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Association of oxidative stress with lipid profile in various stages of Psoriasis

Fearoz Khan, Syed Muhammad Naeem, Mehwish Durrani, Muhammad Shafiq

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Author Information

Dr. Fearoz Khan
Senior lecturer, Department of Biochemistry, Rehman Medical College, Peshawar.
(Corresponding Author)
Email: ferozbch@gmail.com

Dr. Syed Muhammad Naeem
Assistant Professor, Department of Biochemistry, Saidu Medical College, Swat.

Dr. Mehwish Durrani Associate Professor, Department of Biochemistry, Rehman Medical College, Peshawar.

Dr. Muhammad Shafiq
Professor, Department of Biochemistry, Rehman Medical College, Peshawar.

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ABSTRACT

Introduction: Along with specific clinical features reported in the autoimmune disease Psoriasis, biochemistry reveals abnormal lipid profiles, reduced anti-oxidant enzyme activity, and lipid peroxidation, features that may promote atherogenesis in these patients.

Objective: To ascertain the association of oxidative stress in terms of extent of lipid peroxidation with lipid profile in various stages of psoriasis.

Materials & Methods: The present case control study was carried out in the Department of Biochemistry, Basic Medical Sciences Institute (BMSI), Jinnah Postgraduate Medical Centre (JPMC), Karachi from April 2015 to December 2015. One hundred and twenty patients of psoriasis were included in the study and grouped as mild, moderate, or severe; their data were compared with the data of healthy control group (n=40). Blood was taken from all the subjects, serum separated and analyzed for lipid profile including total cholesterol, triglycerides, high-density lipoproteins (HDL) and low-density lipoproteins (LDL). The extent of lipid peroxidation and antioxidant status were determined by assaying the levels of Malondialdehyde (MDA) and Superoxide Dismutase (SOD) respectively by ELISA. Statistical analysis was done by SPSS software version-16.

Results: A significant increase in the serum level of triglycerides (TG), total cholesterol and LDL was seen in psoriatic patients as compared to controls whereas HDL was significantly low in psoriatic groups. The patients of psoriasis as a whole were having higher levels of MDA as compared to control subjects although a significant increase was found only in severe disease group ($p<0.01$). Similarly, the psoriasis patients had low levels of SOD compared to controls, but a significant decrease was observed only in severe disease group ($p<0.004$).

Conclusion: It is likely that imbalance in oxidant-antioxidant system plays role in the etiology of psoriasis.

Keywords: Oxidative Stress; Psoriasis; Lipid Profile.

The authors declared no conflict of interest. All authors contributed substantially to the planning of research, data collection, data analysis, and write-up of the article, and agreed to be accountable for all aspects of the work.

INTRODUCTION

Psoriasis is an irregular, immune related, provocative skin disease being non-contagious and characterized by red patchy lesions among grey, silvery whitish lines. The lines are classically dispersed on elbows, scalp, knees, nails, joints, and other parts that may be often painful and pruritic when severe.[1]

Normally, skin cells are shed off and replaced by new cells, but in psoriasis, production of skin cells is increased.[2] Different types of psoriasis exist, such as psoriasis vulgaris, guttate psoriasis, erythrodermic psoriasis, pustural psoriasis and psoriatic arthropathy.[3]

Psoriasis affects about 2% of global population. According to World Day Association, about 125 million people suffer from this disease globally.[4] About 0.15 million fresh psoriatic cases are reported annually. In the USA, 4.6% of population is affected while a lower prevalence is reported in Indians (0.7%). High prevalence rates have been reported in Kazakhistan.[5]

It is an idiopathic disease that can occur due to abnormalities in essential fatty acid metabolism,[1] lymphokine secretion, and oxygen related stress.[6] It has been proposed in recent research that increased Reactive Oxygen Species (ROS) generation and decreased function of antioxidant system might be responsible for pathological process. Dyslipidemia is observed in early stages of the disease in psoriasis patients and thus may be congenitally determined.

Psoriasis is a multifactorial illness, influenced by both genetic and environmental factors. Multiple factors including atypical lipid profiles, rise in oxidative stress, decline in antioxidant capacity, and risk factors like hypertension, obesity, and diabetes mellitus are associated with it.[7] Chronic inflammation, a characteristic feature of psoriasis may play a role in initiation and progress of dyslipidemia.[8] Increased ROS production during inflammatory processes of psoriasis cause reduction of antioxidant mechanisms and lipid peroxidation.[9]

Psoriasis patients present with an abnormal lipid profile, depletion of antioxidant defenses and lipid peroxidation that promote atherogenesis.

This study evaluates serum lipid profile, Antioxidant and Lipid Peroxidation status in Psoriasis patients.

MATERIALS & METHODS

This case control study was carried out in the Department of Biochemistry, Basic Medical Sciences Institute (BMSI), Jinnah Post Graduate Medical Centre (JPMC) from April 2015 to December 2015 and was approved by the Ethical Committee of JPMC, Karachi.

Informed consent was taken from individuals taking part in this research. Prescribed Performa was used to collect the baseline data including age, sex, gender, ethnicity and detailed medical history of all study subjects. Healthy individuals were taken as controls for comparison.

The study subjects were diagnosed psoriatic patients, while alcoholics, smokers and patients suffering from hypothyroidism, liver, kidney and skin diseases were excluded.

One hundred and sixty psoriatic patients (40 each in mild, moderate and severe group) were enrolled from the Department of Dermatology JPMC, Karachi. Classification of psoriasis was based on "psoriatic area of severity index" (PASI). Forty healthy subjects served as control group.

Five ml venous blood was taken from all study subjects after an overnight fast (10-12 hours). Strict pre-defined protocols were used for sample collection, storage and analysis. Biochemical investigations such as serum total cholesterol, triglycerides, HDL and LDL were determined by enzymatic colorimetric method on Micro Lab 300. MDA and SOD levels were assayed by ELISA method.

Statistical analysis was carried out by SPSS version 16. The lipid profile variables as well as the markers of lipid peroxidation and antioxidant status are expressed as mean ± standard deviation; $p \leq 0.05$ was considered statistically significant.

RESULTS

MDA and SOD levels

The serum MDA levels were 10.6 ± 2.8, 11.3 ± 2.3, 13.3 ± 2.8 and 29.8 ± 14.4 nmol/ml respectively in control, mild, moderate and severe psoriatic groups which reveals that a statistically significant increase in serum MDA levels was found in severe disease group as compared to control subjects ($p<0.01$) while increase in mild and moderate psoriatic groups was insignificant (Table 1).

The serum SOD levels were 109.2 ± 32.7 ,92.4 ± 31.7, 89.5 ± 25, and 29.8±14.4 U/L respectively in control, mild, moderate and severe psoriatic groups which reveals that a statistically significant decrease in serum SOD levels was found in severe disease group as compared to control subjects ($p<0.004$) while decrease in mild and moderate psoriatic groups was insignificant (Table-1).

Table 1: MDA and SOD levels in control and different psoriatic groups (n=160, 40 per group).

Variables	Control	Mild	Moderate	Severe
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Serum MDA (nmol/ml)	10.6 ± 2.8	11.3 ± 2.3	13.3 ± 2.8	29.8 ± 14.4$^{*\square\Delta}$
Serum SOD (U/L)	109.2 ± 32.7	92.4 ± 31.7	89.5 ± 25*	84.8 ± 35.6*

* Statistically significant as compared to controls p<0.05; $^{\square}$ Statistically significant as compared to mild psoriasis p<0.05
$^{\Delta}$ Statistically significant as compared moderate psoriasis p<0.05; ‡ Statistically significant as compared to severe psoriasis p<0.05

Comparison of lipid profile among the study & control groups

The cholesterol levels in control, mild, moderate and severe psoriatic group were 147.5±27.7, 151.5±36, 193±42.7, and 235.1±35 mg/dl respectively showing a significant increase in moderate (p=0.01) and highly significant increase in severe disease group (p=0.001). The levels of Triglycerides were 104.4±25, 129±19.8, 136.8±29.1, and 160.1±25.6 control, mild, moderate and severe, showing a significant increase in mild ($p<0.05$), markedly significant increase in moderate (p=0.01) and highly significant increase in severe disease group (p=0.001).

The HDL-C levels were 36.3±4.8, 32±8.5, 26.6±15.8, and 21.7±5.9 mg /dl was notably low in severe group when compared with control, mild and moderate psoriatic groups (p=0.005).

The mean LDL-C levels 91.4±30.4, 99.7±28.9, and 104.2±30.4, 124±33 was significantly increased in severe group compared to control, mild and moderate psoriatic groups (p=0.005).

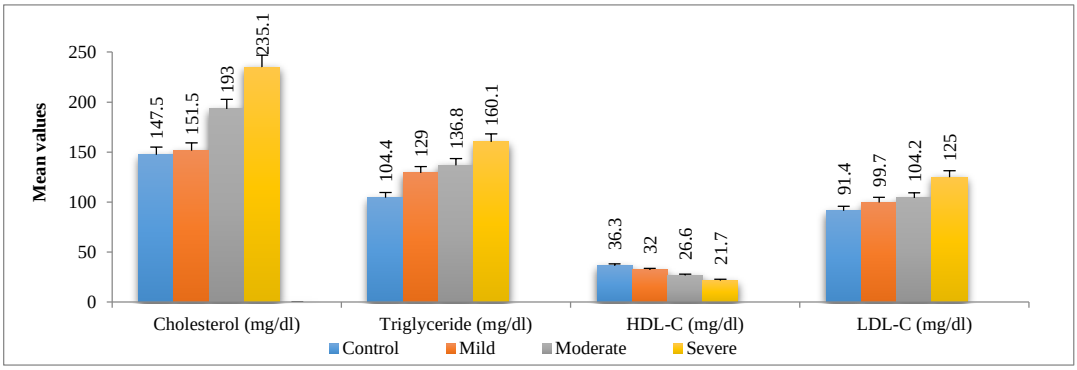

Figure 1: Lipid profiles in the study & control groups (n=160, 40 per group).

DISCUSSION

Raised serum MDA levels were found in psoriatic patients, supporting the trend of increased serum MDA level in these patients, as reported by Pujari VM et al,[10] suggesting the role of lipid peroxidation in the pathogenesis of psoriasis.

The present study yielded strong association between MDA levels and severity of disease. The possible pathway behind rise of MDA level in oxidative stress might be that ROS increases the activity of phospholipase A_2 causing hydrolysis of arachidonic acid, a substrate for lipid peroxidation; as a result many mediators are released, finally producing MDA.[11]

SOD levels were significantly decreased in psoriatic patients compared to control group ($p<0.05$). These results are in accordance with the findings of Mawla et al.[12] The low levels of SOD were more pronounced in severe psoriasis and this may be because SOD is utilized in the breakdown of potentially harmful oxygen molecules in cells produced during inflammatory process in these patients.

Lipid profile was also evaluated, showing a significant rise in total cholesterol level in psoriatic groups when compared to control ($p<0.05$). Similar results were reported by Latha & Kumar[13] and Bhatia et al.[14]

The triglyceride level was significantly increased in psoriatic groups when compared to control ($p<0.05$), endorsing the findings of Ghafoor et al,[15] and Arora et al.[16] A significant decrease in HDL level was observed in psoriatic groups as compared to healthy subjects ($p<0.05$), which is in agreement with the results of Arora et al,[16] and Augustin et al,[17] and contrary to the findings of Dsouza and Kuruville,[18] who attributed the HDL-cholesterol as modifications of risk for cardiovascular diseases in these patients.

The study showed a significant increase in LDL level in psoriatic groups as has been reported by Bhatia et al,[14] and Arora et al.[16]

CONCLUSION

Imbalance in oxidant/antioxidant ratio and hyperlipidemia was more common in psoriasis patients and these factors might intricate the pathological process of psoriasis.

RECOMMENDATION

Dyslipidemias in psoriasis patients should be identified early for treatment and to avoid cardiovascular events and subsequent complications. Furthermore, antioxidant supplementation is recommended to inactivate free radicals preventing further epidermal destruction.

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