosis is seen in 35% (28) of patients. This is less when compared to Boza JC *et al*^[8] and Al Mutairi N^[12] study (46.7%) and (45.1%) and more when compared to Niaz F *et al*^[10] (5.6%) and Ashan U *et al*^[11] (26%) study. This broad range of

variation in different studies might be due to climatic and seasonal variation in presentation of the disease in respective countries.

In the present study, acrochordons were seen in 40% (32) patients. This is comparable with study done by Boza JC *et al*^[8] in which 47.9% (36) patients presented with skin tags. In the present study, striae distensae was noted in 15% (12) of patients which is comparable with study of Niaz F *et al*^[10] where it is seen in 17% (34) patients. This is low compared to Boza JC *et al*^[8] study where 68.4% (52) had striae. This variation could be due to high number of grade 3 obese patients in Boza JC *et al*^[8] study (31.6%) compared to present study (8.7%). In the present study, psoriasis was found in 8.7% (7) of patients which is comparable with study of Boza JC *et al*^[8] and Ashan U *et al*^[11] where 13.2% (10) and 10% (9) patients had psoriasis respectively. Apart from psoriasis other papulosquamous disorders reported in the present study are lichen simplex chronicus in 7.5% (6) and lichen planus in 5% (4) of patients. Lichen planus was reported in the study of Niaz F *et al*^[10] in 1.5% (3) patients.

In present study, fungal infections are seen in 28.7% (23) of patients which is more compared with study done by Niaz F *et al*^[10] where 15% were reported to have fungal infections and less when compared with study done by Boza JC *et al*^[8] in which as high as 44.7% were reported with fungal infections. In present study, bacterial infections were seen in 7.5% (6) of patients. This is in concordance with study done by Niaz F *et al*^[10] where they are reported in 7.5% of patients. This is slightly less when compared with study done by Boza JC *et al*^[8] in which 11.8% prevalence of bacterial infections was reported. In the present study, bacterial infections included folliculitis in 3.7% (3), erythrasma in 2.5% (2) and pitted keratolysis in 1.25% (1) patient.

In the present study, hypertension was noted in 18.7% (15) of patients which is low when compared to other studies. This low prevalence might be due to rural background in most of our study population and less mean age of our study population (39.71 years) when compared with study of Boza JC *et al*^[8] with (49.66 years). In the present study, diabetes mellitus was reported in 15% (12) patients which is in concordance with study of Al Mutairi N^[12] and Divyashree RA *et al*^[9] with 19.9% and 17% respectively. In the present study, osteoarthritis was seen in 22.5% (18) patients which is in concordance with Al Mutairi N^[12] study with 16.7%. PCOD was seen in 8.7% of patients in the present study which is less when compared with study of Al Mutairi N^[12] with 16.9%.

Conclusion

In conclusion, the present study included 80 patients in which females were more compared to males. This might be due to sedentary life style and also increased awareness of skin problems in female population. Patients with grade 1 obesity are more compared to other grades, because most of the study population is from rural background and hence morbid obesity was reported to be less. Among the obesity associated disorders, acanthosis nigricans was the most common condition followed by infections and acrochordons. Acanthosis nigricans was common in grade 2 population followed by grade 3, while other dermatoses like acrochordons, plantar hyperkeratosis, striae distensae and frictional hyperpigmentation were more in grade 3 individuals. This might be due to increased weight bearing,

stretching of skin and friction in grade 3 individuals. Fungal infections were more than bacterial, viral and parasitic infections. This might be because of increased perspiration in obese people favoring the growth of fungi. Among papulosquamous disorders, psoriasis was the commonest. Melasma was common in pigmentary disorders and acne in pilosebaceous disorders. This might be due high female population in the study and hormonal changes associated with obesity. Rare condition like infundibular keratinous cyst was also reported in the study. The differences seen in various studies underscore the genetic makeup, racial influences, and geographic location of study populations in each study. With increasing obese population, better understanding of the skin changes and dermatoses in them helps in better dermatological care. More epidemiologic investigations concerning dermatologic diseases in the obese population are needed to complement the information in this study, which presents an interesting profile of the various skin diseases.

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