

# Prevalence of cardiovascular disease risk factors, and metabolic syndrome and its components in patients with psoriasis aged 30 to 49 years

Agnieszka B. Owczarczyk-Saczonek<sup>1</sup>, Roman J. Nowicki<sup>2</sup>

<sup>1</sup>Department of Dermatology, Sexually Transmitted Diseases and Clinical Immunology, University of Warmia and Mazury, Olsztyn, Poland

Head of the Department: Prof. Waldemar Placek MD, PhD

<sup>2</sup>Department of Dermatology, Venereology and Allergology, Gdansk Medical University, Gdansk, Poland

Head of the Department: Prof. Roman Nowicki MD, PhD

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## Abstract

**Introduction:** Some studies show that metabolic syndrome (MS) is more common in psoriatic patients.

**Aim:** To evaluate the prevalence of MS and its components as cardiovascular disease (CVD) risk factors in psoriatic patients compared to the general Polish population.

**Material and methods:** In 62 patients, aged 30 to 49 years with a mild to severe course of psoriasis, the features of MS have been assessed by IDF definition and compared to the results obtained in the NATPOL 2011 study.

**Results:** Analysis of CVD risk factors in patients with a severe course of psoriasis showed a correlation with waist circumference (0.38,  $p < 0.05$ ), hypertension (0.40,  $p < 0.05$ ) and a negative correlation with HDL (0.29,  $p < 0.05$ ). The prevalence of MS in psoriatic patients was 25.81%, and for the control group – 21.02% ( $p > 0.05$ ), the mean HOMA-IR was 1.93 and 1.94 ( $p > 0.05$ ), respectively. There were differences in the prevalence of abdominal obesity (53.6% vs. 40.3%,  $p < 0.05$ ). In lipid parameters, except for HDL, the compared groups did not differ significantly (triglycerides, ApoA-I and B). Criteria for MS concerning blood pressure ( $> 130/85$  mm Hg) and hypertension were more frequent in men with psoriasis than in the control group (38.2% vs. 11.1%,  $p < 0.05$ ).

**Conclusions:** Severe psoriasis is associated with a significantly higher prevalence of risk factors for CVD. The prevalence of MS, insulin resistance and lipid abnormalities in patients with psoriasis aged 30 to 49 years is similar to the general Polish population. Abdominal obesity is more common in psoriatic patients and hypertension in men with psoriasis.

**Key words:** psoriasis, metabolic syndrome, cardiovascular risk factors.

## Introduction

Psoriasis affects 2–3% of the European population and is now considered not only a skin disease, but also a systemic disease. In recent years, considerable progress has been made in clarification of the molecular mechanisms of the disease. Its association with metabolic syndrome and its components (abdominal obesity, insulin resistance, hypertension and dyslipidaemia) has been shown. Psoriasis may be a risk factor for the development of these diseases as well as an independent risk factor for myocardial infarction [1–5]. Th1 and Th17 lymphocytes and pro-inflammatory cytokines (such as TNF- $\alpha$ , IL-1, IL-6, IL-17) play a decisive role in the patho-

genesis of psoriasis and they also take part in forming atherosclerotic plaques and in development of insulin resistance [6–8]. The inflammation in psoriasis develops atherosclerotic and metabolic disorders, and vice versa. Therefore, the concept of ‘psoriatic march’ has been proposed to clarify the effect of severe psoriasis on the development of cardiovascular diseases [9]. Consequently, a dermatologist is not only responsible for treatment of skin lesions, but also for the diagnosis and monitoring of concomitant disorders. Early and appropriate treatment can prevent the development of associated metabolic disorders.

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**Address for correspondence:** Agnieszka B. Owczarczyk-Saczonek MD, PhD, Department of Dermatology, Sexually Transmitted Diseases and Clinical Immunology, University of Warmia and Mazury, Aleja Wojska Polskiego 30, 10-595 Olsztyn, Poland, phone: +48 601 057 800, +48 89 678 66 70, fax: +48 89 678 66 75, e-mail: aganek@wp.pl

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## Aim

Numerous epidemiological studies show the link between psoriasis and cardiovascular diseases and metabolic disorders. The aim of this study was to evaluate the metabolic syndrome (MS) and its components (insulin resistance, atherogenic dyslipidaemia, abdominal obesity and hypertension) in patients with psoriasis aged 30 to 49 years compared to the adult Poles, who participated in the NATPOL 2011 study in the same age group. Additionally, an analysis has been made of the prevalence of risk factors for cardiovascular diseases depending on the severity of psoriasis.

## Material and methods

The study included 62 consecutive patients with psoriasis aged 30 to 49 years treated at the out-patient clinic and the Department of Dermatology, Municipal Hospital in Olsztyn. The study group consisted of 28 (45.2%) women and 34 (54.8%) men. Among these, 24 patients had moderate and severe psoriasis (38.8%) and 38 a mild form of the disease (61.2%). Psoriatic patients with chronic and acute inflammatory diseases other than psoriasis, cancer, a history of cardiovascular complications and heart failure ( $n = 2$ ) were excluded from the study.

The control group consisted of 861 people aged between 30 and 49 years, who were the representative, random sample of the Polish population: 402 women and 459 men with a negative history of psoriasis. These people were included in the NATPOL research project in 2011 conducted by a team from the Department of Hypertension and Diabetology, University Clinical Centre in Gdansk. The project involved the study of a representative group of 2411 Polish citizens aged between 18 and 78 years. The prevalence of hypertension and other risk factors for cardiovascular diseases among these patients were estimated. A detailed description of the sampling will be published in "Polish Cardiology".

The following parameters were estimated in all subjects: body mass index (BMI), waist circumference, blood pressure, according to the Polish Society of Hypertension Guidelines 2003. The dermatological examination assessed the severity of psoriasis – Psoriasis Area Severity Index (PASI), body surface area (BSA) and the index of the impact of skin diseases on the quality of life – Dermatology Life Quality Index (DLQI) [10]. Based on the above, the severity degree of psoriasis was measured, according to the new arrangements of the EuCOTT expert group (published in February 2011) [10, 11].

The Consensus divides psoriasis into:

- mild psoriasis, when the PASI, BSA and DLQI are  $\leq 10$  points and then topical treatment is used;
- moderate to severe psoriasis, when the PASI or BSA is  $> 10$  points and DLQI is  $> 10$  points. Moderate to severe psoriasis is an indication for systemic therapy [11].

The patients had laboratory tests done under fasting conditions, 12 h after the last meal, evaluating the lipids (HDL, triglycerides, apolipoprotein A1 and B) and carbohydrates (glucose, insulin). Insulin resistance index HOMA-IR (Homeostasis Model Assessment-Insulin Resistance) was calculated [12]. To evaluate lipids, apolipoprotein A1 and B and ApoB/ApoA1 indices were estimated [13].

Metabolic syndrome was diagnosed in 2009 using the modified IDF (International Diabetes Federation) criteria [14], in which abdominal obesity (for Europeans:  $\geq 94$  cm men, women  $\geq 80$  cm) is not a prerequisite for the diagnosis, but it is one of the 5 criteria. The diagnosis of metabolic syndrome is when 3 of 5 criteria are met (abdominal obesity, triglycerides level  $\geq 150$  mg/dl or treatment of hypertriglyceridaemia, HDL  $< 40$  mg/dl in men and  $< 50$  mg/dl in women, blood glucose  $\geq 100$  mg/dl or pharmacotherapy of hyperglycaemia and blood pressure: systolic  $\geq 130$  mm Hg and/or diastolic blood pressure  $\geq 85$  mm Hg or antihypertensive drug treatment) [15].

## Statistical analysis

Statistical analysis of the results was performed using the statistical software package "Statistica PL" v.10. Analysis of variance and correlation were used to verify the hypotheses.

## Results

### Cardiovascular disease risk assessment in patients with psoriasis depending on disease severity

Correlation analysis showed no correlation between the degree of severity and risk factors for cardiovascular diseases in cases of mild psoriasis. However, in patients with moderate and severe psoriasis, there is a correlation between the degrees of psoriasis severity and the following risk factors: waist circumference 0.38 ( $p < 0.05$  – a clear correlation and a negative correlation with HDL  $-0.29$  ( $p < 0.05$  – a clear correlation) (Table 1).

### Evaluation of the prevalence of metabolic syndrome and its components

The results showed no statistically significant difference between the NATPOL 2011 group and a group of patients with psoriasis in the incidence of MS. The prevalence of MS in patients with psoriasis was 25.8% and for the control group 21.0% ( $p > 0.05$ ).

There were no differences between the mean BMI and waist circumference in both groups, considering patients' gender. Mean BMI was 26.6 kg/m<sup>2</sup> in patients with psoriasis and 26.1 kg/m<sup>2</sup> for the control group ( $p > 0.05$ ). Abdominal obesity was 88.4 cm and 90.1 cm, respectively ( $p > 0.05$ ). However, there were differences in the prevalence of abdominal obesity between the study group and the control group (53.6% vs. 40.3%,  $p < 0.05$ ).

**Table 1.** Comparison of average values of selected results between a sample group and a NATPOL 2011 group

Factor	Sample group			Control group – NATPOL 2011		
	Total (N = 62)	Women (N = 28)	Men (N = 34)	Total (N = 861)	Women (N = 402)	Men (N = 459)
BMI	26.59 ±5.13	25.88 ±5.50	27.17 ±4.80	26.09 ±4.67	27.11 ±4.72	27.20 ±4.36
Waist circumference	90.07 ±13.40	88.28 ±16.90	96.70 ±11.27	88.82 ±14.47	83.36 ±13.64	93.32 ±13.73
TG	131.61 ±79.65	108.43 ±71.68	150.71 ±81.80	127.26 ±97.15	115.39 ±66.10	156.7 ±118.71
HDL	54.82 ±18.01	62.36 ±14.56	48.62 ±18.40	49.97 ±13.40	60.68 ±19.94	45.85 ±13.06
Apo A 1	1.56 ±0.44	1.64 ±0.43	1.49 ±0.44	1.56 ±0.37	1.63 ±0.38	1.51 ±0.35
Apo B	0.86 ±0.30	0.79 ±0.43	0.92 ±0.32	0.91 ±0.24	0.85 ±0.23	0.97 ±0.25
Index Apo B/Apo A I	0.59 ±0.24	0.49 ±0.15	0.67 ±0.27	0.61 ±0.21	0.55 ±0.19	0.67 ±0.21
Glucose	89.06 ±16.92	86.16 ±17.55	91.44 ±16.25	90.98 ±16.34	87.78 ±12.09	93.75 ±17.73
Insulin	7.94 ±6.93	7.33 ±7.08	8.44 ±6.86	8.24 ±6.57	7.54 ±3.62	8.85 ±7.52
HOMA-IR	1.93 ±2.13	1.81 ±2.41	2.03 ±1.90	1.94 ±2.17	2.30 ±1.93	2.18 ±2.57
Systolic pressure	128.34 ±16.24	122.46 ±12.40	133.18 ±17.55	126.60 ±16.55	125.00 ±16.70	126.12 ±16.08
Diastolic pressure	81.27 ±8.81	78.46 ±9.14	83.59 ±7.92	80.56 ±10.77	80.38 ±10.63	80.72 ±10.88
Hypertension, n (%)	18 (29%)	5 (17.8%)	13 (38.2%)	207 (24%)	156 (38.8%)	51 (11.1%)
Metabolic syndrome, n (%)	16 (25.8%)	6 (21.4%)	10 (29.4%)	181 (21.02%)	46 (11.44%)	135 (29.41%)
Smoking, n (%)	29 (46.7%)	9 (32.1%)	20 (58.8%)	250 (29%)	101 (25.1%)	149 (32.4%)

There were no differences between the mean HOMA-IR and diabetes in both groups, even after considering patients' gender. The mean HOMA-IR was 1.93 in patients with psoriasis and 1.94 for the control group ( $p > 0.05$ ).

Lipid analysis showed no difference between the mean triglycerides, ApoA1, ApoB, and ApoB/ApoA1 index, also considering the patients' gender. However, there was a significant increase in the HDL level in patients with psoriasis in comparison to the NATPOL 2011 control group.

Statistically significant differences were shown in the prevalence of MS criteria for blood pressure ( $> 130/85$  mm Hg) in these groups considering patients' gender. In the study group, the prevalence of hypertension in patients is more than twice as high as in the NATPOL 2011 group and is 29% vs. 12.42% ( $p < 0.01$ ), respectively. Moreover, in the group of men suffering from psoriasis, hypertension was observed more frequently than in men in the control group (38.2% vs. 11.1%,  $p < 0.05$ ).

## Discussion

### Evaluation of risk factors for cardiovascular diseases in patients with psoriasis depending on disease severity

Recent studies suggest an increased risk of myocardial infarction in young patients with severe psoriasis com-

pared with those without this disorder. In patients with psoriasis, the risk is about 20% to 30% higher than in the control group [16]. Analysis of Gelfand *et al.* based on patients registered on the UK General Practice Research, showed that for a 30-year-old patient with severe psoriasis, the risk of heart attack is 3.10 and with mild psoriasis it is only 1.29. For a 60-year-old patient with both severe and mild course of psoriasis, the risk did not differ significantly from the general population, and was 1.36 and 1.08 respectively [17]. Similar results were obtained by Mehta *et al.*, evaluating a relative risk of death from cardiovascular diseases, in the same group of patients. For 40-year-old patients with severe psoriasis it was 2.69, and for 60-year-old patients – 1.92 [11]. The criterion for severe psoriasis in both studies was the use of systemic therapy, not the EuCCOT classification system.

In our study, two of patients with a history of cardiovascular complications were excluded from the study. It could have had a very little influence on the observed correlation between psoriasis and risk factors for cardiovascular diseases.

### Occurrence of metabolic syndrome in patients with psoriasis

Numerous epidemiological studies show that people with psoriasis are twice as likely to have MS compared to a healthy population, especially those with severe psoriasis [3, 18–20]. However, these are population-based

studies of all adults and they do not take age into account. However, a study by Gisondi *et al.* showed that MS coexists in patients with psoriasis in 30.1% compared to patients with other dermatological diseases – 20.6%, but over the age of 40 [21]. There are also conflicting reports [22, 23]. Korean studies have confirmed this correlation, and people with psoriasis who had metabolic syndrome were much older (mean age = 53.3 years) compared to patients without MS (mean age = 39.5 years) [24]. Similar results were obtained by Pereira *et al.* when examining psoriasis patients aged 35–44 years [25].

Many studies have confirmed the association between obesity and psoriasis and there is even a theory that obesity may be a risk factor for its occurrence [26, 27]. An increase in BMI [28–30] slightly increases the risk, but obesity (BMI > 29 kg/m<sup>2</sup>) can double the risk of psoriasis [19, 27, 28]. Moreover, weight loss may improve psoriasis [29, 30], treatment response [31]. A large cohort study conducted among 78626 nurses in the United States, with a 14-year follow-up and BMI updated every 2 years, has shown that increased adiposity and weight gain are strong risk factors for psoriasis [19]. Similar results were obtained in a study on patients registered in the UK General Practice Research – 4,000 patients with psoriasis were involved. In patients with severe psoriasis odds ratio (OR) was 1.8 and with mild psoriasis 1.3 [1, 26]. A recent study conducted by Armstrong *et al.* (published in 2012) shows that the OR for obesity in patients with psoriasis was 1.66 compared to patients without psoriasis. Depending on the severity of the disease, it turned out that for patients with mild psoriasis it was 1.46 and with severe psoriasis – 2.23 [32].

Our own research showed no statistically significant differences between the mean BMI but it confirmed that the prevalence of abdominal obesity increased in patients with psoriasis.

As early as in 1967, in studies conducted by Lynch, it was found that 29% of patients with psoriasis had abnormal blood glucose levels [33]. Polish studies have confirmed this as well in symptomatic psoriasis, although with resolution of clinical symptoms after treatment, serum glucose level tended to normalise [34, 35]. Studies conducted by Neimann *et al.* confirm the coexistence of diabetes in patients with severe psoriasis in 7.1% and with mild psoriasis in 4.4% compared to the control group (3.3%) [36]. A weak but statistically significant association between the severity of psoriasis (PASI) and markers of insulin resistance (insulin, resistin levels) was observed in Boehencke studies [2, 9].

Our own research found no correlation between HOMA-IR and the severity of psoriasis. There was no difference in the prevalence of insulin resistance and diabetes between the patients and the NATPOL 2011 group.

Our results differ from numerous reports in the world literature. In Cohen *et al.*'s study evaluating the associations of diabetes in 340 patients with psoriasis, a fre-

quent coexistence of these diseases was confirmed in the group. However, in patients below 35 years of age and between 35 and 50 years of age, the association is not statistically significant [3]. Reynosovon Drateln *et al.* also found no differences in insulin secretion and insulin resistance in patients with psoriasis compared to the control group.

However, they observed a correlation between psoriasis duration and insulin sensitivity [37]. In Polish studies, Janusz *et al.* showed slightly higher levels of insulin and HOMA-IR in psoriasis patients compared to the control group, but at the limit of statistical significance. There was found no correlation between these parameters and the disease duration either [38].

In own research, the age of the patients is an important factor influencing the results. This is particularly important in women. The balance of sex hormones plays a role in the development of insulin resistance and therefore the phenomenon is more common during menopause. The average age of Polish women at the time of menopause is 49 ± 3.5 years, which means that the health problems associated with menopause in Poland can be observed in women over 50 [39, 40]. Before experiencing menstrual disorders, there is a decrease in the level of growth hormone GH and insulin-like growth factor (IGF-1). The IGF-1 increases the uptake of glucose and amino acids through different tissues and stimulates glycogen synthesis in the liver. Therefore, a reduction in its level during menopause can have an influence on the creation of insulin resistance and the development of diabetes. Oestrogens deficiency during menopause also promotes the development of obesity, hypertension and the development of a full-blown MS [40, 41].

Numerous reports in the literature describe the frequent coexistence of lipid abnormalities in patients with psoriasis and psoriatic arthritis [1, 33, 42–44]. Moreover, the study conducted by Rocha-Pereira and by Polish researchers Toruniowa and Pietrzak confirm that lipid abnormalities depend on the severity of psoriasis [45–47].

Our own research showed no difference in the level of triglycerides, apolipoprotein A1, B and ApoB/ApoA1 index between the group of patients with psoriasis and the control group. However, an interesting observation is an elevated HDL levels demonstrated in patients with psoriasis.

Similar results were obtained by Mallbris *et al.* in patients with mild psoriasis. They had only a slight increase in the level of cholesterol and lipoproteins and mean HDL was even higher than in the control group [43]. The research by Pereira *et al.*, conducted on patients with psoriasis aged 35–44, showed no statistically significant differences in lipid profile and increased incidence of MS compared to the control group [45].

The association between hypertension and psoriasis was first noted by Preece in 1977 [48]. The research conducted in 2010 by Cohen *et al.* confirmed that hypertension more frequently coexists in patients with psoriasis

compared to healthy people (38% vs. 29.1%), but a significant association was observed in women over 40 and men over 30 [49]. Moreover, the research by Neimann *et al.* showed the relationship between this disorder and the severity of psoriasis: in patients with severe psoriasis – 20%, and mild – 14.7% [34]. However, there are discrepancies in data which have not confirmed such an association [21, 50].

Our results showed that the prevalence of hypertension in men is twice as likely as in the NATPOL 2011 control group.

Our research has confirmed that severe psoriasis is associated with a higher prevalence of risk factors for cardiovascular diseases. The correlations of risk factors (abdominal obesity, lower HDL) were found only in patients with severe and moderate psoriasis, but not in patients with mild psoriasis. The sample group of patients with psoriasis has comprised young people aged 30–49 years in relation to a large reference population participating in the NATPOL 2011 study. A new thing is classification criteria for psoriasis, according to the guidelines of the EuCCOT expert group. No such analyses are available in the Polish literature.

## Conclusions

Severe psoriasis predisposes patients to the development of cardiovascular diseases. The prevalence of MS, insulin resistance and lipid abnormalities in patients with psoriasis aged 30 to 49 years is similar to that of the general adult population of Poland. Abdominal obesity is more common in patients with psoriasis. Hypertension is more common in men with psoriasis.

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## Conflict of interest

The authors declare no conflict of interest.

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