Original Paper

Metabolic Syndrome in Psoriasis Patients-an Observational Study

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ABSTRACT: Our observational study included on 54 patients with PsO, evaluated into the Dermatology Department of the Emergency County Hospital Craiova, Romania, between August 2023 and January 2024, and 40 controls. Our research proposed determining the prevalence of MetS in a cohort of PsO patients, and its relationship to subclinical atherosclerosis, evaluated by carotid ultrasound. Metabolic syndrome (MetS) was established according to National Cholesterol Education Program (NCP) Adult Treatment Panel (ATP) III criteria for MetS for 35 of the patients (64.81%) vs. 11 of the control group (27.5%), p=0.0003. An overview of each component of MetS depending on the diagnostic criteria for MetS showed that waist and total cholesterol exerted significant differences. Carotid ultrasound evaluation revealed an increased ITM, of over 0.9mm, for 19 (35.18%) or PsO patients, significantly increased compared to controls, as well as the presence of carotid plaques in significantly different percentages (37.03% PsO vs. 17.5% controls, p=0.001). We also noted that for patients with MetS, US examination displayed increased results for IMT compared to those without MetS. The prevalence of carotid atheroma plaque was augmented in patients with MetS and PsO. In our PsO group IMT exerted a positive inter-relation with: age, MetS, blood glucose, disease duration, and PASI. Important to note is that after multiple linear regression analysis, age and MetS were independent indicators of IMT (p=0.02 for age and p=0.001 for MetS). Our findings sustain a firm relationship between MetS and psoriasis and the major consequence of this observation is the inherent risk of cardiovascular events.

KEYWORDS: *Psoriasis, metabolic syndrome, cardiovascular risk, carotid ultrasound.*

Introduction

Psoriasis (PsO) is a chronic immune mediated pathology with a complex pathogenesis that involves perpetual interplay between immune cells, genetic alterations along with the input of several environmental risk factors.

Its reported prevalence is between 2-3% of the general population [1].

The evolution and future prognosis are impacted not only by its destructive and progressive evolution but ais also consequent to associated comorbidities that share common pathogenesis [2].

Among these, metabolic syndrome (MetS) is at utmost importance and contemporary researches have focused on the current understanding of the fundamental insights related to their common immune and inflammatory characteristics, significantly impacting a psoriasis patient's quality of life [2,3].

MetS significantly increases cardiovascular risk, in a direct linear manner, event that determines a premature mortality among PsO patients [4].

Additionally, experimental and epidemiological researches have demonstrated the relationship between several cells of the immune system (cytokines, interleukins and adipokines) with the presence of cardiovascular disease, MetS, diabetes and obesity, sustaining the conclusion that PsO constitutes a risk factor of several systemic complications.

Moreover, the presence of several dietary habits, as alcohol consumption, or smoking, contribute and augment the future cardiovascular risk [5,6].

Our research aimed to evaluate a cohort of PsO patients, in regards to the presence of MetS, along with its relationship to subclinical atherosclerosis, evaluated by carotid ultrasound.

Material and Methods

This observational study was performed by including 54 patients with PsO, evaluated in the Dermatology Department of the Emergency

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County Hospital Craiova, Romania, between August 2023 and January 2024, and 40 controls. The study protocol involved clinical, laboratory, and imagistic investigations.

Approval for performing the study was obtained from the ethics committee (under the number of 356/21.09.2023) and a consent form was signed by all patients before the inclusion in the study.

In order to determine the burden of psoriasis we used Psoriasis Area and Severity Index (PASI) [8], with limits between 0-72; therefore, depending on the score we can define a mild disease (<7), moderate (7-15) or severe psoriasis (>15)

The presence of MetS was determined in agreement with the National Cholesterol Education Program (NCP) Adult Treatment Panel (ATP) III by finding at least three of the component variables: increased waist circumference (>102cm in men or >88m in women), hypertriglyceridemia (TG ≥150mg/dL), high-density lipoprotein cholesterol (HDL-C) (<40mg/dL in men or <50mg/dL in women), hypertension (blood pressure ≥130/85mmHg), and hyperglycemia (fasting levels of serum glucose ≥100mg/dL) [8].

Both left and right common carotid arteries were examined with an Esaote MyLab device, with a linear probe that achieved increased frequencies, between 10 and 18MHz, by an experienced sonographer blinded of patients' history and clinical data.

The scan was performed according to Mannheim consensus in order to measure intima-media thickness and to reveal the presence of atheroma plaques [9].

An increased IMT was considered above the value of 0.9mm.

Statistical data were obtained using GraphPad Prism 5.5. Results are described as mean±SD and t-test was used for groups comparison.

Qualitative variables are presented as frequencies (n) and percentages (%).

Logistic regression models were established for factors screening and a multivariate logistic regression model was developed using a forward-stepwise mode.

Results

Our analysis included 54 consecutive PsO patients and 40 controls. PsO group consisted of 26 female patients (48.14%) and 28 male (51.86%), similar to the distribution of controls (47.5% female and 62.5% male).

We identified a mean age of 43.4 years for patients with PsO, similar to the mean age calculated for controls-41.86 years.

The average disease duration was 5.1 years. MS was identified for 35 of the patients (64.81%) and 11 of the subjects included in the control group (27.5%), p=0.0003.

Regarding smoking, between the patients we identified 15 current smokers, status determined for 10 of the controls.

The general and laboratory data of the PsO group are pictured in Table 1 and Table 2.

Table 1. General data of PsO patients.

	Psoriasis N=54	**Without MetS N=19**	**MetS N=35**	**p (MetS/Without MetS)**
Age (years) mean; SD	43.4; 10.02	41.2; 9.2	44.2; 11.01	0.021
Sex F/M N; (%)	26 (48. 14)/28 (51.86)	9 (47.36)/10 (52.64)	20 (57.14)/15 (42.86)	0.032
Disease duration (years) mean; SD	5.1; 7.2	4.9; 8.1	5.4; 7.8	0.041
Smoking N; %	15; 27.77	4; 21.5	11; 31.41	0.001
Weight (Kg) mean; SD	76.3±16.4	71.2±14.2	81.6±15.2	0.003
Height (cm) mean; SD	166.4; 12.2	165.6; 11.1	167.2; 12.2	0.812
BMI (Kg/m2sc) mean; SD	31.5; 5.4	29.12; 6.2	31.9; 7.0	0.02
Waist (cm) mean; SD	92.34; 13.51	89.1; 11.1	101.4; 10.8	0.001
SBP (mmHg) mean; SD	122.1; 15.3	115.5; 10.7	125.7; 15.2	0.031
DBP (mmHg) mean; SD	75.0; 9.5	74.1; 6.2	76.4; 9.1	0.421

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HTA N; %	13; 24.07	4; 21.5	9; 25.71	0.031
Diabetes N; %	19; 35.18	2; 10.52	17; 48.57	<0.0001
Obesity N; %	30. 55.55	3; 15.78	27; 71.14	<0.0001
NAFLD N; %	32; 59.25%	10; 52.63	22; 62.85%	0.002

BMI: body mass index, SBP: systolic blood pressure, DBP: diastolic blood pressure, HTA: hypertension, NAFLD: non-alcoholic fat liver disease. p value describes the statistical significance for the differences between MetS and without MetS groups.

Table 2. Biologic parameters of PsO in regards to the presence of MetS.

	Psoriasis N=54	**Without MetS N=19**	**MetS N=35**	**p (MetS/Without MetS)**
Blood glucose	115.23±29.7	99±18.22	117±23.56	0.003
HbA1c	6.4±1.6	5.9±1.1	6.5±1.4	0.121
SUA	5.91±1.9	5.6±1.3	5.8±1.3	0.321
TC	208.4; 40.91	209.2±38.1	194.6±39.0	0.691
LDLc	110.1±34.4	108.8±35.2	113.2±32.0	0.483
HDLc	41.2±11.2	50.01±9.7	30.59±10.3	0.001
TG	166±43.59	168±54.21	172.34±44.5	0.212
ALT	30.23±12.2	31.2±11.1	37.21±12.21	0.021
AST	29.21±14.5	28.32±11.21	32.34±13.21	0.012
GGT	26.32±11.21	18.45±12.21	27.5+10.92	0.002
CRP	9.34±3.22	8.91±2.92	9.5±2.2	0.021
ESR	34.2±12.23	29.32±12.1	35.3±11.23	0.032

MetS: metabolic syndrome. SUA: serum uric acid. ALT: alanine transaminase. AST: aspartate aminotransferase. GGT: gamma-glutamyl transferase, CRP: C-reactive protein. TC: total cholesterol, TG: triglycerides HDLc: high-density lipoproteins. LDLc: low-density lipoproteins. HbA1c: glycosylated hemoglobin. p value describes the statistical significance for the differences between MetS and without MetS groups.

In regards to each component of metabolic syndrome, we identified certain differences established between PsO and control group: 29 (53.70%) vs. 14 (35.5%) subjects with a waist circumference above the limits (p=0.01), increased triglycerides: 30 (55.55%) vs. 6 (15%) subjects, p=0.001, decreased HDL cholesterol: 21 (38.88%) vs. 9 (22.5%), p=0.002, increased or DBP: 35 (64.81 %) vs. 12 (30%), p<0.0001, high blood glucose: 13 (24.07%) vs. 5 (12.5%), p=0.08 (table 3, Figure 1).

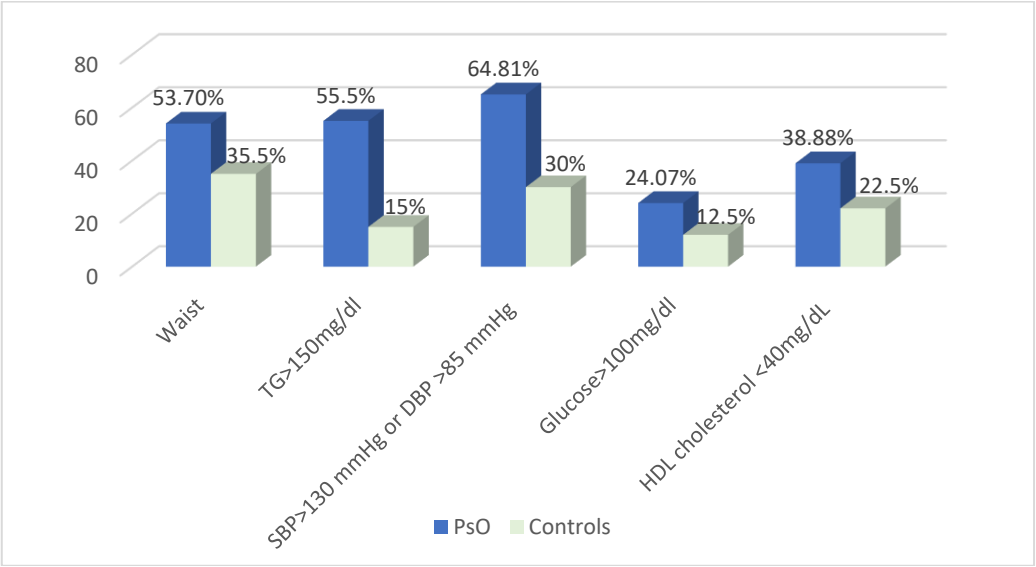

Figure 1. Metabolic syndrome parameters.

Table 3. Description of metabolic syndrome variables for PsO and controls.

	PsO	Controls	p
TC (mg/dl) mean; SD	208.4; 40.91	187.8; 28	0.005
LDLc (mg/dl) mean; SD	110.1; 34.4	101.2; 31.1	0.023
HDLc (mg/dl) mean; SD	41.2; 11.2	39.2; 10.1	0.031
TG (mg/dl) mean; SD	166; 43.59	152.3; 41.12	0.002
Blood glucose (mg/dl) mean; SD	115.23; 29.7	101.21; 12.21	0.001
BMI (kg/m2sc) mean; SD	31.5; 5.4	29.2; 4.1	0.002
Waist circumference (cm) mean; SD	92.34; 13.51	81.07; 14.26	0.003
SBP (mmHg) mean; SD	122.1; 15.3	121.2; 12.1	0.871
DBP (mmHg) mean; SD	75.0; 9.5	72.2; 8.1	0.713

TG: triglycerides. HDLc: high-density lipoproteins.

Table 4. Prevalence of MetS components in PsO cohort.

	Psoriasis N=54	Without MetS N=19	MetS N=45	p (MetS/Without MetS)
Abdominal obesity N; %	29; 53.70%	7; 36.84	22; 48.88	0.002
Diabetes or fasting glucose>100mg/dL N; %	13; 24.07%	4; 21.05	9; 20	0.871
TG>150mg/dL N; %	30; 55.55%	8; 41.1	17; 37.77	0.321
Hypertension or BP>130/90 mmHg N; %	35; 64.81	10; 52.63	25; 55.55	0.751
HDL<40/50mg/dl N; %	21; 38.88%	8; 42.10	13; 37.14	0.721

An overview of the prevalence of each component of MetS in regards to MetS presence/absence in the study group is pictured in Table 4.

We noted statistically significant different values for TC (p=0.005) and for waist measurement (p=0.003).

Another important point of our study group evaluation was constituted by assessment the presence of subclinical atherosclerosis, an early marker and risk factor for cardiovascular events.

Carotid ultrasound evaluation revealed an increased ITM, of over 0.9mm, for 19 (35.18%) or PsO patients, significantly increased compared to controls, p=0.002, as well as the presence of carotid plaques in significantly different percentages (37.03% PsO vs. 17.5% controls, p=0.001).

We also observed that patients with MetS had significantly increased values of IMT when compared to those that didn't meet the criteria for MetS (0.88±0.28mm vs. 0.70±0.20mm, p=0.01), observation maintained for upper limits (1.9mm vs. 1.2mm) (Figure 2).

Also, the percentage of carotid plaques was significantly increased for patients with MetS and psoriasis (17; 45.71% vs. 3; 27.27%, p=0.05).

In our PsO group IMT exerted a positive inter-relation with age, MetS, blood glucose, disease duration, and PASI.

After multiple linear regression analysis, MetS and age were found to be independent predictors of IMT value (p=0.02 for age and p=0.001 for MetS).

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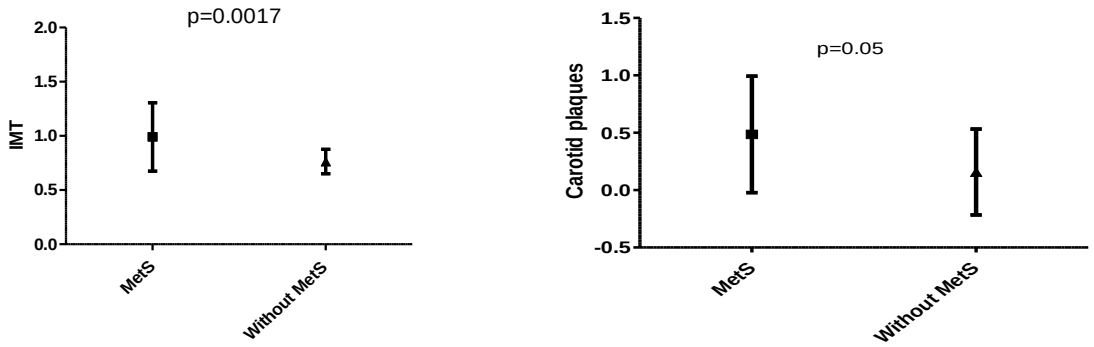

Figure 2. IMT and prevalence of carotid plaques in PsO depending on the presence of MetS.

A final part of the study was represented by the analysis of the possible correlations between MetS components, along with other traditional cardiovascular risk factors, carotid ultrasound measurements, and disease activity or inflammatory parameters.

We observed a strong, positive association for MetS and PASI (r=0.545, p=0.002), PASI and carotid ultrasound parameters (IMT r=0.412, p=0.001; carotid plaques r=0.514, p=0.002).

Discussion

One of the most common chronic, recurrent, and inflammatory dermatologic conditions, PsO, with a world-wide prevalence that varies between 2~3%, is a pathology with systemic involvement and several comorbidities, as psoriatic arthritis, Crohn's disease, cardiovascular disease and MetS [10-15].

Between these, MetS exerts a major role, consequent to its impact on disease evolution, prognosis, morbidity and mortality [16-21].

Researches has focused on the analysis of both prevalence and common pathogenic pathways shared by the two pathologies.

An extensive overview on psoriasis pathogenesis has been provided by several relevant researches and there is a consensus in the direction of sharing certain immunologic features with MetS, mostly in regards to Th1 cytokines.

Important consequences of this autoimmune feature are represented by the effects on insulin resistance, disturbance of lipids metabolism or adipogenesis process [19-21].

An increasing number of researches have results that sustain that psoriasis is often linked with MetS, HTA, diabetes, altered lipid parameters, and NAFLD [2,3,22-25].

A correct management of MetS in patients with PsO implies a careful knowledge of the precise mechanisms linking the two pathologies, as is at utmost importance to establish the proper and individualized therapeutic options, targeted to each component.

The reported prevalence of MetS in psoriasis varies between studies [25-29].

Our results reveled a percentage of 64.81% of the patients that met the criteria for MetS.

An extensive meta-analysis that included 12 observational studies performed on a total of 41853 patients with psoriasis that met the criteria for MetS demonstrated that risk of MetS was 2.26 compared to general population, along with the observation that there is an association between PASI and the presence of MetS [26].

Another relevant report, based on the analysis of 4,065 patients with psoriasis, demonstrated a strong inter-relation between psoriasis and MetS, with a percentage of 34% of the patients with this pathology, along with the observation that psoriasis severity is associated with a higher risk of MetS [27].

Also, independent associations were seen between psoriasis and obesity, high levels of triglycerides and serum glucose, observations pointed out by the results of our research.

The study of Chan et al, published in 2020, that included 338 patients with psoriasis, showed a percentage of 45.1%; also, there were no differences between sexes, but MetS was mostly detected in subjects with an age over 50 [28].

A higher prevalence was reported by Ramírez-Terán et al, in 2022, on a group of 92 PsO patients [29].

Cardiovascular events, major cause of mortality in PsO, can be prevented by an appropriate evaluation of subclinical atherosclerosis and performing carotid ultrasound provides important variables for this purpose, represented by intima-media and the presence of atheroma plaques.

Augmented IMT is a stated marker of subclinical atherosclerotic process, with future

subsequent cardiovascular events in asymptomatic subjects [30].

Carotid ultrasound evaluation of the patients included in our study group revealed an increased ITM, of over 0.9mm, for 19 (35.18%) or PsO patients, significantly increased compared to controls, p=0.002, as well as the presence of carotid plaques in significantly different percentages (37.03% PsO vs. 17.5% controls, p=0.001).

We also noted that patients with MetS had significantly increased values of IMT in comparison to the patients for which the of MetS were not established (0.88±0.28mm vs. 0.70±0.20mm, p=0.01), observation maintained for the percentage of carotid atheroma plaque (17; 45.71% vs. 3; 27.27%, p=0.05).

In a similar manner, the report of Ramírez-Terán et al, showed a percentage of 39.1% patients with an increased that IMT, significantly augmented for cases with MetS (44.7%).

Also, their research demonstrated that the only notable independent predictor of an increased IMT was represented by age, followed by MetS [29].

Several other cases and control studies reported a significantly increased IMT for patients with PsO compared with the control group.

El-Mongy et al conducted a study on 80 patients with chronic psoriasis and 50 healthy controls, with similar demographic characteristics, and their results showed an increased IMT along with an increased percentage of carotid atherosclerotic plaques for PsO patients.

Both IMT and the identification of carotid plaques exerted a positive association with age, disease duration and disease severity [31].

Our results also demonstrated a strong, positive correlation between PASI and carotid ultrasound parameters.

Yiu et al. also reported the presence of a greater IMT for patients with psoriasis compared to controls [32].

Our data also pointed out an increased percentage of NAFLD in PsO patients, with a percentage of 59.25%, higher in the subgroup of patients that met the criteria for MetS (62.85%).

The aforementioned study published by Ramírez-Terán et al, revealed a prevalence of 87% [29], as lower percentages were mentioned by the one of Romero-Pérez D et al [33], published in 2019 (43%) or 47% on a PsO group of 103 patients, published by Roberts et al [34].

Diabetes, one of the variables included by MetS definition, was present for 35.18% of our patients, similar to Ramírez-Terán et al (31.9%) [29] or Espinoza et al [35] (30.1%).

Our results significantly support the existing literature on psoriasis and the metabolic syndrome as this association is frequently seen in our daily practice.

Larger cohorts are required for a more accurate statistical description of the presented results.

Also, an extension of the study, with multicentric involvement, could provide the analysis of PsO patients depending on the administration of systemic therapy, that significantly impacts systemic inflammation and, consequently, the risk of subclinical atherosclerosis and its complications.

Conclusions

Our results sustain the close relationship between metabolic syndrome and psoriasis and the major consequence of this observation is the inherent risk of cardiovascular events.

The components of MetS are represented by several cardiovascular risk factors, significantly impacted by systemic inflammation that characterizes psoriasis pathogeny.

A complex, multidisciplinary assessment of psoriasis patients, with an integrated approach and early detection of each component can enable a prompt and individualized therapeutic approach and prevention of future severe complications.

Conflict of interests

None to declare

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 10.12865/CHSJ.50.02.06