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Serum Levels of Total Antioxidant Capacity and Malondialdehyde in Patients with Pityriasis Versicolor

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Abstract

Background: Pityriasis versicolor is a superficial fungal infection of the skin. It is caused by Malassezia. This fungus is part of the normal skin flora but may cause illness when it transforms to its harmful hyphal form. The actual pathophysiology of pityriasis versicolor has not been understood. In recent decades, it has been claimed that overproduction of reactive oxygen metabolites and/or inadequate production of antioxidants may drive cell death. Oxidative stress driven buildup of harmful free radicals may have a pathophysiological effect in the development and progression of PV. Production of reactive oxygen species (ROS) may lead to a shift in the cellular redox state. The purpose of this research was to evaluate the probable involvement of oxidative stress in the pathogenesis of pityriasis versicolor, by evaluating blood levels of malondialdehyde (MDA) and total antioxidant capacity (TAC) in active pityriasis versicolor patients. Methods: This research comprised 60 pityriasis versicolor patients and 30 healthy controls. All patients were exposed to thorough history, full general and dermatological examination. This research was done at Dermatology, Venereology and Andrology Outpatient clinic of Benha University Hospital from April 2019 to December 2019. Results: Serum MDA level was considerably raised (2.56±1.53) nmol/ml in patients compared to controls (1,38±0.46) nmol/ml, (p value> 0.001). Serum TAC level indicated no statistically significant difference between patients and controls. Using ROC analysis, at the cut off point of MDA>1.9 n mol/ ml, the sensitivity of MDA was 63.33 percent , The specificity of MDA was 93.33 percent , positive predictive value in MDA was 95 percent , and negative predictive value in MDA 56 percent . Using ROC analysis, There was a sensitivity of 60%, specificity of 96%, a 97% positive predictive value, a 54% negative predictive value, and a cutoff of 0.5 mM/L for the TAC test. For both MDA and TAC, there were no statistically significant relationships with age or BMI. No correlations were found between serum TAC levels and several clinical factors (sex, smoking, recurrence, family history and site). Different clinical factors did not seen to have a statistically significant correlation with the blood level of MDA (sex, smoking, recurrence, family history and site). It is clear from this study that MDA has a role in the aetiology of pityriasis versicolor, since the serum MDA level was considerably higher in patients compared to controls. Oxidative stress may have a role in the aetiopathogenesis of pityriasis versicolor, as shown by the presence of MDA.

Key words: Total Antioxidant Capacity, Outcome, Malondialdehyde, Pityriasis Versicolor.

1. Introduction

One of the most common fungal skin infections is Pityriasis versicolor (PV). Malassezia, a lipophilic dimorphic fungus, is the culprit. This fungus is normally found on the skin, but when it transforms into a pathogenic hyphal form, it may cause illness (1).

This may be because the fungus flourishes in warm, moist environments, which explains why PV is more common in humid tropical areas. The disease is more common in adolescents because of changes in hormones that cause an increase in sebum production and create an environment rich in lipids for the fungus to thrive in. PV is more frequent in the summer and affects 1% of the population in areas with moderate climates. The prevalence of PV in tropical locations may be as high as 50%, although effective oral and topical treatments are available, but the illness recurrence is frequent and PV can have a negative impact on quality of life for those with the condition (2).

Skin moisturisers, excessive humidity, high temperature, hyperhidrosis, usage of systemic corticosteroids, and genetic susceptibility all contribute to the development of Pityriasis versicolor. By altering the lipid content of the skin or weakening an individual's immune system, corticosteroids might lead to an increase in the incidence of mycosis (3).

Pityriasis versicolor affects the trunk, neck, and/or arms, and is seldom seen on other regions of the body. This is the most prevalent form of the condition. They may seem coppery brown, lighter than the rest of the skin, or even reddish. Pityriasis versicolor alba, or pale spots, are more frequent on darker skin. In other cases, scaly brown patches are followed by non-scaly white patches. In most cases, PV is painless, however itchiness might occur. Generally speaking, PV-induced skin blemishes are neither more or less susceptible to sunburn than the rest of the skin (4).

For localised forms, topical antifungal imidazole derivatives are used in therapy. Shampoo containing 2.5% selenium sulphide, 25% sodium hyposulfite, or imidazole derivatives taken orally may be utilised in diffuse forms (5).

PV's exact pathophysiology is still a mystery. Cell death has been linked to the overproduction of reactive oxygen metabolites and/or a lack of antioxidants in recent decades. PV may be initiated and progressed by the formation of harmful free radicals as a result of oxidative stress. It is possible to modify the cellular redox status by producing reactive oxygen species (ROS) (6).

In order to determine the degree of free radical damage in a biological sample, the total antioxidant

capacity (TAC) may be used to assess oxidative stress (7).

Byproduct of peroxidative reactions with unsaturated phospholipids, glycolipids, and cholesterol is malonodialdehyde (MDA), a well-recognized marker of oxidative stress (8).

Pityriasis versicolor patients' blood total antioxidant capacity and malondialdehyde levels are being examined in this study to see whether there is a link between those levels and the likelihood of the condition returning.

2.Patients and Methods

Study type

This study was designed as a cross sectional case control study.

Study population

This study included sixty patients with pityriasis versicolor and thirty sex and age matched apparently healthy participants as control group.

Ethical approval

This study was done in Dermatology, Venereology and Andrology Outpatient clinic of Benha University Hospital from April 2019 to December 2019. Approval of Dermatology, Venerology and Andrology Department and Ethics Commitee in the Faculty of Medicine of Benha University Hospitals was taken before preceding the study. A written informed consent was taken from each patient after explaning to them the nature of study.

2.1. Patients

Inclusion criteria

- Patients suffering from Pityriasis versicolor
- Age between 16 and 50 years

Exclusions criteria

- Pregnancy
- Age below 16 or above 50
- Immunosuppression or being under any kind of treatment causing absolute or relative immunosuppression
- Patients with other systemic diseases
- Patients with other cutaneous diseases
- Patients receiving oral or topical corticosteroids

2.2. Method

All patients was subjected to the following

- **History taking**: including age, sex, occupation, socioeconomic status, Pityriasis versicolor recurrence, Pityriasis versicolor family history, the previous treatment and the response to the previous treatment.
- **Complete general examination** to exclude other systemic diseases.
- **Complete dermatological examination:** Full dermatological examination was done.
- Pityriasis versicolor was diagnosed clinically, diagnosis was confirmed using woods light.

Laboratory investigations

Five ml venous blood was collected from all patients and healthy control groups under complete aseptic conditions by veinpuncture. The blood samples were allowed to clot completely within 30 minutes at the room temperature, Blood samples was centrifuged at 3500 rpm for 10 min. The separated sera was immediately stored at -80°C until analysis.

Determination of serum level of Malondialdehyde

This test was done by using Colorimetric Method

2.3. Statistical analysis

Data were collected, coded, revised and entered to the Statistical Package for Social Science (IBM SPSS) version 22. The data were presented as number and percentages for the qualitative data, mean, standard deviations and ranges for the quantitative data with parametric distribution and median with inter quartile range (IQR) for the quantitative data with non parametric distribution.

3.Results

The current study included sixty patients with pityriasis versicolor ; 44 males (73.3 %) and 16 females (26.7%). Their ages ranged from 18-50 years with a mean age of 32.48±10.79 years, their body mass index ranged from 22-40 kg/m2 with a mean BMI 28.05 ± 4.72 kg/m2. Thirty clinically free individuals served as a control group; 20 males (66.7%) and 10 females (33.3%). Their ages ranged from 22-49 years with a mean age of 30.23±7.74 years, their body mass index ranged from 22-35 kg/m2 with a mean BMI 27.87±3.58 Kg/m2. There was no statistically significance difference regarding sex, age and BMI between cases and controls Table(1).

Twenty seven (45%) patients reported to have pityriasis versicolor for the first time, and thirty three (55%) had recurrent episodes **(Table 2).**

Table (1): Comparison between patients and controls as regards demographic data

		Patient group (No.=60)		Control group (No.=30)		Chi square test/ Independent t test*	
		No	%	No	%	X^2/t*	p value
Sex	Female	16	26.7%	10	33.3%	0.433	0.511
	Male	44	73.3%	20	66.7%		
Age	Mean± SD	32.48	10.79	30.23	7.74	1.017*	0.312
BMI	Mean± SD	28.05	4.72	27.87	3.58	0.187*	0.852

Table (2) Recurrence of pityriasis versicolor in patients

		No	%
Recurrence	First	27	45.0%
	Recurrent	33	55.0%

Positive family history of pityriasis versicolor was found in 13 patients (21.7%), and in only 2 controls (6.7%), with insignificant difference between patients and controls (Table 3).

The most common affected site of pityriasis versicolor is chest (88.3%), followed by shoulders (61.7%), neck (63.3%), back(35%), and arm (23.3%), (Table 4).

More than one site could be reported

Serum MDA level was significantly increased (2.56±1.53) nmol/ml in patients compared to control group (1,38±0.46) nmol/ml, (p value < 0.001). On the other hand, there was no statistically significant difference between patients and controls in serum level of TAC (Table 5).

There were no statistically significant correlations between MDA and TAC and both age and BMI (Table 6).

There were no statistically significant relations between serum levels of MDA and different clinical variables (Table 7).

There were no statistically significant relations between serum levels of TAC and different clinical variables (sex, smoking, recurrence, family history and site) (Table 8).

Table (3): Comparison between patients and controls as regards family history of pityriasis versicolor.

		Patient group (No.=60)		Control group (No.=30)		Chi square test	
		No	%	No	%	X^2	p value
Family history	**No**	47	78.3%	28	93.3%	3.24	0.072
	Yes	13	21.7%	2	6.7%		

Table (4): Distribution of lesions of pityriasis versicolor in patients

		No	%
Site	**Chest**	53	88.3%
	Shoulders	37	61.7%
	Neck	38	63.3%
	Back	21	35.0%
	Arm	14	23.3%

Table (5): Comparison between patients and controls as regards serum levels of MDA and TAC

	Patient group (No.=60)		Control group (No.=30)		Independent t test	
	Mean	SD	Mean	SD	T	p value
MDA (nmol/ml)	2.56	1.53	1.38	0.46	4.127	<0.001
TAC (mM/L)	1.04	0.97	1.19	0.46	-0.802	0.425

Table(6): Correlations between serum levels of MDA and TAC and age and BMI

	MDA		TAC	
	R	p value	R	p value
Age	-0.075	0.571	-0.03	0.819
BMI	-0.022	0.866	-0.127	0.333

Table.7. Relations between serum level of MDA and different clinical variables

		MDA		Independent t test	
		Mean	SD	t	P value
Sex	Female	2.37	1.36	-0.585	0.560
	Male	2.63	1.60		
Smoking	Yes	2.50	1.49	-0.244	0.808
	No	2.60	1.49		
Recurrence	First	2.72	1.59	0.715	0.477
	Recurrent	2.43	1.49		
Family history	Positive	2.85	1.89	0.754	0.454
	Negative	2.48	1.43		
Site	Chest	2.65	1.55	1.303	0.198
	Shoulders	2.33	1.56	-1.523	0.133
	Neck	2.61	1.48	0.305	0.761
	Back	2.50	1.62	-0.210	0.835
	Arm	2.44	1.44	0.349	0.728

Table (8): Relation between serum levels of TAC and different clinical variables

		TAC		Independent t test	
		Mean	SD	T	P value
Sex	Female	1.08	1.05	0.197	0.844
	Male	1.03	0.95		
Smoking	Yes	1.01	0.84	-0.196	0.845
	No	1.06	1.05		
Recurrence	First	1.09	1.09	0.351	0.727
	Recurrent	1.00	0.87		
Family history	Positive	1.18	0.97	0.573	0.569
	Negative	1	0.98		
Site	Chest	0.99	0.96	-1.047	0.299
	Shoulders	1.15	0.94	1.132	0.262
	Neck	0.96	0.85	0.861	0.393
	Back	1.10	0.98	0.349	0.728
	Arm	1.04	1.17	0.012	0.990

4. Discussion

The mean age of patients in this research was 32.48 10.79 years (range 23 - 50 years). The increased activity of the sebaceous glands during puberty in young people is a key endogenous component, according to Afshar et al. (9), explaining the greater frequency of the condition at a young age (median 31 years old). Malassezia yeasts thrive when sebum production increases on the skin.

This age group was found to have the highest percentage of PV cases (34.9%), according to Sharma et al. (10).

In this research, men made up 73.3% of patients, while women made up 26.7% of patients. According to some researchers, such as Ramadan et al. (11), the greater frequency of illness in males is attributed to increased sebaceous activity in men. Moreover, Sharma and Mamoria (12) found that men had the greatest incidence of the disease (72.5 percent). Men are more likely than women to be affected, which might be explained by their tendency to perspire more, particularly while engaging in activities that need them to be outside for an extended period of time. Females have a lower incidence rate than males, which might be explained by the fact that females are more reluctant to seek medical attention since lesions tend to occur on more private regions of the body (13).

Other research on this subject have shown conflicting results. Sharma et al. (10) found no difference in the risk of breast cancer based on gender. According to Meera and Heidrich, the number of female patients with pityriasis versicolor was greater than previously reported.

One-third of the participants (33/55) reported recurrences of their symptoms in this research. As previously reported by Kambil, (16) and Snekavalli et al. (13), a recurrence rate of 36.8 per cent and 35 per cent respectively was seen in this study.

These findings might be explained by the high concentration of sebum glands in these areas: 88.5 percent of the participants were found to be affected, followed by neck (63.3 percent), shoulders (61.7 percent), back (35 percent), and arm (23.3 percent).

With Afshar et al. (9), and et al. (17), the present research is almost in agreement with their findings.

A positive family history of pityriasis versicolor was recorded in 21.7 percent of the participants in this investigation. Patients with a favourable family history were found in 38.3% of cases, according to Kuruvilla et al. (17). This shows that susceptibility is influenced by genetics. Similarly, Kambil (16) and Snekavalli et al. (13), who reported a 34.2 percent and 31 percent proportion of good family history, agreed with this conclusion. There were 21.1 percent of patients with a positive family history, especially in first-degree cousins, as reported by He et al (18). In these situations, the disease began earlier in life and was more likely to return, as well as lasting longer.

Pityriasis versicolor patients' blood oxidant and antioxidant indicators have not before been studied in this way.

Pityriasis versicolor patients had a serum MDA level of 2.56 nmol/ml, compared to a control level of 1.38 nmol/ml (p value 0.001). Kurutas and Ozturk, (19), discovered that malondialdehyde, nitric oxide, and nitrotyrosine levels were higher in lesions of pityriasis versicolor than in normal skin, and this conclusion is consistent with their findings. The levels of TBARS, an indication of lipid peroxidation, were shown to be considerably (P 0.05) greater in dermatophytic claves patients when compared to healthy controls by Al Qudah et al. (20).

Oxidative stress from reactive oxygen species (ROS) generated by damaged cellular walls may have contributed to increased levels of MDA in pityriasis versicolor patients in the current investigation. Malassezia species may produce reactive oxygen and nitrogen species in vitro medium, according to Spater et al. (21). However, in the literature search, there is no information on malassezia in vivo. Reactive oxygen species (ROS) like superoxide anion and hydorxyle radical can cause lipid peroxidation, resulting in the formation of lipid peroxides and lipoxides, which in turn can lead to a chain reaction and the generation of MDA and other cytotoxic end products due to their

unhindered cytotoxic action, as suggested by Shabaka et al.(22). Cytotoxicity, mutagenecity, and cell death may occur as a result of these end products' damage to the cell membrane or DNA. Toxic to melanocytes, they may block tyrosinase and cause hypopigmentation, both of which can be seen in hypopigmented verrucas.

Compared to healthy controls, patients' serum TAC levels were found to be non-significantly elevated (p =0.425). This suggests that pityriasis versicolor suffers from an elevated oxidative stress, which results in the depletion of total antioxidant capacity. Pityriasis versicolor sufferers had increased activity of the antioxidant defence enzyme, superoxide dismutase and catalase, in lesional skin in Kurutas and Ozturk, (19), a study of individuals with pityriasis versicolor. The epithelium of individuals with pityriasis versicolor expressed more glutathione s-transferase isoenzyme T1 than control epithelium (P 0.05), according to Kilic et al. (23), who speculated that oxidative stress may be a factor in the disease's development.

Only age (p=0.571), gender (p=0.866), or smoking status (p=0.808) were shown to have a statistically significant link with MDA serum levels. Our findings were consistent with those of Nielsen et al. (24) who reported finding no relationships between MDA levels and either sexual orientation, age, or the use of cigarettes (P 0.03).

This research found no link between the blood level of TAC and age (p=0.819), while Sharifian et al. (25), examined the influence of age on total plasma antioxidant capacity. The antioxidant system weakens with increasing age, according to the researchers' findings.

Besagil et al. (26), on the other hand, discovered a positive association between the serum TAC levels and the BMI in the experimental group (p=0.001).

In contrast to Lettrichová et al. (27), who found that women had considerably lower salivary TAC than males, our investigation found no association between TAC and gender. These findings are consistent with those of Ilaria and Anna (28), who reported that salivary TAC levels were not significantly different between smokers and non-smokers, whereas no changes were identified in urine TAC between smokers and non-smokers.

Smoking had no association with oxidative stress in our investigation, despite the findings of Isik and Ceylan (29), who showed that the antioxidant defence systems of smokers were weakened as well as reactive oxygen radicals produced in smoke.

There have been no previous studies that have looked at the oxidant and antioxidant states of serum from patients with pityriasis versicolor, so we compared our findings with those of Ozturk et al. (30), who found elevated levels of Super oxide dismutase (SOD) and malondialdehyde (MDA) in patients with tinea pedis and seborrhoeic dermatitis. Patients with seborrhoeic dermatitis had lower levels of TAS (total antioxidant status), according to Emre et al. (31). Further research into Pityriasis versicolor and seborrhoeic dermatitis is essential because of these contradicting findings.

5. Conclusion

pityriasis versicolor patients had considerably higher levels of serum malondialdehyde than did control subjects, suggesting that MDA is involved in the disease's onset and progression. Oxidative stress may have a role in the aetiopathogenesis of pityriasis versicolor, as shown by the presence of MDA.

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