Original Research Article

Dermal Manifestations Among Obese and Normal Individuals Visiting Dermatology OPD of Tertiary Care Hospital–Analytical Cross-Sectional Study

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Abstract

Background: Obesityis considered one of the major healthproblems inthe world and acts as a risk factor for many diseases, including dermatological problems. Research on skin diseases affecting obese patients is scarce.**Aims**: Here, we aimed to determine the dermal manifestations in obese patients compared with the controls.**Methods:** The present cross-sectional study was carried for 12 months from December 2019 to 2020 on 200 adults who were divided into two groups; the study group(100) and the control group (100). A detailed clinical examination was done, including weight, height, body mass index (BMI), blood pressure, waist circumference, and demographic data. A thorough dermatological examination was also done, and all the information was recorded in a proforma and was analyzed using the coGuide, considering p value <0.05 as significant.**Results:** The mean BMI in the obese patients and the control group was 34.64±4.37 kg/m2 and 22.23±1.3 kg/m, respectively. The mean difference of age between the study group(43.07±8.35) and the control group (42.02±11.89) was statistically not significant (p value 0.471). The difference in skin manifestations like acanthosis nigricans,acrochordons, keratosis pilaris, plantar hyperkeratosis, striae distensae, bacterial folliculitis, etc., was found to be a significant p value of <0.005 for the obese group than the control group.**Conclusion:** The findings of the present study suggested a high prevalence of dermal manifestations in the obese group than controls.

Keywords: Obesity, body mass index, skin manifestations, overweight.

Introduction

The incidence of obesity increased at a breath-taking pace, with one-fifth of children and one-third of adults suffering from this global pandemic in India, affecting social, economic, and health-related ramifications. All the national initiatives and/or programs to restrict obesity have been unsuccessful. The central factor leading to metabolic syndrome development is obesity, which results from higher energy intake and less expenditure.Western diet, oxidative stress,microbiome, and chronic inflammation are a few of the mediators leading to obesity.[1]More than 1.9 billion adult population was overweight, among which 650 million were obese according to 2016 data. About 39% of adults around 18 years of age were overweight, and 13% were obese.[2]Despite the fact that obesity is a global phenomenon, India is unique in this aspect as it has to struggle with both over and under-nutritionsimultaneously. Obesity is one of the major waves in new world syndrome defined as a cluster of non-communicable diseases and is considered as one of the most neglected global public health problems,described by The World Health Organization. About 17% of the world's population is from India, which is the second-most populous country that also contributes to 16% of the world's deaths.[3]In the 21st century, a significant number of obese patients attending dermatology OPD (outpatient department) increased, making obesity a major epidemic of the century.[4]Comorbidities such as cardiovascular diseases, cancer, diabetes mellitus (DM), and orthopedic problems are increased due to obesity resulting in a mortality rate of 20%. The barrier function of skin, sebum production, sweat glands, lymphatics, the structure of collagen and function, wound healing, and microcirculation is affected due to obesity, which is closely associated with many dermal manifestations.[5]Acanthosis nigricans, acrochordons, keratosis pilaris, hyperandrogenism and hirsutism, striae distensae, adiposis dolorosa, fat redistribution, lymphedema, plantar hyperkeratosis, cellulitis, and skin infections are all wide spectrum of dermatologic diseases considered as the cutaneous stigma of severe obesity.The risk of psoriasis is increased when fat increases, and it can be prevented by reducing weight in obesity.[6] Boza et al.,[7],reported that dermatoses like striae ($p < 0.001$), plantar hyperkeratosis ($p < 0.001$), acrochordons, bacterial infections ($P = 0.05$) were statistically significant in obesity, compared with the control group and be correlated with the degree of obesity.A study by Purim et al.[8], reported that the most frequent dermatoses among obese were acanthosis nigricans, acrochordon (skin tags), stretch marks, and plantar keratodermia, intertrigo, bacterial and fungal infections. Currently, there are several studies evaluating dermal lesions in obese; although, studies in India evaluating the effect of skin manifestations in obese and normal individuals are limited. With this background, the present study aimed to evaluate various skin manifestations in obese and normal patients visiting a tertiary care hospital's dermatology department.

Aims and objectives

To compare various skin manifestations in obese and normal patients visiting the dermatology department of a tertiary care hospital.

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Methodology

Study design: An analytical cross-sectional study.

Source population: Subjects visiting dermatology department of tertiary care hospital.

Study population: Obese subjects with skin manifestations and normal controls visiting dermatology department of tertiary care hospital.

Study period: Twelve months from December 2019 to December 2020.

Sample size and sampling technique: One hundred obese subjects and 100 non-obese subjects constituting the control group were selected according to inclusion criteria by convenience sampling method**.**

Selection of the study group and control group: One hundred patients with BMI ≥ 30 Kg/m² satisfying inclusion and exclusion criteria attending dermatology OPD were included in the study as cases. Also, patients referred from other departments with BMI ≥ 30 Kg/m² were included as cases in the present study. One hundred normal weight patients with BMI between 18.50-24.99 Kg/m² attending dermatology OPD were allocated randomly to the control group after age and sex match.

Body mass index (BMI) was calculated as:

Body mass index (BMI) = weight (in kg)/height² (in m²).

The obese group was further divided into three BMI classes:

- Class I (BMI 30.00-34.99 Kg/m²).
- Class II (BMI 35.00-39.99 Kg/m²).
- Class III (BMI ≥ 40.00 Kg/m²).

Inclusion criteria

1. Age >18 years.
2. All classes of obese individuals present with skin disease.
3. Patients were willing to participate in the study.

Exclusion criteria

1. Both males and females above 18 years of age.
2. Pregnant and breast-feeding women.
3. Obese patients with pre-existing skin disease.
4. All causes of secondary obesity like hypothyroidism, Cushing's syndrome,polycystic ovarian disease, etc.
5. All immune-compromised patients.

Ethical consent and informed consent

All the gathered data was considered confidential. All participants signed written informed consent. Moreover, subjects were assured about their rights to discontinue the study course. Ethical approval was taken priorly from the institutional review board of the concerned tertiary care center.

Data collection:A detailed history was taken, which included the onset, duration, and progress of the condition, history of similar complaints, history of any other underlying illness. A detailed clinical examination was done, including weight, height, BMI, blood pressure, waist circumference, and demographic data. A thorough dermatological examination was also done, and all the information was recorded in a proforma.

Following investigations were done:

Random blood sugar: Levels-70-100mg/dl.

Lipid profile: Total cholesterol 200mg/dl-normal, 201-240mg/dl-borderline, and >240mg/dl-high.

HDL 60mg/dl-normal, 40-59mg/dl-borderline, and <40mg/dl-high.

LDL<100mg/dl-normal, 130-159mg/dl-borderline, 160-189mg/dl-high, and 190mg/dl-very high.

A skin biopsy was done whenever the diagnosis was in doubt, following awritten consent for histopathological examination.

Statistical Methods: The dermatological examination was considered as the primary outcome variable.Baseline parameters like age,gender, history of diabetes mellitus,history of hypertension, BMI,obese class, and abdominal girth were considered other relevant variables.Visual inspection of histograms and normality Q-Q plots were used to check for normality,and the Shapiro-Wilk test p value of >0.05 was considered as the normal distribution.Independent sample t-test (cases/controls) was used to compare the mean values between study groups, and the chi-square test/Fisher's Exact test was used to compare categorical outcomes between study groups using the coGuide version 1.0 considering p value < 0.05 as significant.

Result

Two hundred subjects were included in the final analysis.The difference in means for age between the study group(43.07 ± 8.35) and the control group (42.02±11.89) was not significant (p value 0.471). The gender differencewasinsignificant, with p value of 0.189, with a majority of 67 (67%) female participants in the controls. The difference in the history of diabetes mellitus between the groups is significant, with p value of <0.001, with a majority of 46 (46%) participants in the study group. The difference in the history of hypertension among the groups wassignificant, with p value of 0.003, with a majority of 26 (26%) participants in the study group. The mean difference in BMI between cases and controls was significant (p value <0.001). In the study group, 59 (59%) were obese class I, 29 (29%) participants were obese class II, and 12 (12%) participants were obese class III. The mean difference of abdominal girth between groups was found to be significant (p value <0.001). The difference in lipid profile between the cases and controls is found to be significant with p value of <0.001, with the majority of 92 (92%) participants having abnormal in the controls group and 65(65%)in the study group (table 1).

The difference in major types of skin manifestations, like cellulitis, bacterial and fungal infections, etc., was significant with p value of <0.005between the study group and the control group.The difference was insignificant for hirsutism, necrotizing cellulitis, hidradenitis suppurativa with p value of >0.005. (Table 2).

Among the study group, 1(20%) participant had amyloidosis, diabetic bulla, freckles, lichen planus, and melasma for each as less common manifestations. Among control, 1(3.7%) participant had urticaria, acne vulgaris, aphthous ulcers, diabetic bulla, friction dermatitis, keloid, and leprosy. Each 3(11.11%) participant had acne, 4(14.81%) participants had contact dermatitis and eczema. Each 2(7.41%) participant had melasma and pityriasis versicolor (Table 3).

Table 1: Demographics data and prevalence of comorbidities in obese patients and controls (N=200)

Parameter	Study group		P value
	Study group (N=100)	Controls group (N=100)	
Age (in years) **(Mean± SD)**	43.07 ± 8.35	42.02 ± 11.89	0.471‡‡
Gender			
Male	58 (58%)	67 (67%)	0.189‡
Female	42 (42%)	33 (33%)	
History of diabetes mellitus	46 (46%)	11 (11%)	<0.001‡
History of hypertension	26 (26%)	10 (10%)	0.003‡
BMI (Kg/m2) **(Mean± SD)**	34.64 ± 4.37	22.98 ± 1.53	<0.001‡‡
Obese Class			
I	59 (59%)	0 (0%)	*
II	29 (29%)	0 (0%)	
III	12 (12%)	0 (0%)	

Normal	0 (0%)	100 (100%)	
Abdominal Girth (cms) **(Mean± SD)**	103.48 ± 8.62	84.08 ± 5.95	<0.001‡‡
Lipid Profile			
Abnormal	65 (65%)	92 (92%)	<0.001
Normal	35 (35%)	8 (8%)	<0.001

*due to 0 subjects in the cells, a statistical test was not applied-‡‡-Independent sample t-test ‡chi-square test

Table 2: Comparison of skin manifestations between the study group (N=200)

Parameter	Study group		P value‡
	Study group (N=100)	A control group (N=100)	
Acanthosis Nigricans	84 (84%)	14 (14%)	<0.001
Acrochordons	68 (68%)	6 (6%)	<0.001
Keratosis Pilaris	24 (24%)	3 (3%)	<0.001
Hirsutism	9 (9%)	1 (1%)	0.009
Plantar Hyperkeratosis	19 (19%)	2 (2%)	<0.001
Striae Distensae	53 (53%)	3 (3%)	<0.001
Cellulite	12 (12%)	1 (1%)	0.002
Chronic venous insufficiency	24 (24%)	7 (7%)	<0.001
Intertrigo	33 (33%)	9 (9%)	<0.001
Dermatophytosis	56 (56%)	13 (13%)	<0.001
Candidiasis	23 (23%)	7 (7%)	0.002
Bacterial Folliculitis	21 (21%)	5 (5%)	<0.001
Necrotising Cellulitis	4 (4%)	1 (1%)	0.369
Hidradenitis Suppurativa	9 (9%)	1 (1%)	0.009
Fissure Feet	36 (36%)	10 (10%)	<0.001
Psoriasis	4 (4%)	3 (3%)	1.000
Xerosis	17 (17%)	4 (4%)	0.003

‡Chi-square test

Table 3: Comparison of less common skin manifestations between the study group (N=32)

Others	Study Group ‡	
	Study group (N=5)	A control group (N=27)
A. Urticaria	0 (0%)	1 (3.7%)
Acne	0 (0%)	3 (11.11%)
Amyloidosis	1 (20%)	0 (0%)
Aphthous Ulcers	0 (0%)	1 (3.7%)
Contact dermatitis	0 (0%)	4 (14.81%)
Diabetic Bulla	1 (20%)	1 (3.7%)
Eczema	0 (0%)	4 (14.81%)
Freckles	1 (20%)	0 (0%)
Friction Dermatitis	0 (0%)	1 (3.7%)
Keloid	0 (0%)	1 (3.7%)
Leprosy	0 (0%)	1 (3.7%)
Lichen planus	1 (20%)	0 (0%)
Melasma	1 (20%)	2 (7.41%)
P. Versicolor	0 (0%)	2 (7.41%)

* due to 0 subjects in the cells, a statistical test was not applied- ‡Chi-square test

Discussion

The study aimed to evaluate various skin manifestations in obese and normal adult patients visiting the dermatology unit of a tertiary care setting in India. The findings of the present study reported a strong association between obesity and dermatological diseases.The mean BMI in the obese control group was 34.64±4.37 Kg/m^2 and 22.23±1.3 Kg/m^2. The mean difference of age between the study group (43.07±8.35) and the control group (42.02±11.89) was statistically not significant (p value 0.471). The difference in the history of diabetes mellitus and hypertension between the groups is found to be substantial with p value of <0.001, with a majority of 46 (46%) participants belonging to the study group. Among the study group, 59 (59%) were obese class I, 29 (29%) participants were obese class II,and 12(12%) participants were obese class III. The difference in lipid profile between the cases and controls is found to be significant with p value of <0.001, with 92 (92%) participants having abnormal lipid profile in the controls group and 65(65%)in the study group. The difference in all types of skin manifestations reported in results was found to be significant, with p value of <0.005 between the study group and control group.The findings of the present study is in contrast to a study done by Nino et al.[9]·who conducted a similar case control study among obese and normal children. The results by Nino et al.[9] reported that age of onset, duration, and severity of the underlying disease is directly associated with obesity and the incidence increases further when obesity is associated with diabetes and/or insulin resistance syndrome. The findings were also in concordant to a study reported on obese children by Gupta et al.[10] The results from this study were similar to an analysis performed by Boza *et al*., [7]who reported that striae, plantar hyperkeratosis, acrochordons, intertrigo, pseudoacanthosis nigricans, keratosis pilaris, lymphedema, and bacterial infections showed a statistically significant relationship with obesity, compared with the control group.Acanthosis nigricanswas the most frequent skin disorder in both the groups, 84% and 14%, which is in comparison to a study by Plascencia Gómez et al.[11] where they reported (97%) acanthosis in overweight and obese patients. In the present study,68 (68%) of acrochordons are seen in the study group, which can be compared to a study by Hui et al.[12]· where they reported high prevalence and acrochordons. The presence of striae cutis distensaeis linked to obesity. (53%) of them had striae in the present study, which is higher than that reported in other studies by Ahmed Asim et

al.[13]which showed a prevalence of 51%.The etiology of striae is yet to be defined, and at present, the treatment options are limited and unsatisfactory.The presence of acne has been linked to being overweight. Several studies by Halvorsen et al.[14] have now confirmed a link between high BMI and acne, which is, in contrast,to the present study as the frequency of acne in our study was 3 (11.11%) in the control group. Hirsutism was also a common manifestation in our study group 9 (9%), which is in comparison to Gupta et al.[10] where a correlation was seen between obesity and hirsutism.According to a few reviews of literature,dry skin and skin manifestations increase with age that decreases stratum corneum hydration, and increased transepidermal water loss (TEWL).[15] The present study did not consider aging like physiological skin changes in obese and normal individuals. In contrast, there was a study on Japanese obese-diabetes patients, reported by Ai Ibuki et al.[16] where they examined aging-like skin physiological changes. Keratosis pilaris was present in 24 (24%) cases and 3(3%) control.In the present study, an increase in the incidence of bacterial and fungal infections was noted, which was similar to several previous studies. Plantar hyperkeratosis was present in 19 (19%)cases and 2(2%) control. Fissure foot was present in 36 (36%) cases and 10(10%) controls. All these findings are in concordant with a study conducted on 100 obese patients by Nisha et al.[17]In the present study, only 4% in the study group had psoriasis, which was not statistically significant. This finding was in comparison to a study by Uzma Ahsan et al.[18] where the association of psoriasis($p>0.05$) with obesitycould not be established, maybe due to less sample size and also due to the inclusion of only obese population rather than considering psoriasis patients. The finding was in contrast to Armstrong et al. in 2012[19], where anincreased prevalence and incidence of obesity was seen in patients with psoriasis.The association of psoriasis with obesity was also reported in previous literature.[20]All the findings of the present study are in comparison to a population based study done by Mirmirani et al. on children.[21] which stated that obesity in children results in hyperproliferation and inflammation of skin, bacterial and fungal infection, and mechanical changes but lesser androgen excess and viral infection which is more in adults.

Limitations

The major limitation was a study period of 12 months as we could not follow up with the patients for severity. The sample was single hospital-based, which cannot be generalized to the population.The sample size was also small, and hence the findings may not be conclusive.We did not view the site of skin manifestation,which can give biased results.Therefore, we recommend conducting studies, including a large sample considering the co-existence of comorbidities with obesityin a large geographical area to establish a definite conclusion.

Conclusion

The study concluded that obese patients suffer from dermatologic problems and are commonly associated with other comorbidities affecting the quality of life. In the present study, the prevalence of dermal manifestations was seen in both groups, but it was significantly high for the obese group compared to controls.As the incidence of obesity increases, so will the accompanying conditions.A multidisciplinary approach by the primary care physician, dermatologist, and other specialties of health care is required to reduce harmful effects and complications of obesity.

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