e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(5); 236-241

Original Research Article

A Retrospective Assessment of the Plasma Lipid Profile Parameters and Their Internal Ratios in Psoriasis Patients

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Received: 01-03-2024 / Revised: 10-04-2024 / Accepted: 20-05-2024
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Conflict of interest: Nil

Abstract

Aim: To investigate the plasma lipid profile parameters and their internal ratios in psoriasis patients who have been clinically grouped.

Material and Methods: This study was conducted Department of Dermatology, GMCH, Purnia, Bihar, India for one year. Detailed history, regarding the illness, duration of disease, the drugs taken as well as food habits was collected. The normal control subjects were taken from the employees of Medical College and affiliated hospitals. Psoriasis patients are clinically sub-grouped into Mild, Moderate and Severe depending on their PASI Scores. A fasting heparinized 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.

Results: It is evident that TC/HDLC, TC/LDLC, TAG/HDLC, TAG/LDLC are significantly elevated in psoriasis patients as compared to normal control subjects whereas the ratios TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/VLDLC and LDLC/VLDLC are significantly lowered in psoriasis patients as compared to normal control subjects. The elevation in TAG/ HDLC is much significant (1.86 ± 0.28 in normal controls against 5.42 ± 0.78 in psoriasis patients) indicating the possibility that this ratio may be employed as a cardiovascular disease marker in Psoriasis. It is seen from the table that there is parallel rise in the ratios of TC/ HDLC, TAG/HDLC, TAG/LDLC with the severity of disease whereas a significant parallel decrease in the ratios of TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/VLDLC and LDLC/ VLDLC with the severity of disease. Further the rise in the ratio of TAG/HDLC is so profound with the severity of psoriasis disease that it is possible to use this ratio as a marker of psoriasis disease severity.

Conclusion: It can be concluded from the results obtained in the present study that psoriasis patients are vulnerable group for the dyslipidemia induced cardiovascular complications and the ratio TAG/HDLC is quite promising marker of the cardiovascular complications in psoriasis.

Keywords: Plasma Lipid Profile, Ratios, Psoriasis.

Introduction

Psoriasis is a chronic inflammatory skin disease characterized by hyperproliferation of keratinocytes and an immune-mediated response. This condition, affecting approximately 2-3% of the global population, has been increasingly associated with metabolic syndrome and cardiovascular diseases (CVDs) due to the chronic systemic inflammation that accompanies it. One of the key metabolic abnormalities observed in psoriasis patients is dyslipidaemia, which can be evaluated through plasma lipid profile parameters and their internal ratios. Understanding these parameters is essential for assessing cardiovascular risk and managing the overall health of psoriasis patients. The plasma lipid profile typically includes measurements of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TG). These lipids play crucial roles in cellular functions, energy storage, and transport of fat-soluble vitamins. However, their imbalance can lead to atherosclerosis and subsequent cardiovascular complications [1-6]. Elevated levels of TC are often linked with increased cardiovascular risk. Studies have shown that psoriasis patients tend to have higher TC levels compared to healthy individuals, suggesting an augmented risk for CVD. Known as "bad cholesterol," elevated LDL-C is a significant risk factor for atherosclerosis.

Psoriasis patients frequently exhibit elevated LDL-C levels, correlating with the severity and duration of the disease. Referred to as "good cholesterol," HDL-C helps in the removal of excess cholesterol from the bloodstream. Psoriasis patients often have reduced HDL-C levels, further increasing their cardiovascular risk. High TG levels are associated with an increased risk of CVD. Research indicates that psoriasis patients typically have elevated TG levels, which contributes to the overall dyslipidaemia observed in this population. Analysing the ratios of these lipid parameters provides additional insights into cardiovascular risk, beyond the absolute values of individual lipids [7-10]. TC/HDL-C Ratio: This ratio is a powerful predictor of atherosclerotic cardiovascular disease. An elevated TC/HDL-C ratio in psoriasis patients indicates a higher risk of CVD. LDL-C/HDL-C Ratio: Similar to the TC/HDL-C ratio, an increased LDL-C/HDL-C ratio is a marker of cardiovascular risk. Psoriasis patients often exhibit higher ratios, reflecting their increased vulnerability to CVD . TG/HDL-C Ratio: This ratio is an emerging marker of insulin resistance and metabolic syndrome. Elevated TG/HDL-C ratios in psoriasis patients highlight the link between psoriasis, metabolic disturbances, and cardiovascular risk. Psoriasis can be clinically classified into several sub-groups based on the extent and severity of the disease, including plaque psoriasis, guttate psoriasis, inverse psoriasis, pustular psoriasis, and erythrodermic psoriasis. Each sub-group may present with distinct lipid profile abnormalities and varying degrees of cardiovascular risk. Plaque Psoriasis: The most common form, characterized by raised, red, scaly patches. Studies have reported significant dyslipidaemia in patients with plaque psoriasis, including elevated TC, LDL-C, and TG levels, along with decreased HDL-C levels. Guttate Psoriasis: This type presents with small, drop-shaped lesions. It is less commonly associated with severe lipid abnormalities compared to plaque psoriasis, but patients may still exhibit unfavourable lipid profiles. Inverse Psoriasis: Involving skin folds, this form of psoriasis may present with unique metabolic profiles due to the chronic inflammatory state, although specific lipid profile studies are limited. Pustular Psoriasis: Characterized by white pustules surrounded by red skin, this severe form is associated with significant metabolic disturbances, including pronounced dyslipidaemia. Erythrodermic Psoriasis: A rare but severe form involving widespread inflammation and exfoliation of the skin. Patients often exhibit profound lipid abnormalities and an elevated risk for cardiovascular complications [11-19].

Material and Methods

This study was conducted Department of Dermatology, GMCH, Purnia, Bihar, India for one year. Detailed history, regarding the illness, duration of disease, the drugs taken as well as food habits was collected. The normal control subjects were taken from the employees of Medical College and affiliated hospitals. Psoriasis patients are clinically sub-grouped into Mild, Moderate and Severe depending on their PASI Scores. PASI Score is a mathematically derived score to assess the severity of psoriasis depending on the appearance and distribution of psoriatic lesions on different parts of the body like a Head(h), b. Upper Limbs(u), c. Trunk(t) and d. Lower Limbs(d). While calculating PASI Score the sites of affection i.e, Head, Upper limbs, Trunk and Lower limbs are separately scored. Morphologic scoring of psoriasis plaques is done by evaluation of parameters like Erythema (E), Induration (I) and Desquamation (D). Each of these parameters are graded on a severity scale. Since the four body region (Head, Upper limbs, Trunk and Lower limbs) represent about 10%, 20%, 30% and 40% of body surface area respectively hence they are given corresponding weightage in scoring by multiplying their scores by 0.1, 0.2, 0.3 and 0.4 respectively. 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 [20-22].

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

The present study was carried out jointly by the Dept. of Dermatology. The study included a total number of 100 subjects including 50 normal control and 50 psoriasis patients. The psoriasis patients were clinically sub grouped as per their PASI Score:

Group-1 (Mild Psoriasis): <3 Group-2 (Moderate Psoriasis): 3.0-6.0 Group-3 (Severe Psoriasis): >6.1

Group-1 was having 11 patients, Group-2 consists 17 patients and

Group-3 had 22 patients.

Table-1 shows the plasma levels of Total Cholesterol (TC), Triacylglycerols (TAG), Very low density lipoprotein cholesterol (VLDLC), Low density lipoprotein cholesterol (LDLC), High density lipoprotein cholesterol (HDLC) levels in normal control subjects and in psoriasis patients. It is evident from the table that TC, TAG, VLDLC, and LDLC levels are significantly elevated in psoriasis patients as compared to normal control subjects whereas a significant fall is seen in HDLC levels in psoriasis patients as

compared to normal control subjects.

Table 1: Showing 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 (50)	161.86±31.82	114.64±32.21	28.35±9.08	58.27±8.68	104.86±20.28
Psoriasis Subjects (50)	214.85±28.12	247.78±22.16	50.70±11.12	45.52±9.38	123.85±17.28

Table 2: Showing 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) (11)	142.68 ± 18.18	110.16 ± 22.13	20.18 ±6.16	56.16±16.16	100.66±21.22
Group-2 (Moderate) (17)	172.12±14.12	152.26±18.18	36.63±7.12	49.13±15.12	112.12±18.12
Group-3 (Severe) (22)	208.36±20.12	242.16 ±24.14	49.12±16.18	43.12±16.16	122.8 ± 16.16

Table-2 narrates the plasma levels lipid profile parameters – TC, TAG, VLDLC, LDLC, HDLC levels in Group-1, Group-2 and in Group-3 psoriasis patients. It is seen from the table that 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. Further it is evident from the table that there is a pso- riasis disease severity related parallel raise in TC levels and TAG levels in these studied three groups of psoriasis patients.

Table-3 gives the calculated ratios of TC/TAG, TC/HDLC, TC/ LDLC, TC/VLDLC, HDLC/LDLC, TAG/HDLC, TAG/LDLC and LDLC/VLDLC in normal control subjects and in psoriasis patients. It is evident from the table that TC/HDLC, TC/LDLC, TAG/HDLC, TAG/LDLC are significantly elevated in psoriasis patients as compared to normal control subjects whereas the ratios TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/VLDLC and LDLC/VLDLC are significantly lowered in psoriasis patients as compared to normal control subjects. The elevation in TAG/ HDLC is much significant (1.86 ± 0.28 in normal controls against 5.42 ± 0.78 in psoriasis patients) indicating the possibility that this ratio may be employed as a cardiovascular disease marker in Psoriasis.

Table-4 narrates the ratios of TC/TAG, TC/HDLC, TC/LDLC, TC/VLDLC, TAG/HDLC, TAG/LDLC and LDLC/VLDLC in Group-1, Group-2 as well as in Group3 psoriasis patients. It is seen from the table that there is parallel rise in the ratios of TC/ HDLC, TAG/HDLC, TAG/LDLC with the severity of disease whereas a significant parallel decrease in the ratios of TC/TAG, TC/VLDLC, HDLC/LDLC, HDLC/ VLDLC and LDLC/ VLDLC with the severity of disease. Further the rise in the ratio of TAG/HDLC is so profound with the severity of psoriasis disease that it is possible to use this ratio as a marker of psoriasis disease severity.

Table 3: Showing 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 (50)	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 (50)	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 ± 0.34	2.36 ± 0.38

Table 4: Showing 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 (11)	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 (17)	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 (22)	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

Discussions

Lipid metabolism and lipid turnover seems to be affected in psoriasis as psoriasis is primarily an inflammatory disease and normally inflammatory conditions do induce the releases of various cell signaling compounds including cytokines, interleukins, tissue necrotic factors and others [23-28], which tend to enhance systemic lipid and cholesterol synthesis through stimulating SREBP target genes as well as through up gradation of HMG CoA reductase gene [29, 30]. This causes an increase in the systemic synthesis of lipid and cholesterol which is need of inflammatory state for the additional lipid requirements. Psoriatic dyslipidemia is characterised by elevated plasma triacyl- glycerol, cholesterol and other lipoprotein fractions [31,32]. It is observed in the present study that there is a significant raise in plasma TAG as well as in plasma TC levels in psoriasis patients as compared to normal control subjects suggesting that dyslipidemia observed in these psoriasis patients is due to raise in TAG and TC levels or to an alteration in lipoprotein fractions involved in their transport. This is in agreement with many earlier reports [6,8,9]. Further the elevations in plasma lipid parameters observed in present study in psoriasis patients as well as in clinically sub grouped psoriasis patients is in agreement with studies of Mohammed Amer et al., [33]. As cardiovascular risk factors are elevated in psoriasis making these patients more vulnerable for the risk of developing cardio- vascular complications. No doubt there exist an independent relationship between HDLC and cardiovascular risk however the contribution of TAG to cardiovascular risk cannot be neglected. Cardiovascular complications including atherosclerosis is a multi-factorial process, but abnormalities in plasma as well as dyslipidemia are one of the major key factors in development of cardiovascular complications [34]. The cholesterol and the triacylglycerols are two principal lipid constituents that make up the composition of lipoproteins, the salient lipid transporting particles in human system. The endogenous or liver synthesized triacylglycerols are mainly transported by lipoprotein VLDL, whereas cholesterol being transported by both LDL and HDL lipoprotein fractions, further the LDL arises from VLDL fraction. Thus it becomes significant in dyslipidemia to study and to assess the composition of these two lipoproteins. The development of cardiovascular disease is normally predicted by many atherogenic indices and the most generally employed are: Atherogenic Coefficient (AC) and Atherogenic Index of Plasma (AIP). The principle contributors of psoriatic dyslipidemia being TC as well as TAG and these are transported in blood plasma by VLDL, LDL and HDL respectively. So it becomes significant that the ratio of these parameters, specifically, the Triacylglycerols (TAG) and the HDL Cholesterol (HDLC), may become better markers of psoriatic dyslipidemia. It has been shown recently in dyslipidemia induced cardiovascular disease the various cholesterol fractions and their internal relationships serves as better markers of cardiovascular risk [35], Hence, in the present study, TAG/HDLC was taken to assess the dyslipidemia induced cardiovascular risk in psoriasis patients. The ratio TAG/HDLC is significantly elevated in psoriasis patients as compared to normal control subjects and also a proportional elevation has been observed depending on the severity of the disease indicating its significance in assessing the cardiovascular risk in psoriasis induced dyslipidemia.

Conclusion

It can be concluded from the results obtained in the present study that psoriasis patients are vulnerable group for the dyslipidemia induced cardiovascular complications and the ratio TAG/HDLC is quite promising marker of the cardiovascular complications in psoriasis. Further the results indicate that the ratio TAG/HDLC is a good marker of psoriasis disease severity. Future research work involving more number of psoriasis patients with various cardiac markers throw much light on this aspect.

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