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Original Article

Cutaneous manifestations associated with obesity

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Abstract

Objective To study the frequency of cutaneous manifestations of obesity and their association with severity of disease in Pakistani population.

Methods 100 outdoor patients visiting Rawal Institute of Health Sciences, Islamabad were studied during a period from May 2014 to July 2015. BMI was calculated by measuring weight in kilogram divided by square in height in meter. Cutaneous manifestations in obese patients with class I (CI) [BMI >30-34.9Kg/m^2] and class II (CII) [BMI 35-39Kg/m^2] disease were recorded.

Results The mean age was 41.85±8.61 years while the mean BMI was 33.51±2.51 kg/m^2. A significant difference for diabetes mellitus, striae and acanthosis nigricans was seen between CI and CII groups (p<0.05). BMI showed significant positive correlation with DM (r=0.280, p=0.005) and acne (r=0.315, p=0.001) while diabetes mellitus showed with acanthosis nigricans (r=0.373; p=0.000) and skin tags (r=0.218, p=0.029). Acne showed with miliaria (r=0.210, p=0.036) and varicose vein with xanthomas (r= 0.281, p=0.005).

Conclusion Skin tags, acanthosis nigricans and acne are seen more frequently in obesity.

Keywords
Obesity, cutaneous manifestations.

Introduction

Obesity is a serious public health issue contributing to the pathogenesis of cardiovascular, musculoskeletal and metabolic disorders. Obesity may be present at any age but most commonly develops in mid-life. Obesity has shown a well-established relation with conditions as coronary heart disease, type 2 diabetes mellitus, hypertension, hyperlipidemia, osteoarthritis, obstructive sleep apnea, and depression, as well as, breast, endometrial and colonic cancer. It also showed strong relations with nonalcoholic fatty liver disease and gallstones, diverticulitis, infertility, urinary incontinence, anxiety and impaired social interactions.[1,2]

In skin, obesity affects skin barrier functions, sebaceous glands and sebum productions, sweat glands, lymphatics, collagen structure and its functions, micro- and macrocirculation and subcutaneous fat. Obese patients have larger skins folds and sweat more profusely after becoming overheated because of thick layers of sub coetaneous fat, thereby increasing both the

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frictional and moisture components.[2] Cutaneous manifestations associated with obesity include lymphedema, acanthosis nigricans, and effects of hyperandrogenesis, acne, miliaria, intertrigo, plantar hyperkeratosis, skin infections and varicose veins.[4,5]

The World Health Organization (WHO) and National Institute of Health (NIH) use body mass index (BMI) – an index of weight-for-height commonly used to classify underweight, overweight, and obesity. BMI is defined as weight in kilograms divided by square of height in meters [Kg/m^2]. A BMI of 18.5-24.9 Kg/m^2 is taken as normal, BMI 25-29.9 Kg/m^2 overweight and BMI >30 Kg/m^2 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/m^2) and class III (>40 Kg/m^2).[6]

Waist circumference, measured at the end of normal expiration at the level of iliac crests, is another reasonable way of assessing obesity. Circumference values that indicate a significant increased relative risk are more than 88cm for women and more than 102cm for men.[7]

This study was undertaken to assess the frequency of cutaneous manifestations associated with obesity and their correlation with severity of disease.

Methods

A total of 100 obese patients visiting the Rawal Institute of Health Sciences, Islamabad for their skin problems were selected in the study for a period from June 2014 to July 2015. After patient consent, demographic parameters like age, sex, pulse, blood pressure (using mercury sphygmomanometer, taking average of the three readings after completely relaxing the patient) were recorded. The patients were also inquired regarding history of diabetes mellitus, hyperlipidemia, and hyperuricemia either already diagnosed or under treatment. BMI was calculated after measuring height in cm and converting into meter square, weight in Kg, and using the formula - kg/m^2. Height in centimeter was measured by asking the patient to stand straight against the wall using weight-height measuring machine. The patients were divided into two groups; class I (CI) [BMI 30-34.9 Kg/m^2] and class II (CII) [BMI 35 to 39.9 Kg/m^2]. Patients were examined by a qualified dermatologist (NRD) for cutaneous manifestations like skin complexion (dark or fair), striae, skin tags (acrochordon), miliaria, acanthosis nigricans, varicose veins, xanthoma and xanthelasma, plantar hyperkeratosis, and intertrigo etc.

Results

The mean age of patients of group CI (n=50) was 41.2±7.55 years while that of group CII (n=50) was 42.25±9.33 years (p=0.397). The mean height showed a non-significant difference (p=0.123) between group CI (169.70±7.80 cm) and group CII (172.15±8.97 cm). A similar trend was seen when pulse rate (p=0.147) and blood pressure (p=0.183) of the two groups were compared, however, difference was significant in terms of weight (89.67±8.40 Kg, 108.64±23.23Kg; p=0.000) and BMI (31.18±0.91, 35.72±0.74; p=0.000) between the groups.

Table 1 represents cutaneous manifestations of obesity. A non-significant greater percentage (OR=0.783; p=0.545) of females was noted in both (CI and CII) groups. A non-significant higher percentage for hypertension (OR=0.777; p=0.347), hyperuricemia (OR=0.583, p=0.372), hyperlipidemia (OR=0.706, p=0.405), family history of obesity (OR=0.911; p=0.829), miliaria (OR=0.599; p=0.260) and plantar hyperkeratosis (OR=0.545; p=0.147) was noticed in patients of

group CI compared to those of group CII; while dark skin complexion (OR=0.592; *p*= 0.211), varicose veins (OR=2.550; *p*=0.182) and xanthomas/ xanthelasma (OR=1.278; *p*=0.539) were of non-significant greater percentage in group CII compared to patients of group CI.

A significant higher percentage for diabetes mellitus (OR=2.455; *p*=0.028), striae distensae (OR=2.279; *p*=0.044), and acanthosis nigricans (OR=3.857; *p*=0.001) was seen when patients of group CII and CI were compared; while acne was found to be more statistically significant in patients of group CI compared to group CII (OR=0.259; *p*=0.001). The patients of group CI and CII showed same percentage for intertrigo (OR=1.000; *p*=1.000)

Table 2 shows analysis of variance between and within the groups. Analysis of variance showed a significant difference for BMI (*p*=0.000), acne (*p*=0.009), diabetes mellitus (*p*=0.028), acanthosis nigricans (*p*=0.002), skin tags (*p*=0.016), stretch marks (*p*=0.044), and blood pressure (*p*=0.026), within and between the groups. However, the skin complexion (*p*=0.215), miliaria (*p*=0.265), xanthoma/ xanthelasma (*p*=0.163), varicose veins (*p*=0.186) plantar hyperkeratosis (*p*=0.150) and intertrigo (*p*=0.334) were found to be non-significant within and between the groups

Table 3 showed correlations with variables. BMI showed a positive correlation with DM (*r*=0.280, *p*=0.005), acne (*r*=0.315, *p*=0.001), miliaria (*r*=0.119, *p*=0.238), and plantar hyperkeratosis (*r*=0.167, *p*=0.097), while negative correlation with skin tags (*r*= -0.332, *p*=0.001), varicose vein (r= -0.132; p=0.190), intertrigo (*r*= -0.084, *p*=0.406), and xanthomas (r= -0.120, p=0.236).

Diabetes mellitus showed positive correlation with acanthosis nigricans (*r*=0.373; *p*=0.000) stretch marks (*r*=0.174, *p*=0.083), skin tags (*r*=0.218, *p*=0.029), varicose veins (*r*=0.114, *p*=0.261), xanthomas (*r*=0.154, *p*=0.126), miliaria (*r*=059, *p*=0.559) and intertrigo (*r*=0.101, *p*=0.317), while a significant negative correlation was seen with plantar hyperkeratosis (*r*= -0.016, *p*=0.873) and acne (*r*= -0.032, *p*=0.752).

Acne showed significant negative correlation only with skin tags (*r*= -0.217, *p*=0.030), and positive correlation with BMI (*r*=0.315, *p*=0.001) and miliaria (*r*=0.210, *p*=0.036) while the varicose veins had significant positive correlation with xanthomas (*r*= 0.281, *p*=0.005). Miliaria had significant negative correlation with acanthosis nigricans (*r*= -0.245, *p*=0.014).

Discussion

Our results are in consistence with a number of studies which showed association of obesity with cutaneous manifestations.[3,8,9,10]

Among the skin manifestations skin tags (52%) followed by striae distensae (48%) were found more frequent (52%) than other cutaneous manifestations. These results are in consistence with Tamega *et al.*[11] and Boza *et al.*[12] who showed a significant correlation ($p<0.05$) with diabetes mellitus and dyslipidemia. Our result also showed a significant difference (*p*=0.04) when skin tags were compared within and between the two study groups. Our results showed a significant correlation ($p<0.05$) with diabetes mellitus.

Acanthosis nigricans was seen in 44% of the selected patients. Other comorbid conditions like diabetes mellitus showed significant association with acanthosis (*p*=0.000), and miliaria (*p*=0.014), however, it also showed a positive correlation with skin tags and striae distensae. A significant difference (*p*=0.002) was seen for

Table 1 Different systemic and cutaneous manifestations of obesity in study population (n=100).

Variable	*CI* *n= 50 (50%)*	*CII* *n= 50 (50%)*	*OR*	*P value*	*CI 95%*
Sex					
Male	23 (46.0%)	20 (40%)	0.783	0.545	0.354 – 1.730
Female	27 (54.0%)	30 (60%)			
Skin complexion					
Dark	29 (58.0%)	35 (70%)	0.592	0.211	0.259 – 1.351
Fair	21 (42.0%)	15 (30%)			
Family H/O Obesity					
Yes	35 (70.0%)	34 (68%)	0.911	0.829	0.390 – 2.126
No	15 (30.0%)	16 (32%)			
Hypertension					
Yes	32 (64.0%)	29 (58%)	0.777	0.347	0.347 – 1.738
No	18 (36.0%)	21 (42%)			
Diabetes mellitus					
Yes	21 (42%)	32 (64%)	2.455	0.028	1.097 – 5.494
No	29 (58%)	18 (36%)			
Hyperuricemia					
Yes	08 (16%)	06 (12%)	0.583	0.372	0.177 – 1.925
No	42 (84%)	44 (88%)			
Hyperlipidemia					
Yes	20 (40%)	16 (32%)	0.706	0.405	0.311 – 1.603
No	30 (60%)	34 (68%)			
Acne					
Yes	30 (60%)	14 (28%)	0.259	0.001	0.112 – 0.599
No	20 (40%)	36 (72%)			
Acanthosis nigricans					
Yes	14 (28%)	30 (60%)	3.857	0.001	1.670 – 8.911
No	36 (72%)	20 (40%)			
Striae distensae					
Yes	23 (46%)	33 (66%)	2.279	0.044	1.017 – 5.108
No	27 (54%)	17 (34%)			
Acrochordon (skin tag)					
Yes	20 (40%)	32 (64%)	2.667	0.016	1.188 – 5.985
No	30 (60%)	18 (36%)			
Miliaria					
Yes	25 (50%)	20 (40%)	0.667	0.315	0.302– 1.472
No	25 (50%)	30 (60%)			
Varicose veins					
Yes	03 (06%)	07 (14%)	2.550	0.182	0.620 – 10.492
No	47 (94%)	43 (86%)			
Xanthoma/xanthelasma					
Yes	18 (36%)	21 (42%)	1.287	0.539	0.575 – 2.881
No	32 (64%)	29 (58%)			
Plantar hyperkeratosis					
Yes	19 (38%)	18 (36%)	0.918	0.836	0.407 – 2.067
No	31 (62%)	32 (64%)			
Intertrigo					
Yes	10 (20%)	10 (20%)	1.000	1.000	0.375 – 2.664
No	40 (80%)	40 (80%)			

acanthosis within and between the groups. These results are in association with Phiske[10] and Al Mutari[13] who showed statistically significant association (p<0.05) of acanthosis nigricans with obesity. A positive correlation was also noticed with skin tag, and stretch marks.