Cutaneous Manifestation of Obesity among Sudanese Patients in Khartoum Dermatology Hospital
University of Bahri - Khartoum, Sudan

Dr. Nada Ali Bahafizalla¹, Dr. Siham Mohamd Osman Gritly²

¹MD Dermatologist

Abstract: The impact of obesity on the skin has received very little attention mainly in Sudan. The aim were to investigate the relationship between overweight/obesity and some of the dermatological manifestations and to identify skin conditions associated with BMI and the relation between waist to hip circumference and dermatological diseases in Khartoum dermatology and STIs Teaching Hospital patients. Study design it is a cross-sectional hospital based descriptive and analytical study. Methods Selective sample from fifty patients was chosen from Khartoum Teaching Hospital of Skin and Venereal Diseases. Measurements and all the medical assessments were done by the researcher. Result this study indicated high association between body mass index and planter hyperkeratosis (p value 0.03) and between W/H ratio and planter hyperkeratosis among female patients at p value=0.032 but not among male. High association was found between W/H ratio and intertrigo disease among male patients but not among female. Positive associations were observed between W/H ratio hirsutism and acne among female patients (p value .003, .002). We concluded that the increase in Body Mass Index and waist to hip circumferences are associated with increase in some of the dermatological diseases. More attention should be imposed on the weight control and management programs.

Keywords: Cutaneous Manifestation, Body Mass Index, Obesity, Overweight, Waist to Hip Ratio

1. Background

Although obesity is recognized as a major public health problem and is increasing in prevalence mainly in western regions, however little attention has been paid to the impact of obesity on the skin in Sudan. There is lack of reliable information concerning the impact of obesity on the skin, including skin physiology, skin manifestations of obesity, and dermatologic diseases in developing countries. Obesity in the developing world can be seen as a result of a series of changes in diet, physical activity, health and nutrition, collectively known as the nutrition transition. As poor countries become more prosperous, they acquire some of the benefits along with some of the problems of industrialized nations [1]. This research aimed to study the relation between overweight and various dermatological conditions in Khartoum dermatology and STIs teaching hospital and to identify skin conditions associated with BMI as well as to identify the relation between waist to hip circumference and dermatological diseases.

2. Obesity and Skin Physiology

Obesity is associated with a number of significant changes in skin barrier function used bioengineering methods to investigate the correlation between BMI and epidermal functions. Obese individual demonstrated significantly increased transepidermal water loss and erythema compared with control subjects[2]

Sebaceous glands and sebum production:

There are no epidemiologic studies examining the relationship between obesity and sebum production. This relationship is potentially important because sebum production plays a major role in the pathogenesis of acne [3, 4] other researches revealed that obesity associated changes in skin physiology may be related to increased sweat gland activity [2,3,4] Obese patients have larger skin folds and sweat more profusely after becoming overheated because of thick layers of subcutaneous fat, thereby increasing both the frictional and moisture components[5,6]

Lymphatics: Obesity impedes lymphatic flow, which leads to collection of protein-rich lymphatic fluid in the subcutaneous tissue. This accumulation frequently results in lymphedema. Lymphedema is associated with dilatation of tissue channels and reduced tissue oxygenation. Further accumulation of fluid in the setting of decreased oxygen tension leads to fibrosis and a chronic inflammatory state. [5]

Subcutaneous fat: In adults, subcutaneous fat is made up almost entirely of white adipose tissue, which provides insulation and serves as an energy depot? White adipose tissue plays an important role in endocrine functions as well as metabolism of lipids and glucose. [7] Endocrine peptides secreted by adipocytes include leptin and tumor necrosis factor a, among others. In contrast, brown fat is most prominent in newborn infants and its exact role in obese adults is not yet clear [7].

Interrelation between obesity and skin disease: Obesity is a chronic disease that may lead to skin problems, including acanthosis nigricans, skin tags, hyperandrogenism, striae distensae, plantar hyperkeratosis, and candidal intertrigo. Although some conditions (eg, skin tags and striae distensae) may simply be annoying or present cosmetic issues, conditions such as acanthosis nigricans and hyperandrogenism may be indicative of systemic diseases[8].

Obesity also may contribute to poor healing of acute and chronic wounds that develop in this population. Some of the most common obesity-related skin disorders and factors affecting wound healing. Massive obesity leads to nonspecific skin disorders. Skin folds are more numerous
and deeper in the obese subject, and can become the site of various disorders. Hence the difficulty of diagnosis and treatment is increased. Acanthosis nigricans should be recognized, but not solely attributed to obesity, since other causes, particularly cancer, may be involved [9]. Specific dermatoses as skin tags, striae distensae and plantar hyperkeratosis, could be considered as a cutaneous stigma of severe obesity[10].

**canthosis nigricans;** Acanthosis nigricans is the most common dermatological manifestation of obesity. Appears as symmetric, velvety, hyperpigmented plaques that may occur in almost any location. It is most commonly observed in the axilla, groin, and posterior neck but can also be seen on the elbows, knuckles, and face, particularly in ethnic skin. Some researchers [10] Found that 74% of an obese population exhibited acanthosis nigricans along with elevated plasma insulin levels[10]. The plaques can be managed by improved control of hyperinsulinemia. Treatment with a low-calorie diet and weight reduction can improve the insulin resistance state, thus decreasing the severity of the skin disease [11]. Other treatments have been reported[12, 13, 14, 15, 16,17,18].

**Acrochordons;** Are pedunculated soft brown papules most commonly seen on the neck and in the axillae and groin; they are frequently seen in association with acanthosis nigricans. In a study of 156 obese patients, the percentage of those with acrochordons increased with the severity of obesity[5]. In general, acrochordons are more strongly associated with diabetes than with obesity. patients with acrochordons had greater impairment of carbohydrate metabolism [19].

**Keratosis pilaris;** Keratosis pilaris often presents as small, perifollicular, spiny papules on extensor aspects of extremities. Often associated with atopic diathesis [20], thisbenign dermatosis also manifests in those with greater BMI[5,20, 21]. Treatments are of varying success and include keratolytics, retinoids, and mild topical corticosteroids [20].

**Hyperandrogenism and hirsutism;** Hyperandrogenism can be the result of increased production of endogenous androgens due to increased volumes of adipose tissue (which synthesizes testosterone) and hyperinsulinemia (which increases the production of ovarian androgens)[22].

**Adiposis dolorosa;** Adiposis dolorosa, or Dercum’s disease, is a rare progressive condition characterized by multiple, painful, subcutaneous lipomas that usually occur in obese, postmenopausal women[23].

The painful lipomas are symmetrically distributed and are either diffuse or localized. These fatty deposits have been reported to occur in any location, except on the head and the neck; however, the trunk and lower extremities, especially around the knees, are the most commonly involved sites. Characteristically, pain is out of proportion to physical findings[24,25]. Pain increases with BMI, and patients are usually 50% above normal weight for their age.

3. **Methods; Study Design**

This study designed to determine the relationship between overweight/obesity and some of the dermatological manifestations. Selected Data collected from fifty patients attended Khartoum Hospital of Dermatology. The results of this cross sectional hospital based study were presented in tables using SPSS version 16 for data analysis (Statistical Product and Services Solution). The majority of the group’s ages were between 20-35 years.

**Study area**

The study conducted at Khartoum Teaching Hospital of Skin and Venereal Diseases located in the north –east of Khartoum Teaching Hospital at the corner between Hospital Street and Almac-NimirSrear.

Khartoum Teaching Hospital of Skin and Venereal Diseases consider as the first specialized hospital in Sudan that caring of about 300-500 patient per day. It is working 24hrs/7 days a week with regular clinic during the day time. The general clinic includes, the out-patient clinics for new cases and emergencies as well as referred clinic for follow up patients.

There are different clinic every week such as psoriasis and leprosy clinic, as well as pediatrics dermatology clinic working daily. It is consider the first Hospital included pediatrics dermatology in Khartoum state.

Ethical consideration; Proposal was presented to the ethics review committee of Sudan Medical Specialization Board, council of Dermatology and approved. Permission to conduct study was requested from authorities of health care in study area. A written Consent was taken from caretaker.

**Patients and Methods;** The first method of data collection was through preliminary information obtained from previous researches, articles and official sectors. The second method was interviews guided by a questionnaire. The third method involved the anthropometric techniques (weight, height, waist circumferences, hip circumference). The fourth method involved patient’s medical history and examination.

4. **Results and Analysis Presentation**

![Figure 1: Distribution of Body Mass Index Among the Studied Patients](image-url)
Table 1: Association between Body Mass Index and Planter Hyperkeratosis

|           | Body Mass Index Groups | Total |
|-----------|------------------------|-------|
|           | Over weight | Obese  |
| Planter Hyperkeratosis | YES | Count | 14 | 0 | 14 |
|            | 100.00% | 0.00% | 100.00% |
|            | 27 | 9 | 36 |
|            | 75.00% | 25.00% | 100.00% |
| Total      | Count | 41 | 9 | 50 |
|            | 82.00% | 18.00% | 100.00% |

Chi-Square Tests

| Value | Df | Asymp. Sig. (2-sided) |
|-------|----|-----------------------|
| Pearson Chi-Square | 4.268 | 1 | 0.039 |

Table 2: Association between Body Mass Index and Psoriasis

|           | Body Mass Index Groups | Total |
|-----------|------------------------|-------|
|           | Over weight | Obese  |
| PSORIASIS | YES | Count | 1 | 5 | 6 |
|            | 16.70% | 83.30% | 100.00% |
|            | 40 | 4 | 44 |
|            | 90.90% | 9.10% | 100.00% |
| Total      | Count | 41 | 9 | 50 |
|            | 82.00% | 18.00% | 100.00% |

Chi-Square Tests

| Value | Df | Asymp. Sig. (2-sided) |
|-------|----|-----------------------|
| Pearson Chi-Square | 19.718 | 1 | 0.0 |

Figure 2: Distribution between Body Mass Index and Gender

Figure 3: Waist to Hip Ratio among Female Patients

Figure 4: Distribution of W/H Ratio and Male Patients

Figure 5: Association between body mass index and psoriasis, planter hyperkeratosis and body mass index
Table 3: Association Between Waist To Hip Ratio And Intertrigo Among Male Patients

| Waist/Hip Ratio Group | Male | Total |
|-----------------------|------|-------|
| Low Risk | Moderate Risk | High Risk | 2 |
| Intertrigo YES | 1 | 0 | 1 | 2 |
| NO | 0 | 5 | 17 | 22 |
| Total | 1 | 5 | 18 | 24 |

Chi-Square Tests

| Value | df | Asymp. Sig. (2-sided) |
|-------|----|-----------------------|
| Pearson Chi-Square | 11.636 | 2 | 0.003 |
| No. of Valid Cases | 24 |

Table 4: Association between Waist to Hip Ratio and Planter Hyperkeratosis Among Female Patients

| Waist/Hip Ratio Groups Female | Total |
|-------------------------------|-------|
| Low Risk | Moderate Risk | High Risk | 5 |
| Planter Hyperkeratosis YES | 0 | 3 | 2 | 5 |
| NO | 4 | 2 | 15 | 21 |
| Total | 4 | 5 | 17 | 26 |

Chi-Square Tests

| Value | df | Asymp. Sig. (2-sided) |
|-------|----|-----------------------|
| Pearson Chi-Square | 6.913 | 2 | 0.032 |
| No. of Valid Cases | 26 |

Table 5: Association between Waist to Hip Ratio and Acne Among Female Patients

| Waist/Hip Ratio Groups Female | Total |
|-------------------------------|-------|
| Low Risk | Moderate Risk | High Risk | 8 |
| ACNE YES | 4 | 2 | 2 | 8 |
| NO | 0 | 3 | 15 | 18 |
| Total | 4 | 5 | 17 | 26 |

Chi-Square Tests

| Value | df | Asymp. Sig. (2-sided) |
|-------|----|-----------------------|
| Pearson Chi-Square | 12.082 | 2 | 0.032 |
| No. of Valid Cases | 26 |

Table 6: Association between Waist to Hip Ratio and Hirsutism among Female Patients

| Waist/Hip Ratio Groups Female | Total |
|-------------------------------|-------|
| Low Risk | Moderate Risk | High Risk | 26 |
| Hirsutism YES | 2 | 0 | 0 | 2 |
| NO | 8.30% | 20.80% | 70.80% | 100.00% |
| Total | 4 | 5 | 17 | 26 |

Chi-Square Tests

| Value | df | Asymp. Sig. (2-sided) |
|-------|----|-----------------------|
| Pearson Chi-Square | 11.917 | 2 | 0.003 |

5. Discussions

Different dermatological diseases had been tested in this study to identify their association with overweight/obese patients (BMI & w/h). Yosipovitch suggested that certain dermatoses such as plantar hyperkeratosis, acanthosis nigricans, skin tags, striae distensae, and intertrigo are more common among obese persons [20]. Some, such as
plantar hyperkeratosis, could serve as markers of obesity and its severity, while the presence of acanthosis nigricans and skin tags may point to underlying internal disease such as diabetes and polycystic ovary syndrome [5]. In this study high association was observed between body mass index and planter hyperkeratosis, in addition there was a Positive association between W/H ratio and planter hyperkeratosis among female patients at p value .032 but not among male. Birtane found that Hyperkeratosis was the most common skin finding in obese patients [26]. Obese patients have higher plantar pressures during walking and standing and increased forefoot width [27]. Planter hyperkeratosis should be considered as a cutaneous stigma of severe obesity [26].

After testing the association between overweight/obesity and waist to hip ratio. Acrochordons using chi square the result showed no association found but the percentage of overweight patients and Acrochordons were high (33.3%). Kahana et al did not find an increased incidence with obesity but did report that those patients with acrochordons had greater impairment of carbohydrate metabolism [19]. On the other hand a study in Mexico, found that the percentage of those with acrochordons increased with the severity of obesity [5].

Positive association between overweight/obesity and acanthosis nigricans were observed among male patients in this study. Hud et al found that 74% of an obese population exhibited acanthosis nigricans along with elevated plasma insulin levels [10]. High association (P value .003) was observed between W/H ratio and intertrigo disease among male patients but not among female. There is a linear trend between the severity of obesity and intertrigo [5]. Positive association between W/H ratio and hirsutism among female patients were observed (p 003). Ruutianen et al found that facial hirsutism is significantly correlated with BMI independently of age and testosterone level [23].

Psoriatic patients have a higher prevalence of overweight and obesity compared with non-psoriatic patients [28]. Overweight and obesity has different risk effect on severity and manifestaations of psoriasis and might be useful for better evaluating psoriasis clinically (was statistically correlated with body mass index (BMI) (r = 0.184, P < 0.01) [28]. Elevated BMI (>25) was significantly associated with long-term prognosis of psoriasis [29]. However, strong association was observed between body mass index and psoriasis as indicated in this study. Sakai et al analyzed a cohort of 169 psoriasis patients over more than 10 years and found that elevated BMI >25 was significantly associated with long term prognosis of psoriasis [28]. Studies done in Sweden have also found a significant association between obesity and increased morbidity of psoriasis [29]. There is increasing evidence that progressive weight loss can produce significant improvements in the severity of psoriasis [31, 32].

Strong association was found between W/H ratio and acne within female patients (p .002). On the other hand no association was found between W/H ratio and male patients. In contrast to study in Taiwan found that the obese patient had a lower incidence of acne than non obese women [30].

4. Striae Distensae was found among 34.6% of overweight female although no association was found in either body mass index nor W/H. a study done in mexico suggested that Striae Distensae are present in obese patients [5].

6. Conclusion

It seems that the increase in Body Mass Index and waist to hip ratio are associated with increase in some of the dermatological disease. There are strong association of planter hyperkeratosis, Psoriasis, intertrigo, Hirsutism and body mass index as well as with increase in waist to hip ratio.

References

[1] The world health report 1998 - Life in the 21st century: A vision for all.
[2] Wintzen M, Yaar M, Burbach JP, Gilchrest BA. Proopiomelanocortin gene product regulation in keratinocytes. J Invest Dermatol 1996;106:673-8.
[3] Löffler H, Aramaki JU, Effendy I. The influence of body mass index on skin susceptibility to sodium lauryl sulphate. Skin Res Technol 2002;8:19-22.
[4] Zouboulis CC. Acne and sebaceous gland function. ClinDermat 2004;22:360-6. J AM ACAD DERMATOL VOLUME 56, NUMBER 6
[5] Garcia Hidalgo. Dermatological complication of obesity. Am J Dermatol 2002;497-506.
[6] Pi-Sunyer FX. The obesity epidemic: pathophysiology and consequences of obesity. Obes Res 2002;10(Suppl 2): 975S-1045S.
[7] Chin LC, Huang TY, Yu CL, Wu CH, Hsu CC, Yu HS. Increased cutaneous blood flow but impaired post-ischemic response of nutritional flow in obese children. Atherosclerosis 1999; 146:179-85.
[8] Hahler B. An overview of dermatological conditions commonly associated with the obese patient. Ostomy Wound Manage. 2006 Jun;52(6):34-6, 38, 40 passim. Review. PubMed PMID: 16799182.
[9] Biaunie G, Kas B Cutaneous complications of massive obesity. PMID: 8310247 [PubMed - indexed for MEDLINE]
[10] Hud JA Jr, Cohen JB, Wagner JM, Cruz PD Jr. Prevalence and significance of acanthosis nigricans in an adult obese population. Arch Dermatol 1992;128:941-4.
[11] Kuroki R, Sadamoto Y, Imamura M, Abe Y, Higuchi K, Kato K, et al. Acanthosis nigricans with severe obesity, insulin resistance and hypothyroidism: improvement by diet control. Dermatology 1999;198:164-6.
[12] Walling HW, Messingham M, Myers LM, Mason CL, Strauss JS. Improvement of acanthosis nigricans on isotretinoin and metformin. J Drugs Dermatol 2003;2:677-81.
[13] Tankova T, Koev D, Dakovska L, Kirilov G. Therapeutic approach in insulin resistance with acanthosis nigricans. IntClinPract 2002;56:578-81.
[14] Weston S, Clay CD. Unusual case of lymphoedema in a morbidly obese patient. Australas J Dermatol 2007; 48:115–19.
[15] Weisshaar E, Bonnekoh B, Franke I, Gollnick H. Successful symptomatic tazarotene treatment of juvenile acanthosis nigricans of the familial obesity.

Volume 5 Issue 2, February 2016
www.ijsr.net
Licensed Under Creative Commons Attribution CC BY

Paper ID: NOV161507
DOI: 10.21275/NOV161507
1610
associated type in insulin resistance.

Hautarzt 2001;52:499-503. German.

[16] Bohm M, Luger TA, Metze D. Treatment of mixed-type acanthosis nigricans with topical calcipotriol. Br J Dermatol 1998;139:932-4.

[17] Akovbyan VA, Talanin NY, Arifov SS, Tukhvatullina ZG, Musabayev AN, Baybekov IM, et al. Successful treatment of acanthosis nigricans with etretinate. J Am Acad Dermatol 1994;31:118-20.

[18] Rosenbach A, Ram R. Treatment of acanthosis nigricans of the axillae using a long-pulsed (5-msec) alexandrite laser. Dermatol Surg 2004;30:1158-60

[19] Kahana M, Grossman E, Feinstein A, Ronnen M, Cohen M, Millet MS. Skin tags: a cutaneous marker for diabetes mellitus. Acta Derm Venereol 1987;67:175-7.

[20] Yosipovitch G, Mevorah B, Mashiaich J, Chan YH, David M. High body mass index, dry scaly leg skin and atopic conditions are J AM ACAD DERMATOL JUNE 2007 912

[21] Barth JH, Ngll, Wojnarowskaf, Dawber RP, Acanthosisnigricans, in insulin resistance and cutaneous virilism. Br J Dermatol 1988; 613-9

[22] Barth JH, Ngll, Wojnarowskaf, Dawber RP, Acanthosisnigricans, in insulin resistance and cutaneous virilism. Br J Dermatol 1988; 613-9

[23] Ruutiainen K, Erkkola R, Gronroos MA, Irjala K. Influence of body mass index and age on the grade of hair growth in hirsute women of reproductive ages. Fertil Steril 1988;50:260-5.

[24] Brodovsky S, Westreich M, Leibowitz A, Schwartz Y. Adiposis dolorosa (Dercum’s disease): 10-year follow-up. Ann Plast Surg 1994;33:664-8.

[25] DeFranzo AJ, Hall JH Jr, Herring SM. Adiposis dolorosa (Dercum’s disease): liposuction as an effective form of treatment. Plast Reconstr Surg 1990;85:289-92.

[26] Birtane M, Tuna H. The evaluation of plantar pressure distribution in obese and non-obese adults. Clin Biomech 2004;19:1055-9.

[27] Gisondi P, Tessari G, Conti A et al. Prevalence of metabolic syndrome in patients with psoriasis: a hospital-based case-control study. Br J Dermatol

[28] Sakai R, Matsui S, Fukushima M, Yasuda H, Miyachi H, Miyachi Y. Prognostic factor analysis for plaque psoriasis. Dermatology 2005;211:103-6.

[29] Lindegard B. Diseases associated with psoriasis in a general population of 159,200 middle-aged, urban, native Swedes. Dermatologica 1986;172:298-304.

[30] Jen-hung Yang, Shun-Longweng 116, comparative study of cutaneous manifestation of hyper indrogonism in obese and non obese Taiwanese women. 2010