

Assessment of Leptin Level in Serum of Patients with Seborrheic Dermatitis

Menna A. Soliman¹, Asmaa M. Al Refaei², Ghada M. Abdel Khalik¹ and Maha T. Rachwan²

¹Dermatology, Venereology and Andrology Department, Faculty of Medicine, Benha University

²Clinical and Chemical Pathology Department, Faculty of Medicine, Benha University

E-Mail: Menna.mostafa.soliman90@gmail.com

Abstract

Background: Seborrheic dermatitis (SD) is a prevalent dermatological condition encountered in medical settings, known by various names such as sebo psoriasis, seborrheic eczema, and dandruff, among others. The rising prevalence of metabolic syndrome (MetS) poses a global health challenge, with emerging interest in its connection to various dermatological conditions, including SD, conditions like obesity are associated with increased leptin levels and resistance to its action, suggesting a complex interaction between leptin and skin health. Objective: This review aims to assess serum level of leptin in patients with SD and its relation to MetS in these patients, if any. Conclusions: patients with seborrheic dermatitis exhibit significantly higher serum leptin levels compared to healthy controls, indicating a potential role of leptin in the pathogenesis of the disease. Notably, serum leptin levels correlated with the severity of the disease and showed potential as a biomarker for disease severity.

Keywords: Seborrheic dermatitis, Leptin, Metabolic syndrome.

1.Introduction

Seborrheic dermatitis (SD) is a common skin condition seen frequently in clinical practice. The use of varying terms such as sebopsoriasis, seborrheic dermatitis, seborrheic eczema, dandruff, and pityriasis capitis reflects the complex nature of this condition [5].

It often presents as yellow, greasy scales with erythematous skin in seborrheic areas such as the scalp, face (eyebrows, nasolabial folds, above the upper lip, ears, retro-auricular area) and the upper chest. In addition to skin inflammation, SD can be associated with pruritus [4].

2.Epidemiology

While SD affects all ages, it has a predominantly bimodal distribution, with a peak during infancy (2-12 months of age) and another peak in early adulthood. Additionally, the incidence is higher among human immunodeficiency virus (HIV)-infected and immunocompromised patients ranging from 30% to 83%. There are multiple factors that determine an individual's susceptibility to the development of disease such as gender, individual lipid composition, immune status, neuropsychiatric factors (including Parkinson's disease (PD) and other neuropsychiatric diseases) and high environmental humidity and heat. In recent years, studies have suggested a genetic predisposition, although further study is needed. While SD and dandruff have a strong relationship with HIV, most patients with SD have no major abnormalities of the immune system [12].

3.pathogenesis of seborrheic dermatitis

It revolves around the presence of *Malassezia* yeast colonies and an inflammatory response in the affected individual. Keratinocytes proliferation resulting from inflammatory response in the host skin leads to the clinically relevant symptoms of SD [20].

4.Metabolic syndrome

The increasing prevalence of Metabolic syndrome (MetS) is a worldwide health problem, and the association between MetS and skin diseases has recently attracted growing attention. We summarize the associations between MetS and SD. To discuss the potential common mechanisms underlying MetS and skin diseases, we focus on insulin signaling and insulin resistance, as well as chronic inflammation including adipokines and proinflammatory cytokines related to molecular mechanisms. A better understanding of the relationship between MetS and skin diseases contributes to early diagnosis and prevention, as well as providing clues for developing novel therapeutic strategies [10].

5.Leptin

Leptin is an adipokine, adipocyte-derived compound, which acts both as a hormone and cytokine. It is mainly synthesized by adipocytes of white adipose tissue. Leptin possesses pleiotropic functions including stimulation of angiogenesis and production of proinflammatory cytokines. The various types of leptin activity are related to the wide distribution of leptin receptors. This adipokine acts by activating intracellular signaling cascades such as JAKs (Janus kinases), STATs (signal transducers and activators of transcription), and others. In a course of obesity, an increased serum level of leptin coexists with tissue receptor resistance. It has been reported that enhanced leptin levels, leptin receptor impairment, and dysfunction of leptin signaling can influence skin and hair. The previous studies revealed the role of leptin in wound healing, hair cycle, and pathogenesis of skin diseases like psoriasis, lupus erythematosus, and skin cancers. However, the exact mechanism of leptin's impact on the skin is still under investigation. Here in, we

present the current knowledge concerning the role of leptin in SD [9].

Akbaş et al., *Vincenzi and Tosti* and *Moreno-Coutiño et al.* reported in their studies that the age of SD patients was almost middle age {16}.

Seborrheic dermatitis has a biphasic incidence, occurring in infants between the ages of 2 weeks and 12 months and later during adolescence and adulthood. *Dall'Oglio et al.* found that the prevalence of clinically significant seborrheic dermatitis is approximately 3 percent, with peak prevalence in the third and fourth decades [6]. *Akbaş et al.* reported that the median age of onset of disease was 27.7 years [3].

Akbaş et al. and *Jahan et al.* reported that more than half of patients were males [13]. *Moreno-Coutiño et al.* also reported male predominance in the patients' group (90%) {16}. Consequently, *Abdulrahman et al.* and *Sampaio et al.* found that SD tends to be more prevalent among men [1,18].

In contrast to these findings, *Akbaş et al.* reported that 59.3% of the patients were females [3]. *Xuan et al.* found that 67.3% of the patients were females [24]. Also, *Abdulrahman et al.* found that 61% were females [1]. The higher prevalence among females might be ascribed to the greater cosmetics consumption.

A multivariate logistic regression model demonstrated that SD was significantly associated with hypertension after controlling for confounders, including age, sex, socioeconomic status, smoking, diabetes and obesity [15].

Akbaş et al. found that the BMI of the patients was significantly higher compared to the controls [3]. *Sanders et al.* found that the majority of SD patients had BMI ranging from 25–30 [19]. *Linder et al.* found that SD patients were more likely to be obese [15].

Akbaş et al. reported that the scalp was the most affected followed by the nasolabial folds and eyebrows were the least [3]. *Park et al.* found that the most frequently involved site at the time of their visit was the scalp followed by the perioral area and nose [17].

Dessinioti and Katsambas and Clark et al., SD is commonly featured in areas rich in sebum production, such as the face, scalp, upper trunk, lower extremities and upper extremities [8, 5] *Akbaş et al.* who found that 55.6% of the patients had single involvement followed by 22.2% being involved of two or three locations [3].

Imamoglu et al. found that in terms of history of metabolic disease in first degree relatives (diabetes mellitus, cardiovascular disease, and dyslipidaemia), 78.7% of those in the patient group had a history of metabolic disease in their families [11].

While pruritus (itching) is not an obligatory symptom, it is often present, particularly in cases involving the scalp, as observed by *Del Rosso* [7].

Akbaş et al. found that the patients had significantly higher LDL, total cholesterol, and HDL levels. Also, there were non-significant differences between patients and control groups regarding triglycerides and fasting blood glucose [3].

Abdulrahman et al. found that the mean fasting total cholesterol, LDL and triglycerides levels were higher for high level cases than the normal level cases. The total cholesterol level, LDL, triglycerides and HDL had a statistically significant association with the severity of the disease [1]

Toruan et al. showed a strong and significant correlation between serum total-cholesterol levels and sebum secretion and between serum LDL-cholesterol serum levels and sebum secretion, moderate correlation between serum triglyceride levels and sebum secretion and no correlation between serum HDL-cholesterol levels and sebum secretion [22]. Similarly, *Imamoglu et al.* found significantly lower High-density lipoprotein (HDL) levels in SD patients than in the controls and that mean of triglyceride, cholesterol, LDL, and fasting blood glucose in case group were more than in control group but not statistically significant [11].

Stefanadi et al. and Dumas & Ntambi have shown increased numbers of oxidative stress and inflammatory markers in various skin diseases, like MetS [21]. *Agarwal and Das* concluded that SD is an important warning for the development of MetS and dyslipidemia [2].

Wikramanayake et al. founded that metabolic syndrome leads to hormonal disturbance, which leads to skin diseases like acne or SD. Inflammatory markers like leptin, adiponectin, TNF- α , IL-17, IL-23, and oxidative stress in metabolic syndrome also appear in many autoimmune and inflammatory skin conditions [25]. A raise in TNF- α and a drop in adiponectin can increase the level of Very-Low-Density Lipoprotein (VLDL) and lower peripheral clearance [2].

6.Recommendations and future prospectives

- It is recommended to consider implementing longitudinal studies to better understand the causal relationships and progression of SD in relation to serum leptin levels and other metabolic factors.
- Further investigating the relationship between SD and MetS are needed considering a larger subset of patients with MetS to strengthen the statistical power.
- Control for more variables in future studies such as lifestyle factors, diet, medication use, and other health conditions that could influence both seborrheic dermatitis and leptin levels.

7.Conclusion

In conclusion, patients with SD exhibit significantly higher serum leptin levels compared to

healthy controls, indicating a potential role of leptin in the pathogenesis of the disease.

References

- [1] Abdulrahman, B. B., Elethawi, A. M. D. & Abdullah, H. M. 2020. Assessment of lipid profile among patients with seborrheic dermatitis. *Bali Med J*, 9, 952-958.
- [2] Agarwal, K. & Das, S. 2019. Metabolic syndrome-The underbelly of dermatology. *Gulf J Dermatol Venereol*, 26, 1-10.
- [3] Akbaş, A., Kılınc, F., Şener, S. & Hayran, Y. 2022. Investigation of the relationship between seborrheic dermatitis and metabolic syndrome parameters. *J Cosmet Dermatol*, 21, 6079-6085.
- [4] Borda LJ, Perper M, Keri JE, et al. (2019). Treatment of seborrheic dermatitis: a comprehensive review. *J Dermatology Treat*. 30(2):158-169.
- [5] Clark GW, Pope SM, Jaboori KA. (2015) Diagnosis and treatment of seborrheic dermatitis. *Am Fam Physician Feb* 1;91(3):185-90.
- [6] Dall'Oglio, F., Nasca, M. R., Gerbino, C. & Micali, G. 2022. An Overview of the Diagnosis and Management of Seborrheic Dermatitis. *Clin Cosmet Investig Dermatol*, 15, 1537-1548.
- [7] Del Rosso, J. Q. 2011. Adult seborrheic dermatitis: a status report on practical topical management. *J Clin Aesthet Dermatol*, 4, 32-8
- [8] Dessinioti, C. & Katsambas, A. 2013. Seborrheic dermatitis: etiology, risk factors, and treatments: facts and controversies. *Clin Dermatol*, 31, 343-351.
- [9] Dopytalska, K., Baranowska-Bik, A., Roszkiewicz, M. et al. (2020), The role of leptin in selected skin diseases. *Lipids Health Dis* 19, 215
- [10] Hu Y, Zhu Y, Lian N, Chen M, Bartke A, Yuan R. (2019). Metabolic Syndrome and Skin Diseases. *Front Endocrinol (Lausanne)*. 20; 10:788.
- [11] Imamoglu, B., Hayta, S. B., Guner, R., Akyol, M. & Ozcelik, S. 2016. Metabolic syndrome may be an important comorbidity in patients with seborrheic dermatitis. *Arch Med Sci Atheroscler Dis*, 1, e158-e161.
- [12] Jackson, J. M., Alexis, A., Zirwas, M., & Taylor, S. (2022). Unmet needs for patients with seborrheic dermatitis. *Journal of the American Academy of Dermatology*, S0190-9622(22)03307-2.
- [13] Jahan, I., Islam, M. R., Islam, M. R., Ali, R., Rahman, S. M. M., Nahar, Z., et al. 2021. Altered serum elements, antioxidants, MDA, and immunoglobulins are associated with an increased risk of seborrheic dermatitis. *Heliyon*, 7, e06621.
- [14] Linder, D., Dreiherr, J., Zampetti, A., Sampogna, F. & Cohen, A. D. 2014. Seborrheic dermatitis and hypertension in adults: a cross-sectional study. *J Eur Acad Dermatol Venereol*, 28, 1450-1455.
- [15] Moreno-Coutiño, G., Sánchez-Cárdenas, C. D., Bello-Hernández, Y., Fernández-Martínez, R., Arroyo-Escalante, S. & Arenas, R. 2019. Isolation of *Malassezia* spp. in HIV-positive patients with and without seborrheic dermatitis. *An Bras Dermatol*, 94, 527-531.
- [16] Park, S. Y., Kwon, H. H., Min, S., Yoon, J. Y. & Suh, D. H. 2016. Clinical manifestation and associated factors of seborrheic dermatitis in Korea. *Eur J Dermatol*, 26, 173-6.
- [17] Sampaio, A. L., Mameri, A. C., Vargas, T. J., Ramos-e-Silva, M., Nunes, A. P. & Carneiro, S. C. 2011. Seborrheic dermatitis. *An Bras Dermatol*, 86, 1061-71; quiz 1072-4.
- [18] Sanders, M. G. H., Pardo, L. M., Ginger, R. S., Kieft-de Jong, J. C. & Nijsten, T. 2019. Association between Diet and Seborrheic Dermatitis: A Cross-Sectional Study. *J Invest Dermatol*, 139, 108-114.
- [19] Sowell J, Pena SM, Elewski BE. (2022). Seborrheic Dermatitis in Older Adults: Pathogenesis and Treatment Options. *Drugs Aging*. 39(5):315-321.
- [20] Stefanadi, E. C., Dimitrakakis, G., Antoniou, C. K., Challoumas, D., Punjabi, N., Dimitrakaki, I. A., et al. 2018. Metabolic syndrome and the skin: a more than superficial association. Reviewing the association between skin diseases and metabolic syndrome and a clinical decision algorithm for high risk patients. *Diabetol Metab Syndr*, 10, 9.
- [21] Toruan, T., Nopriyati, T. & Sari, Y. 2017. The relationship between serum lipid profile and sebum secretion in seborrheic dermatitis patients. *Int J Health Sci Res*, 7, 138-43.
- [22] Vincenzi, C. & Tosti, A. 2020. Efficacy and Tolerability of a Shampoo Containing Broad-Spectrum Cannabidiol in the Treatment of Scalp Inflammation in Patients with Mild to Moderate Scalp Psoriasis or Seborrheic Dermatitis. *Skin Appendage Disord*, 6, 355-361.
- [23] Xuan, M., Lu, C. & He, Z. 2020. Clinical characteristics and quality of life in seborrheic dermatitis patients: a cross-sectional study in China. *HRQOL*, 18, 308.
- [24] Wikramanayake, T. C., Borda, L. J., Miteva, M. & Paus, R. 2019. Seborrheic dermatitis-Looking beyond *Malassezia*. *Exp Dermatol*, 28, 991-1001.