Original Research Article

To Assess the Plasma Lipid Profile Parameters and Their Internal Ratios to Assess Their Relationship to Cardiovascular Risk in Psoriasis Patients: A Comparative Study

Pooja Nupur[1], Subodh Kumar[2], Ramawatar Singh[3]

[1]Assistant Professor, Department of Skin & V. D, Nalanda Medical College & Hospital, Patna, Bihar, India

[2]Assistant Professor, Department of Skin & V. D, Nalanda Medical College & Hospital, Patna, Bihar, India

[3]Associate Professor & HOD, Department of Skin & V. D, Nalanda Medical College & Hospital, Patna, Bihar, India

Abstract

Aim: The aim of the present study was to assess the plasma lipid profile parameters and their internal ratios to assess their relationship to cardiovascular risk in psoriasis patients.

Methods: The psoriasis patients attending Department of Skin & V. D, Nalanda Medical College & Hospital, Patna, Bihar, India were selected from January 2021 to December 2021. The study included a total number of 200 subjects including 100 normal control and 100 psoriasis patients.

Results: Plasma levels of Total Cholesterol (TC), Triacylglycerols (TAG), VLDLC, LDLC, and HDLC in normal controls and psoriasis sufferers. The table shows that psoriasis patients had higher TC, TAG, VLDLC, and LDLC levels than normal controls, but lower HDLC levels. Compared to Group-1 and Group-2, Group-3 had considerably higher lipid profile measures except HDLC. Psoriasis patients have higher ratios of TC/HDLC, TC/LDLC, TAG/HDLC, and TAG/LDLC than normal controls, but lower ratios of TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/VLDLC, and LDLC/VLDLC.

Conclusion: The current research indicated that psoriasis patients are sensitive group for the dyslipidemia produced cardiovascular issues and the ratio TAG/HDLC is fairly promising predictor of the cardiovascular complications in psoriasis. Further the findings reveal that the ratio TAG/HDLC is an excellent diagnostic of psoriasis disease severity.

Keywords: Psoriasis; PASI Score; Total Cholesterol; Triacylglycerol; Cardiovascular Risk and TAG/HDLC

Introduction

A condition characterised by persistent inflammation of the skin. Psoriasis is defined by an excessive growth of keratinocytes and an immune system response. This condition, which affects 2-3% of the global population, is becoming more associated with metabolic syndrome and cardiovascular diseases due to ongoing inflammation throughout the body. Plasma lipid profile measures and the ratios therein may indicate dyslipidaemia in people with psoriasis. Psoriasis patients must comprehend these factors in order to assess their cardiovascular risk and effectively manage their health. The plasma lipid profile typically assesses the levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides. Lipids have a crucial role in cell activity, as well as in storing energy and transporting fat-soluble nutrients. An imbalance in their levels might lead to atherosclerosis and cardiovascular problems. [1-6] Elevated total cholesterol (TC) levels are associated with an increased risk of cardiovascular disease. Research indicates that individuals with psoriasis have higher levels of total cholesterol (TC) compared to those who are healthy, which in turn increases their risk of cardiovascular disease (CVD). LDL-C, also known as low-density lipoprotein cholesterol, is a kind of cholesterol that is considered harmful and may raise the chance of developing atherosclerosis. Psoriasis patients have elevated levels of LDL-C (low-density lipoprotein cholesterol) depending on the severity and length of their condition. HDL-C, known as "good cholesterol," aids in the elimination of excess

cholesterol from the bloodstream. Psoriasis patients had reduced levels of HDL-C, which therefore elevated their risk of cardiovascular disease. The risk of cardiovascular disease (CVD) rises with elevated levels of triglycerides (TG). Studies indicate that individuals with psoriasis have elevated levels of triglycerides (TG), resulting in the development of dyslipidaemia. In addition to absolute cholesterol levels, the ratios of several lipid indicators may provide insights into cardiovascular risk. [7-10]

Psoriasis is becoming recognised by dermatologists as a systemic disease that affects several organs and has significant effects.2 Dyslipidaemia is the prevailing comorbidity in individuals with psoriasis, maybe resulting from cardiovascular complications and psychological stress. Multiple studies have shown alterations in plasma lipid levels in individuals with psoriasis. [4,5,11-13] This study investigated the relationship between plasma lipid profile measures, internal ratios, and cardiovascular risk.

Materials and Methods

The psoriasis patients attending Department of Skin & V. D, Nalanda Medical College & Hospital, Patna, Bihar, India were selected from January 2021 to December 2021. The study included a total number of 200 subjects including 100 normal control and 100 psoriasis patients.

A comprehensive medical history was obtained, including information about the illness, duration of the disease, medications taken, and dietary habits. The control subjects were selected from the employees of the Medical College and its affiliated hospitals. Psoriasis patients are categorized into Mild, Moderate, and Severe groups based on their PASI Scores.

PASI Score is a statistically developed score to determine the severity of psoriasis dependent on the presence and distribution of psoriatic lesions on various areas of the body such a. Head (h), b. Upper Limbs(u), c. Trunk(t) and d. Lower Limbs(d). While calculating PASI Score the locations of affection i.e, Head, Upper limbs, Trunk and Lower limbs are separately assessed. Morphologic grading of psoriasis plaques is done by examination of factors like Erythema (E), Induration (I) and Desquamation (D). Each of these parameters is assessed on a scale of severity.

Since the four-body region (Head, Upper limbs, Trunk and Lower limbs) constitute around 10%, 20%, 30% and 40% of body surface area accordingly ergo they are given appropriate weightage in scoring by multiplying their scores by 0.1, 0.2, 0.3 and 0.4 respectively. Hence the final formula[14] at arriving PASI Score is:

$$PASI = 0.1 \times (Eh + Ih + Dh) A + 0.2 \times (Eu + Iu + Du) A + 0.3 \times (Et + It + Dt) A + 0.4 \times (El + Il + Dl) A.$$

A fasting heparinised blood sample (5-7ml) was collected from selected psoriasis patients as well as from chosen normal control subjects after obtaining an informed consent. The blood samples were centrifuged at 3500 rpm for ten minutes. The separated plasma was employed for estimation of Total Cholesterol, Triacylglycerols and HDL Cholesterol. [15-17]

Statistical Analysis

The data obtained were expressed as their Mean ± SD and the statistical significance was calculated using student t-test. $p < 0.05$ was considered as significant.

Results

Table 1: The plasma levels of Total Cholesterol (TC), Triacylglycerols (TAG), VLDL Cholesterol, LDL Cholesterol and HDL Cholesterol levels in normal control subjects as well as in psoriasis patients

Groups	Total Cholesterol (mg/dl)	Triacylglycerols (mg/dl)	VLDLC (mg/dl)	HDLC (mg/dl)	LDLC (mg/dl)
Normal Subjects	161.86 ± 31.82	114.64 ± 32.21	28.35 ± 9.08	58.27 ± 8.68	104.86 ± 20.28
Psoriasis Subjects	214.85 ± 28.1	247.78 ± 22.16	50.70 ± 11.12	45.52 ± 9.3	123.85 ± 17.28

Plasma levels of Total Cholesterol (TC), Triacylglycerols (TAG), VLDLC, LDLC, and HDLC in normal controls and psoriasis sufferers. The table shows that psoriasis patients had higher TC, TAG, VLDLC, and LDLC levels than normal controls, but lower HDLC levels.

Table 2: The plasma levels of Total Cholesterol (TC), Triacylglycerols (TAG), VLDL Cholesterol, LDL Cholesterol and HDL Cholesterol levels in Group-1, Group-2, Group-3 psoriasis patients

Groups	Total Cholesterol (mg/dl)	Triacylglycerols (mg/dl)	VLDL (mg/dl)	HDL (mg/dl)	LDL (mg/dl)
Group-1 (Mild) (22)	142.68 ± 18.18	110.16 ± 22.13	20.18 ±6.16	56.16 ± 16.16	100.66 ± 21.22
Group-2 (Moderate)(34)	172.12 ± 14.12	152.26 ± 18.18	36.63 ± 7.12	49.13 ± 15.12	112.12 ± 18.12
Group-3 (Severe)(44)	208.36 ± 20.12	242.16 ± 24.14	49.12 ± 16.18	43.12 ± 16.16	122.8 ± 16.16

The lipid profile parameters except the HDLC are significantly elevated in Group-3 as compared Group-1 and Group-2, In Group-2 as compared to Group 1 as well as in Group 3 as compared to Group 2.

Table 3: The ratios of TC/TAG, TC/HDL, TC/LDL, TC/VLDL, HDL/LDL, HDL/VLDL, TAG/HDL, TAG/ LDL and LDL/VLDL in normal control subjects and in psoriasis patients

Parameters / Groups	TC/ TAG	TC/ HDL	TC/ LDL	TC/ VLDL	HDL/ LDL	HDL/ VLDL	TAG/ HDL	TAG/ LDL	LDL/ VLDL
Normal control subjects (100)	1.36 ± 0.09	2.65 ± 0.66	1.51 ± 0.02	5.95 ± 0.92	0.49 ± 0.08	2.10 ± 0.45	1.86 ± 0.28	0.95 ± 0.22	3.52 ± 0.82
Psoriasis patients (100)	0.86 ± 0.05	4.92 ± 0.88	1.73 ± 0.02	4.34 ± 0.54	0.37 ± 0.03	0.89 ± 0.02	5.42 ± 0.78	1.90 ± 0.32	2.36 ± 0.38

Psoriasis patients have higher ratios of TC/HDLC, TC/LDLC, TAG/HDLC, and TAG/LDLC than normal controls, but lower ratios of TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/VLDLC, and LDLC/VLDLC. Using TAG/HDLC ratio as a cardiovascular disease marker in Psoriasis may be possible because to considerable increase (1.86 ± 0.28 in normal controls vs. 5.42 ± 0.78 in patients).

Table 4: The ratios of TC/TAG, TC/HDL, TC/VLDL, HDL/LDL, HDL/VLDL, TAG/HDL, TAG/LDL and LDL/VLDL in Group-1, Group-2 as well as in Group-3 Psoriasis patients

Parameters / Groups	TC/ TAG	TC/ HDL	TC/ LDL	TC/ VLDL	HDL/ LDL	HDL/ VLDL	TAG/ HDL	TAG/ LDL	LDL/ VLDL
Group-1 (22)	1.29 ± 0.09	2.55 ± 0.58	1.42 ± 0.09	7.10 ± 1.64	0.55 ± 0.04	2.74 ± 0.08	1.92 ± 0.16	1.12 ± 0.06	4.90 ± 0.42
Group-2(134)	1.12 ± 0.04	3.52 ± 0.96	1.52 ± 0.86	4.70 ± 0.72	0.42 ± 0.06	1.36 ± 0.21	3.06 ± 0.88	1.32 ± 0.55	3.05 ± 0.08
Group-3(44)	0.82 ± 0.04	4.86 ± 1.82	1.66 ± 0.08	4.40 ± 1.01	0.33 ± 0.09	0.85 ± 0.05	5.60 ± 1.87	1.96 ± 0.07	2.23 ± 0.86

As disease severity increases, TC/HDLC, TAG/HDLC, and TAG/LDLC ratios rise, while TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/VLDLC, and LDLC/VLDLC ratios decrease.

Discussion

Psoriasis is a long-lasting skin condition that affects around 2-3% of the population. Its prevalence is influenced by several variables such as genetics, environment, viruses, immune system, biochemistry, hormones, and psychological factors. Alcohol and drug addiction may also contribute to its occurrence. This condition is prevalent worldwide, affecting about 120-180 million individuals. [18] In recent years, it has been acknowledged that psoriasis is a systemic condition linked to several organ abnormalities and consequences. [2]

The concentrations of Total Cholesterol (TC), Triacylglycerols (TAG), Very low-density lipoprotein cholesterol (VLDLC), Low density lipoprotein cholesterol (LDLC), and High density lipoprotein cholesterol (HDLC) in the plasma of both normal control participants and psoriasis patients were measured. The data clearly shows that psoriasis patients have considerably higher levels of TC, TAG, VLDLC, and LDLC compared to normal control participants. Conversely, psoriasis patients exhibit a considerable decrease in HDLC levels compared to normal control subjects. The present study reveals a notable increase in plasma triglyceride (TAG) and total cholesterol (TC) levels in psoriasis patients compared to normal control subjects. This suggests that the dyslipidaemia observed in these psoriasis patients is caused by elevated TAG and TC levels or by changes in the lipoprotein fractions responsible for their transportation. This aligns with other previous findings. [19-21]

The lipid profile measures, with the exception of HDLC, show a considerable increase in Group-3 compared to both Group-1 and Group-2. Additionally, there is an increase in Group-2 compared to Group-1, as well as in Group-3 compared to Group-2. Levels of TC/HDLC, TC/LDLC, TAG/HDLC, and TAG/LDLC are higher in psoriasis patients compared to normal control individuals. Conversely, the ratios TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/VLDLC, and LDLC/VLDLC are lower in psoriasis patients compared to normal control subjects. The ratios of

TC/ HDLC, TAG/HDLC, and TAG/LDLC increase in parallel with the severity of the disease, whereas the ratios of TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/VLDLC, and LDLC/VLDLC show a substantial parallel decrease with the severity of the disease. Cardiovascular problems, such as atherosclerosis, are caused by several causes. However, abnormalities in plasma and dyslipidaemia are significant contributors to the development of these difficulties. [22] Cholesterol and triacylglycerols are the main lipid components of lipoproteins, which are the primary particles responsible for carrying lipids in the human body. The triacylglycerols synthesised in the liver, also known as endogenous triacylglycerols, are mostly carried by a lipoprotein called VLDL. On the other hand, cholesterol is delivered by both LDL and HDL lipoprotein fractions. Additionally, LDL is derived from the VLDL fraction. Therefore, it is crucial in dyslipidaemia to examine and evaluate the makeup of these two lipoproteins. Cardiovascular disease is often predicted by several atherogenic indices, with the most commonly used ones being the Atherogenic Coefficient (AC) and the Atherogenic Index of Plasma (AIP). The main factors for psoriatic dyslipidaemia are total cholesterol (TC) and triglycerides (TAG), which are carried in the bloodstream by very low-density lipoproteins (VLDL), low-density lipoproteins (LDL), and high-density lipoproteins (HDL) accordingly. Therefore, it is important to note that the ratio between Triacylglycerols (TAG) and HDL Cholesterol (HDLC) might serve as more accurate indicators of psoriatic dyslipidaemia. Recent studies have demonstrated that the different fractions of cholesterol and their interrelationships are more accurate indicators of cardiovascular risk in dyslipidemia-induced cardiovascular disease.[23] Therefore, in this study, the TAG/HDLC ratio was used to evaluate the cardiovascular risk in psoriasis patients with dyslipidaemia.

Conclusion

The current research determined that individuals with psoriasis are a susceptible population for developing dyslipidemia-induced cardiovascular difficulties. Additionally, the ratio of triglycerides to high-density lipoprotein cholesterol (TAG/HDLC) shows promise as a reliable marker for assessing cardiovascular complications in psoriasis. Moreover, the findings suggest that the TAG/HDLC ratio serves as a reliable indicator of the severity of psoriasis illness. Further study should be conducted with a larger sample size of psoriasis patients, focussing on different cardiac indicators, in order to get greater insight into this feature.

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