Obesity indices as a risk factor of skin diseases: A Case-control study conducted in Cairo, Egypt

Raed M Alazab[1], Abdel Raouf M Almohsen[2]

[1]Professor of Environmental and Occupational medicine, Department of Community Medicine and Occupational Medicine;
[2]Professor of Dermatology, Venereology and Andrology; Faculty of Medicine, Alazhar University, Cairo, Egypt.

Abstract

Overweight and obesity are two major health problems that have been recognized worldwide which affect all ages and have many negative health effects. WHO in year 2010 reported that in Egypt the prevalence of overweight among women is 76% compared to 64.5% for male while the prevalence of obesity among women is 48% compared to 22% for male. The aim of the study was to determine the most prevalent skin diseases among the studied overweight and obese patients and to examine if overweight and obesity are risk factors for skin diseases. A case-control was carried out on 250 overweight and obese patients compared with another 250 normal weight patients as controls. The participants were selected from the outpatient dermatology clinic of Al Hussein University hospital, Faculty of medicine, Alazhar University, Egypt. All patients were subjected to medical history, clinical dermatological examination and measurement of obesity indices. The most prevalent skin diseases among the studied cases were: striae (68.4%), planter hyperkeratosis (61.6%), skin tags (61.2%), acanthosis nigricans (53.6%), intertrigo (53.6%), tinea pedis (41.2%) with statistical significance difference compared to controls. As a result, overweight and obesity might be a risk factor for some skin diseases. Dermatologists must work with primary health care physicians and nutritional specialists to reduce incidence of obesity or reduce the effects of obesity on the skin.

Keywords: Obesity, risk factors, Skin diseases, Case-control study, Egypt.

Introduction

The World Health Organization (WHO) defines overweight and obesity as 'abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) – the weight in kilograms divided by the square of the height in meters (kg/m^2) – is a commonly used index to classify overweight and obesity in adults.[1] WHO defines overweight as a BMI equal to or more than 25, and obesity as a BMI equal to or more than 30.[1] WHO global estimates in 2008 indicated that more than 1.4 billion adults, 18 years and older were overweight and more than half a billion were obese and the prevalence of obesity has nearly doubled globally between 1980 and 2008. Once associated with high-income countries, obesity is now also prevalent in low- and middle-income countries and at least 2.8 million people each year dies as a result of being overweight or obese.[1] Australia, UK, and USA among high-income countries while Mexico, Egypt and South Africa among lower- and middle-income countries have the higher number of overweight and obese people.[2] It is estimated that in 2030 an estimated 2.16 billion adults worldwide will be overweight and 1.12 billion will be obese.[3]

Obesity has become an epidemic in many parts of the world. WHO has warned of the escalating epidemic of obesity that could put the population in many countries at risk of developing long-term non-communicable diseases (NCD). Available studies in the Eastern Mediterranean countries indicated that obesity had reached at an alarming level among both children and adults.[4] In Egypt,

Practice Points

- Dermatological changes have been reported in patients with obesity.

- The most common skin diseases among obese patients were striae, planter hyperkeratosis, skin tags, acanthosis nigricans, intertrigo, tinea pedis.

- The odds ratio of the following diseases in obese patients were: planter hyperkeratosis (42.9), intertrigo (16.9), striae (14.7), varicose vein (14.3), skin tag (8.5), psoriasis (4.03) and hirsutism (3.9).

- Statistical significance difference were noted between obese patients and control groups in tinea pedis, planter wart , striae, intertrigo, skin tag, planter hyperkeratosis,varicose vein, hirsutism and psoriasis.

- Dermatologists must work with primary health care physicians and nutritional specialists to reduce incidence of obesity or reduce the effects of obesity on the skin.

2010 WHO estimated the prevalence rate of overweight among women was 75.3% compared to 60.4% for male, and the prevalence of obesity among women is 44.5% compared to 21.4% for male.[5]

Correspondence: Prof. Raed M Alazab, Department of Community Medicine and Occupational Medicine, College of Medicine, Alazhar University, Cairo, Egypt. Email: raedelazab@hotmail.com

Obesity is a health problem of considerable magnitude in the western world. Dermatological changes have been reported in patients with obesity, including: acanthosis nigricans and skin tags (due to insulin resistance), hyperandrogenism, striae due to over extension, stasis pigmentation due to peripheral vascular diseases, lymphedema, pathologies associated with augmented folds, morphologic changes in the foot anatomy due to excess load, and complications that may arise from hospitalization.[6]

The aim of the present study were to determine more prevalent skin diseases among the overweight and obese patients people and to examine if overweight and obesity are risk factors for skin diseases.

Materials and methods

Type of the study:

A case-control study was conducted during the period from February 2012 to April 2013. This study was carried out on 250 overweight or obese patients as a cases group and another 250 normal weight patients were included as a control group.

Sample size estimation of the studied patients:

The sample size was estimated by using program Epi Info version 7.1.2.0, 2013, CDC, USA. The following are data used to calculate the minimum sample size required: confidence level (99.9%), power (80%), and ratio of control: cases (1:1), percentage of control exposed (40%) and odds ratio (2.25). Minimum sample size estimated was 222 per each group of cases and controls. Sample size increased by about 10% to over-come non-responses.

Place and Selection of patients:

All patients of the study were selected from the outpatient dermatology clinic of Al Hussein University hospital, Faculty of medicine, Alazhar University, Egypt. Exclusion criterion included were: patients below age of 18 years and any patient with any diseases other than dermatological origin.

Sampling technique:

A simple random sampling technique was used to select the included cases and controls. The outpatient clinic was visited 5 days/week (from 9am to 12pm) for a period of 8 months. All cases and controls who met the inclusion criteria were taken into a list. They were numbered chronologically using a random table and a total of 500 (250 cases and 250 controls) respondents were selected.

Ethical consideration:

The protocol of the study was first presented to the staff of the Department of Dermatology, Venereology and Andrology, Faculty of Medicine, Alazhar University and then the department approved the study. Finally, the protocol was got ethical clearance from the Committee of Medical Ethics at Faculty of Medicine, Alazhar University. An oral consent from every participant was taken for participation in the study. Ethical guidelines on research produced by the *Declaration of Helsinki* (updated 2008) was considered and applied during the period of the study.

History/Physical examination:

All patients were subjected to the following:

i. Medical history:

- Personal history including: age, sex, residence, marital status and occupation.

- Present and past history: to exclude any non-dermatological disease.

ii. Obesity measurements:

Weight: Subjects were weighed in kilograms.

Height: Standing body height in meter (BH) was measured without shoes with the shoulders in relaxed position and arms hanging free.

Body mass index (BMI): which is calculated by dividing a patient's weight by his squared height (kg/m^2). The following categories were used: The normal weight patients (body mass index (BMI) less than 25), the overweight patient (body mass index (BMI) equal to 25 -29.9) and the obese patient (body mass index (BMI) equal to or higher than 30), obese group was further divided into three BMI classes: class I (BMI 30–34.9), class II (BMI 35–39.9) and class III (BMI ≥40).[1]

Waist circumference: The range of normal, high and very high waist circumference among male and female participants are shown in Table 1. During the examination, the individual stand with feet close together, arms at the side and body weight evenly distributed, and relaxed, and the measurement taken at the end of a normal expiration, the tape measure placed directly on skin, waist circumference measured at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest.[8]

Hip circumference: Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor.[8]

Waist/Hip ratio:

This was calculated by dividing a patient's waist circumference by their hip circumference (Table 2).[8]

Table 1: Range of waist circumference among male and female participants

Sex	Waist circumference		
	Normal	High	Very High
Male	< 94	94 – 102	≥ 102
Female	< 80	80 – 88	≥ 88

Table 2: Acceptable and non-acceptable Waist/Hip ratio among male and female participants[8]

Sex	Acceptable		Non Acceptable		
	Excellent	**Good**	**Average**	**High**	**Extreme**
Male	0.83	0.85 – 0.90	0.90 – 0.95	0.95 – 1.00	> 1.00
Female	0.75	0.75 – 0.80	0.80 – 0.85	0.85 – 0.90	> 0.90

iii. Complete dermatological examination:

The examination was conducted using the following as per guidelines:[7]

- Observing the overall appearance of the patient and skin. Is the patient healthy or ill-appearing? Is there an abnormal color to the skin?

- Inspecting each part of the body. A head-to-toe approach was done:

    ♦ Scalp and hair: If the patient has a full head of hair, we may need to part it in several areas to see the scalp well. Hair bands should be removed so that the hair is loose.

    ♦ Face, including eyes, nose, and mouth: In the nose, examine the outer nostrils and the nasal septum (using a flashlight). Mouth findings are often subtle and we should always use a flashlight here. The patient was advised to move the tongue to either side so that the inner cheeks can be visualized; also inspection of the palate and all surfaces of the tongue were done

    ♦ Ears and neck: Inspection of the outer ear, the external ear canal and behind the ears. After examining the neck, feel for any enlarged lymph nodes locally, as well as elsewhere.

    ♦ Chest and abdomen: Inspection of the axillae and under the breasts, and in skin folds of obese patients.

    ♦ Back and buttocks: Examining the intergluteal cleft and perianal region.

    ♦ Arms, hands, fingernails: Inspection of the sides of the fingers and web spaces, and distinguish lesions on the dorsum of the hand from those on the palms. When examining nails also looking at the surrounding (periungual) area and the cuticles.

    ♦ Legs, feet, toenails: The groin folds was inspected at this time. Examining the feet in the same manner as the hands, including interdigital areas and the soles.

    ♦ Genitalia. Inspection of the pubic area and labia in women, and the pubic area, scrotum and penis in men.

Statistical analysis:

Analysis of data was conducted by using Epi info program on Microsoft windows of personal computer.

The collected data were coded, entered, analyzed and tabulated. Range, Mean ± SD, t test, odds ratio (OR) and chi^2 were the statistical methods used during the analysis of data of the present study. A *p* value <0.05 was considered as the accepted level of significance.

Results

The socio-demographic characteristics of the studied subjects are shown in Table 3. It was found that 14% and 15% of cases and controls were males respectively (*p*>0.05) although the age range of both groups was 18 to 60 years old. Majority of the studied subjects in both groups were married, house wives and nonsmokers.

Table 4 shows that the most common skin diseases among cases were tinea pedis (41.2%), hair dandruff (26.8%), striae (68.4%), intertrigo (53.6%), skin tag (61.2%), planter hyperkeratosis (61.6%), and acanthosis negricans (53.6%). Among the controls, the common skin diseases included: hair dandruff (28%), acne (14%), tinea pedis (18%), callosity (11.2%), striae (12.8%) and skin tag (15.6%). It was found that Odds ratio of the following diseases in cases were; planter hyperkeratosis (42.9), intertrigo (16.9), striae (14.7), varicose vein (14.3), skin tag (8.5), psoriasis (4.03) and hirsutism (3.9).

Table 5 shows the following measurements among the cases: mean BMI 32.4±4.2; mean hip circumference, male 104.5±0.6 and female 92.9±0.2; mean waist circumference, male was 98.9±0.2 and female was 91.3±0.3; and mean Waist/Hip ratio, male 0.94±0.02 and female 0.86±0.2. The measurements among controls were: mean BMI 22.4±1.6; mean hip circumference, male 92.9±0.9 and female 95.3±0.1; and mean waist circumference, male 82.2±0.3; female 75.9±0.2; and mean Waist/Hip ratio, male 0.88±0.1 and female was 0.79±0.3. It was found that there was statistical significance difference between both groups as regards all obesity measurements.

Table 6 shows the comparison between controls and every category of BMI. It was observed that there was statistical significance difference between cases and control groups as regards the following skin diseases: tinea pedis (*p*-0.00) in categories of overweight, obese class 1 and obese class 2; planter wart (*p*-0.01) in categories of obese class 1; striae (*p*-0.00), intertrigo (*p*-0.00), skin tag (*p*-0.00), planter hyperkeratosis (*p*-0.00),varicose vein (*p*-0.00), hirsutism (*p*-0.00) in categories of overweight, obese class 1 and obese class 2; and psoriasis in categories of overweight and obese class 2 (*p*-0.00) and in obese class 1 (*p*-0.01).

Table 3: Socio-demographic characteristics of the studied groups

Socio–Demographic	Cases group N=250	Control group N=250	*p*-value
Age			
Range (years)	25-60	18-60	0.00*
Mean± SD	39.2±6.8	33.4±7.8	
Sex			
Male	36 (14.4%)	38 (15.2%)	0.8
Female	214 (85.6)	212 (84.8%)	
Marital status			
Married	242 (96.8%)	174 (69.6%)	0.00*
Single	8 (3.2%)	76 (30.4%)	
Occupation			
House wife	165 (66.0%)	126 (50.4%)	
Housekeeper	23 (9.2%)	4 (1.6%)	
Student	3 (1.2%)	54 (21.6%)	
Technician	0 (0%)	3 (1.2%)	
Accountant	6 (2.4%)	9 (3.6%)	0.00*
Plummer	7 (2.8%)	5 (2%)	
Employee	34 (13.6%)	32 (12.8%)	
Worker	4 (1.6%)	11 (4.4%)	
Electricity technician	8 (3.2%)	6 (2.4%)	
Smoking			
Smokers	36 (14.4%)	38 (15.2%)	0.8
Non smokers	214 (85.6%)	212 (84.8%)	

*Significant

Discussion

The present study found that the most prevalent skin diseases among cases group included striae (68.4%, OR 14.7), planter hyperkeratosis (61.6%, OR 42.9), skin tags (61.2%, OR 8.5), acanthosis nigricans (53.6%, 0.0% among controls), intertrigo (53.6%, OR 16.9), and tinea pedis (41.2%, OR 3.2) (Table 4).

The striae (68.4%), the most prevalent disease, might be related to excessive tension on the skin caused by excessive body weight.[18] However, a higher prevalence rate was observed among obese adults in Mexico (89%),[8] but a lower prevalence was reported in studies a Taiwan (40%)[9] and Kuwait (23.3%).[10] These variation could be attributed to different sample size, ethnic groups or female to male ratio among the studied cases.

It was noticed in the present study that the prevalence rate of planter hyperkeratosis was ranked as the second most common skin disease (61.6%. It is considered as a stigma of morbid obesity resulting from the effect of the pressure of excess weight. It was found that the prevalence rate of planter hyperkeratosis in the present study lower than that reported among obese adults in Mexico (75.2%)[8] but higher than those shown in Brazil (46.7%),[11] and Kuwait (45.1%).[10] Skin tags (61.2%) in the present study were found to be lower than that reported among obese adults in the USA (74%),[12] but higher than those shown in Brazil (47.94%),[11] and Kuwait (30%).[10]

Acanthosis nigricans (hyperpigmented velvety cutaneous thickening affecting localized areas of the skin) is frequently associated with obesity, endocrinopathies, malignancy, genetic syndromes and some drugs use.[13] Acanthosis nigricans in the present study was prevalent among 53.6% of the studied group, which was lower than the findings from studies conducted in Brazil (76%),[11] USA (74%),[12], and Mexico (64.2%),[8] but higher than those found in Kuwait (33%)[10], and Saudi Arabia(14.1%).[15] This variation in prevalence rate might be attributed to the variation of age groups and the severity of obesity among the subjects of the mentioned studies. The prevalence rate of intertrigo (53.6%) was higher than the findings observed in Iraq (52%),[16] Brazil (44.7%),[11] and Kuwait (22.2%).[10]

The present study found that the prevalence of tinea pedis was (41.2%) however, a lower prevalence rate (1.9%) was reported in a study in USA. Patients were randomly invited to have an additional examination of their feet, obesity was one of the three most prevalent predisposing factors among the examined patients.[24] The prevalence rate of hair dandruff (26.8%) among cases group was higher than what was reported in Saudi Arabia study (23.8%)[15] and hirsutism (15.2%) was lower than the findings observed in Kuwait (15.8%).[10] It was observed in one study that the facial hirsutism is significantly correlated with BMI independently of age and testosterone level.[17] They demonstrated that 74 of the obese patients were diagnosed as having polycystic ovary syndrome, 69 of them were hirsute, 43 also had acne, and 26 had acanthosis nigricans.[17]

The prevalence of superficial varicose vein in the present study was (14.8%); a study in Belgrade comprised 1116 subjects with primary chronic superficial varicose veins; 384 (34.4%) men and 732 (65.6%) women found that; 464 (41.6%) were normal-weight patients, 476 (42.7%) were overweight and 176 (15.8%) were obese.[25]

Table 4: Prevalence of skin diseases among the studied groups

Skin Diseases	Cases group N=250	Control group N=250	chi-square	p-value	Test of significance
Planter wart	4 (1.6%)	21 (8.4%)	25.0	0.00*	0.2
Vitilligo	0 (0%)	4 (1.6%)	N/A	-	-
Acne	28 (11.2%)	35 (14%)	0.89	0.34	0.9
Tinea pedis	103 (41.2%)	45 (18%)	32.29	0.00*	3.2
Hair dandruff	67 (26.8%)	70 (28%)	0.09	0.76	0.9
Generalized hair falling	4 (1.6%)	19 (7.6%)	10.25	0.00*	0.2
Scabies	4 (1.6%)	18 (7.2%)	9.32	0.00*	0.2
Callosity	29 (11.6%)	28 (11.2%)	0.02	0.88	1.04
Milaria	0 (0%)	3 (1.2%)	N/A	-	-
Striae	171 (68.4%)	32 (12.8%)	160.23	0.00*	14.7
Intertrigo	134 (53.6%)	16 (6.4%)	132.61	0.00*	16.9
Tinea versicolour	0 (0%)	2 (0.8%)	N/A	-	-
Skin tag	153 (61.2%)	39 (15.6%)	109.88	0.00*	8.5
Tinea corporis	0 (0%)	2 (0.8%)	N/A	-	-
Planter hyperkeratosis	154 (61.6%)	9 (3.6%)	191.38	0.00*	42.9
Hair pediculosis	4 (1.6%)	12 (4.8%)	4.13	0.00*	0.3
Hidradenitis suppurativa	3 (1.2%)	0 (0%)	N/A	-	-
Acanthosis negricans	134 (53.6%)	0 (0%)	N/A	-	-
Lymphedema	13 (5.2%)	0 (0%)	N/A	-	-
Onychomycosis	2 (0.8%)	0 (0%)	N/A	-	-
Superficial Varicose vein	37 (14.8%)	3 (1.2%)	31.41	0.00*	14.3
Hirsutism	38 (15.2%)	11 (4.4%)	16.49	0.00*	3.9
Ptyriasis rosea	2 (0.8%)	2 (0.8%)	N/A	-	-
Alopecia areata	2 (0.8%)	5 (2%)	1.30	0.25	0.4
Psoriasis	26 (10.4%)	7 (2.8%)	11.71	0.00*	4.03
Plane wart	0 (0%)	1 (0.4%)	N/A	-	-
Tinea cruris	3 (1.2%)	3 (1.2%)	N/A	-	-
Urticaria	0 (0%)	4 (1.6%)	N/A	-	-
Hyperhydrosis	0 (0%)	2 (0.8%)	N/A	-	-
Folliculitis	4 (1.6%)	0 (0%)	N/A	-	-
Contact dermatitis	1 (0.4%)	0 (0%)	N/A	-	-

OR: Odds Ratio

The prevalence of acne in the present study was (11.2%), which was lower than what were reported in the Kuwait (21.5%),[10] Mexico (25.1%),[6] and Saudi (19.4%)[15] studies. The authors of the Saudi study concluded that acne was associated with insulin resistance and hyperandrogenism and was the most common skin condition among the overweight and obese schoolchildren.[15]

The prevalence rate of psoriasis in the present study was (10.4%), which was lower than what reported from Brazil (13.2%),[11] but higher than those shown in Kuwait (6.4%).[10] It was found in a 10-year study that elevated BMI (>25) was significantly associated with long-term prognosis of psoriasis[19] while Naldi *et al.*,[20] reported that clinical obesity (BMI >29) formulate more than double the risk of psoriasis. Psoriasis has been recognized as a systemic disease associated with meta-bolic syndrome, type-2 diabetes, dyslipidemia, hyper-tension and obesity. There is also evidence that being overweight is a risk factor for the onset of psoriasis and that the BMI is correlated with the PASI (Psoriasis Area and Severity Index).[21,22]

The prevalence of lymphedema in the present study was (5.2%), which was lower than what was reported from

Brazil (12.32%)[11]. This could be explained with the lower number of cases of obesity grade 3 among cases group (10%) and no cases among control group. It was conclude in a French study that morbid obese patients showed the positive correlation between obesity and lymphedema.[23]

The study has also a number of limitations. All cases and controls were residents at one area surrounding the university hospital (where the cases and controls were selected) and also nearly of the same socioeconomic status, so the findings of the study should be generalize with caution. The study also conducted with a small sample size. Large-scale multi-centered follow-up studies should be conducted to identify the skin diseases and related complications among obese patients.

Conclusion

Overweight and obesity might be a risk factor for some skin diseases. The most common skin diseases among obese patients were striae, planter hyperkeratosis, skin tags, acanthosis nigricans, intertrigo, tinea pedis. The odds ratio of the following diseases in obese patients were: planter hyperkeratosis (42.9), intertrigo (16.9), striae (14.7), varicose vein (14.3), skin tag (8.5), psoriasis (4.03) and hirsutism (3.9). Statistical

Table 5: Obesity measurements among the studied groups

Obesity measurements	Cases group N=250	Control group N=250	Test of significance	*p*-value
Weight (kg)				
Range	64 : 118	50 :78	T test = 33.0	0.00*
Mean ±SD	90.2 ±11.8	62.9 ±5.6		
Height				
Range	154 :179	157:179	T test = 2.3	0.00*
Mean ±SD	166.7 ±4.4	167.8 ±5.8		
BMI				
Average	0	250 (100%)		
Overweight	80 (32%)	0		
Obese 1	98 (39.2%)	0		
Obese 2	47 (18.8%)	0	T test = 35.4	0.00*
Obese 3	25 (10%)	0		
Range	25.1 :43.9	18.6 :24.9		
Mean± SD	32.4 ± 4.2	22.4 ±1.6		
Hip circumference				
Male	N = 36	N = 38		
Range	95 :111	88 :99	T test = 24.0	0.0*
Mean ± SD	104.5 ±0.6	92.9 ± 0.9		
Female	N = 214	N = 212		
Range	94 : 127	90 : 98	T test = 50.0	0.0*
Mean ± SD	99.9 ±0.2	95.3 ±0.1		
Waist circumference				
Male	N = 36	N = 38		
Range	89 : 108	79 : 88	T test = 36.0	0.0*
Mean ± SD	98.9 ± 0.2	82.2 ± 0.3		
Female	N = 214	N = 212		
Range	78 : 108	70 : 82	T test = 23.0	0.0*
Mean ± SD	91.3 ±0.3	75.9 ± 0.2		
Waist/Hip ratio				
Male	N = 36	N = 38		
Range	0.89 : 0.99	0.81 : 0.91	T test = 7.1	0.01*
Mean ± SD	0.94 ± 0.02	0.88 ± 0.1		
Female	N = 214	N = 212		
Range	0.78 :0.93	0.74 :0.87	T test = 6.1	0.03*
Mean ± SD	0.86 ± 0.2	0.79 ± 0.3		

*Significant

Table 6: Distribution of Skin diseases among cases group according to BMI in comparison to control group

Skin diseases	Control	Cases			
	Average BMI N =250	Overweight N = 80	Obese class 1 N = 98	Obese class 2 N = 47	Obese class 3 N = 25
Planter wart	21 (8.4 %)	3 (3.75%)	1 (1.02%)*		0
Vitilligo	4 (1.6%)	0	0	0	0 (0%)
Acne	35 (14%)	13 (16.25%)	7 (7.14%)	6 (12.8%)	2 (8%)
Tinea pedis	45 (18%)	38 (47.5%)*	39 (39.8%)*	18 (38.3%)*	8 (32%)
Hair dandruff	70 (28%)	21 (26.25%)	25 (25.5%)	13 (27.66%)	8 (32%)
Striae	32 (12.8%)	39 (48.75%)*	75 (76.5%)*	37 (78.7%)*	20 (80%)*
Callosity	28 (11.2%)	13 (16.25%)	7 (7.14%)	6 (12.76%)	3 (12%)
Intertrigo	16 (6.4%)	31 (38.75%)*	59 (60.2%)*	29 (61.7%)*	15 (60%)*
Tinea versicolour	2 (0.8%)	0	0	0	0
Skin tag	39 (15.6%)	49 (61.25%)*	58 (59.18%)*	31 (65.96%)*	15 (60%)*
Hidradenitis suppurativa	0	0	2 (2.04%)	1 (2.13%)	0 (0%)
Acanthosis negricans	0	15 (18.75%)	67 (68.37%)	32 (68.1%)	20 (80%)
Lymphoedema	0	2 (2.5%)	5 (5.1%)	4 (8.5%)	2 (8%)
Superficial varicose vein	3 (1.2%)	12 (15%)*	13 (13.26%)*	7 (14.89%)*	5 (20%)0*
Hirsutism	11 (4.4%)	17 (21.25%)*	10 (10.20%)*	8 (17.02%)*	3 (12%)
Psoriasis	7 (2.8%)	9 (11.25*	9 (9.18%)*	7 (14.89%)*	1 (4%)
Folliculitis	0	1 (1.25%)	2 (2.04%)	1 (2.13%)	0

*Significant

significance difference were noted between obese patients and control groups in tinea pedis, planter wart, striae, intertrigo, skin tag, planter hyperkeratosis, varicose vein, hirsutism and psoriasis. Dermatologists must work with primary health care physicians and nutritional specialists to reduce incidence of obesity or reduce the effects of obesity on the skin.

Conflict of interest

The authors declare no conflict of interest.

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