Assessment of lipid profile among patients with seborrheic dermatitis

Barez Burhan Abdulrahman1*, Ali Muzan Dhahir Elethawi2, Hadi Mohammed Abdullah3

ABSTRACT

Background: Although the complicated interplay of Malassezia, keratinocytes and the immune response against a modified lipid composition in the skin have a vital role in the pathogenesis of Seborrheic Dermatitis (SD), the pathophysiology itself is still inadequately understood. The association of SD with metabolic syndrome like dyslipidemia can be explained by inflammation in both conditions’ pathogenesis. The present study was aimed at evaluating the relationship between the lipid profile abnormality and the SD.

Methods: A prospective cross-sectional study was conducted in the Dermatology teaching center in Sulaimani, Iraq, from 1/9/2019 to 1/3/2020. This study used a structured data collection format comprised of items concentrating on socio-demographic characteristics, duration of the disease, level of SD, the severity of SD, and lipid profile. The data were analyzed by STATA 14 statistical software and summarized in tables and figures. The Chi-square test was done to detect the association between categorical variables.

Results: Lipid profile has a statistically significant association with the level and severity of SD. Finally, we recommend a large observational study to depict the causal relationship between serum lipid abnormality and SD.

INTRODUCTION

Seborrheic Dermatitis (SD) is a common long-term skin disorder that mainly causes scaly reddish-brown patches on areas rich in oil-producing glands. It usually affects areas such as the face, scalp, upper chest, and back.1 Dandruff is a milder form of the condition, which mainly affects the scalp with no inflammation. Among the general adult population, the prevalence of clinically significant SD is about 3%. However, it is higher in patients with immunodeficiency disorders and those with neurological disorders such as Parkinson's disease. The disease typically occurs in healthy persons, but its prevalence is very high (34–83%) in immunocompromised patients (HIV) and patients with neurological disorders.2,3 The mild scaling prevalence, like dandruff, is estimated at 15% -20%, although it is announced to reach up to 50%.4

Red scaly patches on exposed surface areas (e.g., face and ears), pruritus, dandruff, combined with the chronic and recurrent nature of SD, lead to low self-esteem and poor quality of life. Seborrheic dermatitis is more frequent in men and more severe in cold and dry climates and increased stress periods.5 The incidence of SD particularly reaches its highest point among three following age ranges: 2 weeks to 12 months (infanthy), 13 to 19 (adolescence), and 30 to 60 (adulthood). The third and fourth decades of life is when the incidence of SD reaches its peak among adults.6

According to the scaling and inflammation level, the severity of SD can be divided into three mild, moderate, and severe levels. Based on the findings, clinical characteristics consist of oily yellow scales placed on erythematous patches.
Among adolescents and adults, there is a range of changes from the mildly erythematous patch and fine scaling in the seborrheic areas of the skin, through crusted erythematous plaques, to extensive manifestations in patients with immunodeficiency disorders, especially in those with potentially life-threatening generalized exfoliative dermatitis.

The sebaceous glands are exocrine glands made up of immature and mature sebum-producing epithelial cells that eventually develop into a holocrine gland and release their secretions onto the skin surface. The human sebum consists of triglycerides (TG) (30%-50%), fatty acids (15%-30%), wax esters (26%-30%), squalene (12%-20%), esters of cholesterol (3%-6%) and free cholesterol (1.5%-2.5%). Like adipocytes, sebocytes are sebum-producing epithelial cells; although sebocytes produce lipids through holocrine secretion, adipocytes produce lipids to be stored so that energy is stored in subcutaneous, visceral, and/or epididymal white adipose tissues. Although both keratinocytes and sebocytes build lipids, they both can actively absorb lipids from circulation. For instance, essential fatty acids can be found in large amounts in both skin cell types.

Several studies recommended that lipid panels affect inflammatory skin disorders such as acne vulgaris and psoriasis. A study indicated that cholesterol level was higher in patients with acne (P=0.025), especially in male ones (P=0.04). The level of other plasma lipids, i.e., TG, LDL, and HDL, was higher in the intervention group patients than in the control group, although it was not statistically significant.

Because treatment options for seborrheic dermatitis, such as topical or oral antifungals and topical corticosteroids, provide temporary relief, it is essential to identify modifiable lifestyle factors that may reduce the burden of this condition. Therefore, this study aimed to determine the association between lipid profile and seborrheic dermatitis.

**METHODS**

**Study design**

This study is a prospective cross-sectional study conducted in Sulaimani Teaching Center of Dermatology from 1 September 2019 to 1 March 2020.

**Inclusion criteria**

During the study period, all patients with seborrheic dermatitis were enrolled in the study.

**Exclusion criteria**

Patients who were not willing to undergo lipid profile tests were excluded from the study.

**Sample size & sampling procedures**

Medical records of all seborrheic dermatitis cases were reviewed, and all patients admitted during the study period were included unless they refused to give consent and blood sample. A total of 100 patients with seborrheic dermatitis were recruited in the present study.

**Variables**

**Independent variables**

Socio-demographic characteristics: Gender, Age, duration of the disease, level, and severity of the disease.

**Dependent variables**

Lipid profile (total cholesterol, LDL-C, VLDL-C, triglycerides, and HDL-C).

**Data collection procedures**

A structured data collection format comprised of items concentrating on socio-demographic characteristics, duration of the disease, level of SD, severity of SD, and lipid profile were used. Medical records of patients with SD were traced retrospectively. Data were collected by experienced physicians working in the hospital.

**Data quality assurance**

Before the commencement of data collection, a brief description was given to data collectors about the study's objective and the data collection format. The format was pre-tested on 5% of the randomly selected patient's medical records, not included in the final analysis. It was then critically evaluated for adequacy and easiness to fill and collect apposite and relevant data. As per the results, necessary rearrangements regarding ambiguous and unclear questions were made before the actual data collection commencement. Strict supervision was conducted during data collection. The filled data collection formats were rigorously appraised for completeness and consistency to safeguard the data's quality. Moreover, data entry was rechecked and cross-checked; meanwhile, any uncertainties were dealt with accordingly.

**Data processing and analysis**

The data were entered into Microsoft excel and was then cleaned and checked for completeness and consistency. Then it was imported to STATA 14 statistical software for processing and analysis. The data were summarized in tables and figures. The Chi-square test was done to see the association between categorical variables. Statistical significance
patients was 37.5 ± 13.06 years ranging from 13 to 70 years. Sixty patients were between 25 to 50 years of age. Of all 100 cases, 61 were females, and the average age in male and female cases were 33.85 ± 12.34 years and 39.84 ± 13.07 years, respectively. The mean disease duration was 6.43 ± 5.0 years, ranging from 1 to 30 years. Thirty-five patients had seborrheic dermatitis for more than five years (Table 1).

**Level and severity of seborrheic dermatitis**

Of the 100 cases, 64 were high-level cases (Figure 1). Thirty-nine of the cases were moderate, and 8 were very severe (Figure 2). From the 36 normal level cases, 22 were mild. From the 64 high-level cases, there were 27 moderate, 23 severe, and 8 very severe cases (Table 2).

**Lipid panel of patients with seborrheic dermatitis**

The mean scores of fasting cholesterol, LDL, HDL, VLDL and Triglycerides were 181.96 ± 55.97 mg/dl, 109.94 ± 25.13 mg/dl, 29.16 ± 9.03 mg/dl, 145.8 ± 45.15 mg/dl, and 33.9 ± 6.77 mg/dl, respectively. The mean fasting total cholesterol (219.72 mg/dl vs. 114.83 mg/dl), LDL (123.92 mg/dl vs. 85.08 mg/dl) and triglycerides (170.38 mg/dl vs. 102.17 mg/dl) levels were higher in high level cases compared to normal level cases. The HDL level (31.06 mg/dl vs. 38.94 mg/dl) of the high-level patients was lower than normal patients (Figure 3). The very severe cases had the highest level of fasting total cholesterol (238.63 mg/dl), LDL (128.63 mg/dl), VLDL (40.28 mg/dl), and triglycerides (201.38 mg/dl), and the lowest HDL (28.75 mg/dl) level compared to all groups (Figure 4).

**Associated factors with level and severity of seborrheic dermatitis**

Table 3 summarizes the association between demographic characteristics and lipid profile with seborrheic dermatitis disease level. Age (P<0.001), duration of disease (P<0.001), total cholesterol level (P<0.001), LDL (P<0.001), triglycerides (P<0.001), and HDL (P<0.001) had a statistically significant association with the level of disease. Sex had no statistically significant association with disease level (P=0.831).

Table 4 shows the association between demographic factors and lipid profiles with seborrheic dermatitis disease severity. Age (P=0.009), total cholesterol level (P<0.001), LDL (P<0.001), triglycerides (P<0.001), and HDL (P=0.004) had a statistically significant association with the severity of the disease. Sex (P=1.000) and disease duration (P=0.054) had no statistically significant association with disease level.
Seborrheic Dermatitis (SD) and dandruff are both chronic skin conditions on two different ends of the same range, with dandruff as a milder form of the condition, which mainly affects the scalp with no inflammation.\(^2\) Even though the complicated interplay of Malassezia, keratinocytes and the immune response against a modified lipid composition in the skin have a vital role in Seborrheic Dermatitis's pathogenesis, the causal relationship is not understood yet.\(^3,17\) Therefore, the pathophysiology remains poorly understood.

The current study aimed to assess the association between serum lipid profiles with SD.

In the current study, patients' average age was 37.5 ±13.06 years, and 61 were female. The average duration of the disease was 6.43±5.0 years. Of all 100 cases, 64 were high level. Thirty-nine of the cases were moderate, and 8 were very severe. From 36 normal level cases, 22 were mild. From 64 high-level cases, there were 27 moderate, 23 severe, and 8 very severe cases. The results of the present study are much the same as the general incidence of SD, which particularly reaches its highest point among three following age ranges: 2 weeks to 12 months (infanthood), 13 to 19 years (adolescence), and 30 to 60 years (adulthood).\(^16-19\) Generally, androgens play a key role in controlling the function of sebaceous glands. Accordingly, SD is more common among men.\(^1\) However, in this study, more female cases were identified than what was anticipated. The higher prevalence among females might be ascribed to the greater cosmetics consumption.

In the present study, the mean fasting total cholesterol (219.72 mg/dl vs.114.83 mg/dl), LDL (123.92 mg/dl vs.85.08 mg/dl) and triglycerides (170.38 mg/dl vs.102.17 mg/dl) levels were higher for high level cases than the normal level cases. The HDL level (31.06 mg/dl vs.38.94 mg/dl) of the high-level patients was lower than that of normal patients. The very severe cases had the highest level of fasting total cholesterol (238.63 mg/dl), LDL (128.63 mg/dl), VLDL (40.28 mg/dl) and triglycerides (201.38 mg/dl), and the lowest HDL (28.75 mg/dl) level compared to all groups. Age (P<0.001), duration of disease (P<0.001), total cholesterol level (P<0.001), LDL (P<0.001), triglycerides (P<0.001), and HDL (P<0.001) had a statistically significant association with the level of disease. Age (P=0.009), total cholesterol level (P<0.001), LDL (P<0.001), triglycerides (P<0.001), and HDL (P=0.004) had a statistically significant association with the severity of the disease.

Similarly, studies in this area showed several determinant factors affecting one's susceptibility to SD development. These factors include gender, lipid composition, immune status, neuropsychiatric disorders (including Parkinson's Disease (PD) and other disorders), and high environmental temperature and humidity.\(^6,20-22\) In a case series study, Toruan et al., showed a strong and significant correlation between serum total-cholesterol levels and sebum secretion (r = 0.860; P = 0.000); and between serum LDL-cholesterol serum levels and sebum secretion (r = 0.929; P = 0.000); moderate correlation between serum triglyceride levels and sebum secretion (r = 0.445; P = 0.014); and no correlation between serum HDL-cholesterol levels and sebum secretion (r = 0.845; P = 0.014).
and sebum secretion ($r = -0.283; P = 0.129$). Similarly, Imamoglu et al. found significantly lower High-density lipoprotein (HDL) levels in SD patients than in the controls. A review article concluded that SD is an important warning for the development of metabolic syndrome and dyslipidemia.

Several studies have shown increased numbers of oxidative stress and inflammatory markers in various skin diseases, similar to metabolic syndrome. Metabolic syndrome is a condition characterized by hyperinsulinemia/insulin resistance, abdominal obesity, dyslipidemia characterized by a high plasma triglyceride (TG) and low high-density lipoprotein (HDL) concentration, and an increase in blood pressure (BP). Any pathophysiologic disorder which causes a loss of metabolic control in the organs can lead to skin disorders. Metabolic syndrome leads to hormonal disturbance, which leads to skin diseases like acne or androgenic alopecia. The inflammatory markers like leptin, adiponectin, TNF-α, IL-17, and IL-23, and oxidative stress in metabolic syndrome also appear in many autoimmune and inflammatory skin conditions. A raise in TNF-α and a drop in adiponectin can increase the level of Very-Low-Density Lipoprotein (VLDL) and lower peripheral clearance.

Malassezia species are known for producing lipase, which causes the release of arachidonic acid and subsequent inflammatory reactions. Malassezia yeasts raise the release of inflammatory cytokines from keratinocytes such as TNF-α, IL-6, and IL-8. Furthermore, High-Density Lipoprotein (HDL) is known for its antimicrobial activity, as low levels of HDL can decline antimicrobial activity, which in turn can lead to inflammation and SD through increasing Malassezia colonization.

### Table 3. Factors associated with diseases level

| Fasting lipid level | Level of diseases | Χ² (P-value) |
|---------------------|-------------------|--------------|
|                     | Normal (n=36)     | High level (n=64) |
| Sex                 | Male              | Female       | 0.17 (P=0.831) |
|                     | 15                | 24           |               |
|                     | 21                | 40           |               |
| < 19                | 9                 | 0            |               |
| 19-25               | 10                | 4            | 34.72 (P<0.001) |
| 25-50               | 17                | 43           |               |
| 50-65               | 0                 | 14           |               |
| >65                 | 0                 | 3            |               |
| Age (years)         | 1-2               | 12           | 31.54 (P<0.001) |
|                     | 2                 | 19           |               |
|                     | >5                | 5            | 30            |
|                     | 17                | 11           |               |
| Duration of disease (years) | 12 | 4 | 31.54 (P<0.001) |
|                     | 2-5               | 2            | 19            |
|                     | >5                | 5            | 30            |
| Total cholesterol   | Normal            | Abnormal     | 66.03 (P<0.001) |
|                     | 36                | 10           |               |
|                     | 0                 | 54           |               |
| LDL                 | Normal            | Abnormal     | 68.76 (P<0.001) |
|                     | 33                | 5            |               |
|                     | 3                 | 59           |               |
| STG                 | Normal            | Abnormal     | 66.03 (P<0.001) |
|                     | 36                | 10           |               |
|                     | 0                 | 54           |               |
| HDL                 | Normal            | Abnormal     | 34.48 (P<0.001) |
|                     | 36                | 26           |               |
|                     | 0                 | 38           |               |

### Table 4. Factors associated with the severity of seborrhoeic dermatitis

| Factors         | Mild | Moderate | Severe | Very severe | P-value |
|-----------------|------|----------|--------|-------------|---------|
| Sex             | Male | 11       | 15     | 10          | 3       | 1.000   |
|                 | Female | 17    | 24     | 15          | 5       |         |
| Age (years)     | < 19  | 2       | 6      | 1           | 0       |         |
|                 | 19-25 | 8      | 3      | 3           | 0       |         |
|                 | 25-50 | 18     | 22     | 16          | 4       | 0.009   |
|                 | 50-65 | 0      | 8      | 3           | 3       |         |
|                 | >65   | 0      | 0      | 2           | 1       |         |
|                 | <1    | 11     | 11     | 5           | 1       |         |
| Duration of diseases | 1-2 | 8      | 6      | 2           | 0       | 0.057   |
|                 | 2-5   | 3      | 6      | 10          | 2       |         |
|                 | >5    | 6      | 16     | 8           | 5       |         |
| Total cholesterol | Normal | 24    | 17     | 3           | 2       | <0.001  |
|                 | Abnormal | 4    | 22     | 22          | 6       |         |
| LDL             | Normal | 19    | 15     | 4           | 0       | <0.001  |
|                 | Abnormal | 9    | 24     | 21          | 8       |         |
| Triglycerides   | Normal | 22    | 18     | 5           | 1       | <0.001  |
|                 | Abnormal | 6    | 21     | 20          | 7       |         |
| HDL             | Normal | 4     | 16     | 12          | 6       | 0.004   |
|                 | Abnormal | 24   | 23     | 13          | 2       |         |
CONCLUSION

In this study, most SD patients were females and had moderate to very severe SD. The mean fasting total cholesterol, LDL-C, and triglycerides levels were higher in high-level cases than the normal level cases. The mean HDL-C level of the high-level patients was lower than the normal level patients. The very severe cases had the highest level of fasting total cholesterol, LDL-C, VLDL-C, and triglycerides, and the lowest HDL-C level compared to all groups. Age, duration of disease, total cholesterol level, LDL-C, triglycerides, and HDL-C had a statistically significant association with disease level. Age, total cholesterol level, LDL-C, triglycerides, and HDL-C had a statistically significant association with the disease's severity.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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ETHICAL STATEMENT

This study was conducted after ethical clearance was obtained from the supervising committee of the Kurdistan Board of Medical specialty number (4422/2/19). All study participants were asked for written consent before starting the study, and only consenting cases were included. Official permission was obtained from the Sulaimani dermatology teaching center to access the participants’ medical records for data collection. Data were collected keeping the identity of the participants’ anonymous, without revealing their names and addresses.

AUTHOR’S CONTRIBUTION

Dr. Barez substantially contributed to designing the study, collecting the data, and writing and drafting the manuscript. Dr. Ali also substantially contributed to designing and supervising the study and writing the draft of the manuscript.

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