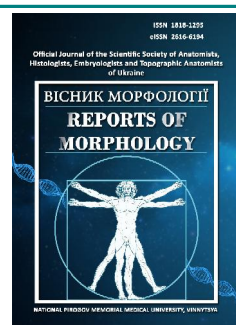




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Discriminant models of the possibility of occurrence and course of psoriasis in men of the general group and different somatotypes depending on the characteristics of anthropo-somatotypological indicators

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Significant prevalence and multifactorial occurrence of psoriasis are the main reasons why this disease has been studied for years by scientists in the field of dermatology. Finding tools to predict the occurrence and severity of this disease is one of the key unrealized areas of modern medicine in the field of skin diseases. The purpose of the study is to build and analyze discriminant models of the possibility and features of psoriasis course in Ukrainian men without and taking into account the somatotype, depending on the structure and size of the body. Anthropometric and somatotypological examination of 82 practically healthy and 100 patients with mild and severe psoriasis was performed. Construction of discriminant models of the possibility of occurrence and features of psoriasis depending on anthropo-somatotypological indicators is performed in the license package "Statistica 5.5". It was found that men of the general group and representatives of the mesomorphic somatotype can reliably interpret the obtained classification indicators both between healthy and patients with psoriasis of different course, and between men with psoriasis of mild and severe course (correctness 84.1% of cases, statistics Wilks' Lambda=0.074, $p<0.001$ in the general group, correctness 83.6% of cases, statistics Wilks' Lambda=0.077, $p<0.001$ in mesomorphic somatotype). In men of endo-mesomorphic somatotype, a reliable interpretation of the obtained classification indicators is possible only between healthy and psoriatic men (correctness 84.6%, statistics Wilks' Lambda=0.027, $p<0.001$). Discriminant models in men of the general group include body diameters and SFT (44.4% each) and the fat component of body weight (11.1% each); in men of mesomorphic somatotype - body diameters (57.1%), SFT (28.6%) and body surface area (14.3%); in men of endo-mesomorphic somatotype - body diameters (60.0%) and SFT on the thigh and the height of the finger anthropometric point (20.0% each). The greatest contribution to discrimination in men of the general group and representatives of the mesomorphic somatotype is made by shoulder width, and in men of endo-mesomorphic somatotype - shoulder width, interspinous and intercrystal distances. The results obtained, especially in the division of men into somatypes, indicate a high genetic predisposition to psoriasis.

Keywords: psoriasis, anthropometric and somatotypological indicators, discriminant analysis, men.

Introduction

More than 200 years have passed since the first detailed clinical description of psoriasis and its isolation as a separate disease by the "father" of modern dermatology Robert Willan (hence the outdated name of psoriasis - Willan'slepra). However, since then, researchers have not been able to say for sure what is the trigger for this disease,

which drug treatment will get rid of it or prevent its occurrence. It is still only known that psoriasis is a chronic inflammatory immune-mediated proliferative disease that mainly affects the skin, joints and nails. Such significant attention to psoriasis is primarily due to the high prevalence of this disease.

Data from many studies indicate that 2 to 3% of the world's population suffers from psoriasis. However, the prevalence is heterogeneous in different regions of the world. Thus, in Northern India, the prevalence of psoriasis among children is 0.0002%, and the peak incidence occurs at the age of 6-10 years in boys and 11-15 years in girls; a positive family history was found in 9.8-28.0% of respondents [12].

In the United States, the prevalence of psoriasis ranges from 2.0 to 4.6%. The incidence according to various authors is from 60.4 per 100000 to 14.0 per 10000 people; 75% of people suffering from this disease are working people under the age of 40.

Among the risk factors are primarily smoking, alcohol consumption, stressors, the presence of infectious diseases, etc. [5]. That is why the medical community is actively continuing research to find not only the causes and treatment of psoriasis, but also effective means of predicting the occurrence of this disease in different groups of the population, taking into account somatotype indicators [21].

The experience of domestic researchers in finding relationships between different somatotypological indicators and other, at first glance completely unrelated to them human characteristics, inspires confidence in the possibility of successful use of this approach to predict the occurrence and course of psoriasis [1, 15].

The purpose of the study is to build and analyze discriminant models of the possibility and features of psoriasis course in Ukrainian men without and taking into account the somatotype, depending on the structure and size of the body.

Materials and methods

Anthropometric examination [6] of men (aged 22 to 35 years) with psoriasis of mild (n=32) and severe (n=68) course was conducted on the basis of the Department of Skin and Venereal Diseases with a course of postgraduate education of National Pirogov Memorial Medical University, Vinnytsya and the Military Medical Clinical Center of the Central Region.

The severity and area of psoriatic lesions were calculated using the total PASI index (Psoriasis Area and Severity Index) [14], according to which: mild severity - PASI value <10; moderate severity - PASI values from 10 to 20; severe - PASI value > 20 [3].

Anthropometric data of 82 practically healthy men of the same age group from the data bank of the research center of National Pirogov Memorial Medical University, Vinnytsya was taken as control.

Given the distribution of healthy men with psoriasis of mild and severe course by somatotypes according to the Heath-Carter scheme [7]: endomorphs - respectively 2-0-0; mesomorphs - respectively 39-28-55; ectomorphs - 9-0-2, respectively; ecto-mesomorphs - 13-0-2, respectively; endo-mesomorphs - respectively 13-4-9; representatives

of the middle intermediate somatotype - respectively 6-0-0; only representatives of mesomorphic and endo-mesomorphic somatotypes were selected for further modeling of the possibility of occurrence and peculiarities of psoriasis course.

Construction of discriminant models of the possibility of occurrence and features of psoriasis depending on anthropo-somatotypological indicators was carried out in the license package "Statistica 5.5".

Results

Taking into account anthropometric and somatotypological indicators in practically healthy and patients with mild and severe psoriasis of men of the *general group*, the discriminant function covers 84.1% of cases. Between healthy and patients with mild or severe psoriasis in the *general group*, the discriminant variables are shoulder width (ACR), intercrystal distance (CRIS), skinfold thickness (SFT) on the posterior surface of the shoulder (GZPL), transverse mid-chest diameter (PSG), SFT on anterior shoulder surface (GPPL), SFT on the side (GB), body fat component (DM), anterior-posterior mid-thoracic diameter (SGK) and SFT on the abdomen (GG). Among these indicators, shoulder width is the largest contributor to discrimination between groups. The set of all anthropo-somatotypological variables has a pronounced (Wilks' Lambda=0.074; p<0.001) discrimination between groups of healthy and patients with mild or severe psoriasis in men of the *general group*.

For each of the groups, a classification index (Df) was determined, by means of which anthropo-somatotypological indicators can be attributed to "typical" for healthy or patients with psoriasis of different course men of the *general group*. Below in the form of equations is the definition of the classification index, where the attribution to healthy men is possible at a value of Df close to 216.5; to men with mild psoriasis - at a Df value close to 234.5; to men with severe psoriasis - with a Df value close to 237.8:

$$Df \text{ (for healthy men of the general group)} = ACR \times 5,209 + CRIS \times 3,961 + GZPL \times 3,234 + PSG \times 2,537 - GPPL \times 0,465 - GB \times 0,434 - DM \times 5,995 - SGK \times 2,886 + GG \times 1,164 - 216,5;$$

$$Df \text{ (for men of the general group of patients with mild psoriasis)} = ACR \times 2,551 + CRIS \times 5,937 + GZPL \times 0,158 + PSG \times 4,427 + GPPL \times 2,354 + GB \times 0,297 - DM \times 7,306 + SGK \times 3,179 + GG \times 1,300 - 234,5;$$

$$Df \text{ (for men of the general group of patients with severe psoriasis)} = ACR \times 2,726 + CRIS \times 5,600 + GZPL \times 0,652 + PSG \times 4,525 + GPPL \times 2,260 + GB \times 0,188 - DM \times 7,914 + SGK \times 3,517 + GG \times 1,581 - 237,8;$$

where (here and later), the diameters of the torso and

pelvis - in cm; SFT dimensions - in mm; indicators of the component composition of body weight in kg.

The statistical significance of all discriminant functions was determined using the criterion χ^2 . The results of this analysis indicate that taking into account the above anthropometric and somatotypological indicators, a reliable interpretation of the obtained classification indicators is possible both between healthy and patients with psoriasis of different course, and between patients with mild and severe psoriasis in men of *general groups*.

Taking into account anthropometric and somatotypological indicators in practically healthy and patients with mild and severe psoriasis of men of *mesomorphic somatotype*, the discriminant function covers 83.6% of cases. Shoulder width (ACR), intercrystal distance (CRIS), SFT on the posterior surface of the shoulder (GZPL), transverse mid-chest diameter (PSG), SFT on the anterior surface of the shoulder (GPPL), anterior-posterior mid-thoracic diameter (SGK) and body surface area (S) are discriminant between healthy and severe psoriasis men of *mesomorphic somatotype*. Among these indicators, the largest contribution to discrimination between groups, as in general groups, is shoulder width. The set of all anthropometric variables has a pronounced (Wilks' Lambda=0.077; $p < 0.001$) discrimination between groups of healthy and patients with mild or severe psoriasis of men of mesomorphic somatotype.

Below in the form of equations is the definition of the classification index, where the attribution to healthy men of mesomorphic somatotype is possible at a value of Df close to 154.7; to men of *mesomorphic somatotype* in patients with mild psoriasis - at a Df value close to 159.2; to men of mesomorphic somatotype in patients with severe psoriasis - with a Df value close to 159.8:

Df (for healthy men of mesomorphic somatotype) = ACR x 4,504 + CRIS x 1,688 + GZPL x 0,800 - PSG x 0,307 - GPPL x 2,572 + SGK x 0,280 + S x 40,51 - 154,7;

Df (for men of mesomorphic somatotype in patients with mild psoriasis) = ACR x 1,884 + CRIS x 4,089 - GZPL x 3,012 + PSG x 1,695 - GPPL x 0,033 + SGK x 1,203 + S x 17,95 - 159,2;

Df (for men of mesomorphic somatotype in patients with severe psoriasis) = ACR x 2,050 + CRIS x 3,713 - GZPL x 3,059 + PSG x 2,009 + GPPL x 0,139 + SGK x 1,203 + S x 17,95 - 159,8;

where (here and later), the surface area of the body - in m^2 .

The results of the evaluation of the criterion χ^2 indicate that taking into account the above anthropometric indicators it is possible to reliably interpret the obtained classification indicators both between healthy and patients with psoriasis of different course, and between patients with psoriasis of mild and severe course in men with *mesomorphic*

somatotype.

Taking into account anthropometric and somatotypological indicators in practically healthy and patients with mild and severe psoriasis men of *endo-mesomorphic somatotype*, the discriminant function covers 84.6% of cases. Interspinous distance (SPIN), shoulder width (ACR), intercrystal distance (CRIS), thigh SFT (GBD) and finger anthropometric point height (ATP) are discriminant between healthy and severe psoriasis men of *endo-mesomorphic somatotype*. Among these indicators, shoulder width, interspinous and intercrystal distance have the largest contribution to discrimination between groups. The set of all anthropometric variables has a pronounced (Wilks' Lambda=0.027; $p < 0.001$) discrimination between groups of healthy and patients with mild or severe psoriasis of men of *endo-mesomorphic somatotype*.

Below in the form of equations is the definition of the classification index, where the attribution to healthy men of *endo-mesomorphic somatotype* is possible at a value of Df close to 1018; to men of *endo-mesomorphic somatotype* of patients with mild psoriasis - at a Df value close to 1419; to men of *endo-mesomorphic somatotype* in patients with severe psoriasis - with a Df value close to 1368:

Df (for healthy men of *endo-mesomorphic somatotype*) = SPIN x 36,64 - ACR x 0,470 + CRIS x 26,56 - GBD x 8,960 + ATP x 6,010 - 1018;

Df (for men of *endo-mesomorphic somatotype* in patients with mild psoriasis) = SPIN x 44,43 - ACR x 4,330 + CRIS x 33,40 - GBD x 11,32 + ATP x 8,030 - 1419;

Df (for men of *endo-mesomorphic somatotype* in patients with severe psoriasis) = SPIN x 43,89 - ACR x 4,780 + CRIS x 32,91 - GBD x 11,29 + ATP x 7,980 - 1368;

where, the height of anthropometric points - in cm.

The results of the evaluation of the criterion χ^2 indicate that taking into account the above anthropometric indicators, it is possible to reliably interpret the obtained classification indicators only between healthy and patients with psoriasis of different course in men of *endo-mesomorphic somatotype*.

Discussion

The use of modern medical information technologies and programs is a promising area in medicine for early diagnosis and possible prevention of many multifactorial diseases, including diseases of the skin and its appendages [8, 11, 18].

As diagnostic features for mathematical modeling it is necessary to choose indicators that are available by measurement and have a fairly wide range of values under different disease conditions (eg, form and type of flow), which allows to determine variables (in our case

anthropometric and somatotypological indicators) that discriminate the obtained conditions of patients ("healthy", "sick", "form or type of disease") [22].

We have built discriminant models to predict to which population men of the general group and different somatotypes may belong, depending on anthropo-somatotypological parameters of the body - to potentially healthy, or to potentially patients with mild or severe psoriasis.

In the analysis of discriminant equations in men of the general group and representatives of the mesomorphic somatotype, it was found that a reliable ($p < 0.001$) interpretation of the obtained classification indicators is possible both between healthy and patients with psoriasis of different course and between patients with mild and severe psoriasis (Wilks' Lambda statistics = 0.074 in the general group; Wilks' Lambda statistics = 0.077 in representatives of the mesomorphic somatotype). In men of endo-mesomorphic somatotype, a reliable ($p < 0.001$) interpretation of the obtained classification indicators is possible only between healthy and psoriasis men of different currents (Wilks' Lambda statistics=0.027).

Discriminant models in men of the general group include body diameters and SFT (44.4% each) and the fat component of body weight (11.1% each); in men of mesomorphic somatotype - body diameters (57.1%), SFT (28.6%) and body surface area (14.3%); in men of endo-mesomorphic somatotype - body diameters (60.0%) and SFT on the thigh and the height of the finger anthropometric point (20.0% each). Moreover, the greatest contribution to discrimination in men of the general group and representatives of the mesomorphic somatotype is made by shoulder width, and in men of endo-mesomorphic somatotype - shoulder width, interspinous and intercrystal distance. Similar results (high percentage of participation in models of diameters of a trunk and a pelvis), especially at division of men on somatotypes, specify high genetic predisposition of this multifactorial disease [19].

A meta-analysis of 16 studies on the relationship between somatotypes and the risk of psoriasis, covering a total of 2.1 million people, found that the OR for obese people with psoriasis is 1.66 (95% confidence interval 1.46-1.89) compared with healthy individuals. Regarding the severity of the course of the disease OR for people with obesity and mild course was 1.46 (95% CI 1.17-1.82), and with severe psoriasis was 2.23 (95% CI 1.63-3.05) [2]. An analysis of 14 studies from the EU and the Middle East, involving a total of 25,042 patients with psoriasis, also found a correlation between the occurrence of psoriasis and the presence of metabolic syndrome [20].

A similar study was conducted by a group of authors led by P.Fleming [13]. A literature review of 254 articles was conducted, of which 9 were included in the study, which met the criteria of the study sample. In 7 of 9 studies, a statistically significant association was found between an increase in the severity of psoriasis and an increase in BMI

in patients.

In another study, researchers examined people with psoriasis to determine their area of visceral fat (VFA), subcutaneous fat (SFA) and total fat area (TFA) in the umbilical region. It was found that individuals with psoriasis compared to the control group (healthy individuals) had higher values of VFA and VFA/SFA ratio (123.4 ± 80.3 vs. 81.2 ± 59.8 cm² and 0.734 ± 0.593 vs. 0.491 ± 0.336 ; $p = 0.005$ and $p = 0.017$, respectively) [4].

Correlations between anthropometric indicators and the risk of the disease were found for other dermatological pathologies. Thus, M.J.Chen and co-authors [9] studied the risks of acne in women. As a result of statistical processing of the obtained results, positive correlations were found with such indicators as waist circumference, the ratio of waist and hip circumference and BMI.

Demir S.Pektas and others [10] chose to study patients with rosacea. The anthropometric examination and comparison of data with the results obtained from the control group revealed the following features: patients with rosacea had higher values of the ratio of waist and hips and the value of body mass index (27.9 ± 5.2 kg/m² vs. 23.0 ± 1.4 kg/m², $p < 0.001$ and 0.87 ± 0.10 vs. 0.77 ± 0.80 , $p < 0.001$, respectively).

A survey of the population of Saudi Arabia revealed that certain skin diseases tend to spread in overweight people. Thus, such an association was found for herpes of the foot, bacterial folliculitis and intertrigo [16].

Chinese scientists have confirmed that the body's BMI correlates with the severity of acne. Mean BMI values were higher in individuals with moderate and severe acne compared to healthy individuals (21.86 ± 2.83 kg/m², vs. 20.22 ± 2.43 kg/m², $p < 0.001$) [17].

The results obtained during the study and the data of other authors, both domestic and foreign, allow us to assert the reliability and prospects of using anthropometric research to predict the occurrence and course of psoriasis.

Conclusions

1. Reliable discriminant models developed on the basis of constitutional body parameters allow to predict with high probability the possibility of psoriasis occurrence and course in men of the general group (correctness 84.1% of cases, statistics Wilks' Lambda=0.074; $p < 0.001$) and representatives of mesomorphic somatotype (correctness 83.6% of cases, statistics Wilks' Lambda=0.077, $p < 0.001$). In men of endo-mesomorphic somatotype, only significant discrimination between healthy and psoriatic men is possible (correctness 84.6% of cases; Wilks' Lambda statistics=0.027; $p < 0.001$).

2. The structure of the constructed discriminant equations in men of the general group most often includes body diameters and SFT (44.4% each); in men of mesomorphic and endo-mesomorphic somatotypes - body diameters (57.1% and 60.0%, respectively).

3. The greatest contribution to discrimination in men of

the general group and representatives of the mesomorphic somatotype is made by shoulder width, and in men of endo-

mesomorphic somatotype - shoulder width, interspinous and intercrystal distance.

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ДИСКРИМІНАНТНІ МОДЕЛІ МОЖЛИВОСТІ ВИНИКНЕННЯ ТА ОСОБЛИВОСТЕЙ ПЕРЕБІГУ ПСОРИАЗУ У ЧОЛОВІКІВ ЗАГАЛЬНОЇ ГРУПИ ТА РІЗНИХ СОМАТОТИПІВ В ЗАЛЕЖНОСТІ ВІД ОСОБЛИВОСТЕЙ АНТРОПО-СОМАТОТИПОЛОГІЧНИХ ПОКАЗНИКІВ

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Значна поширеність і мультифакторіальність виникнення псоріазу є головними причинами, чому дане захворювання роками продовжують вивчати вчені в області дерматології. Пошук засобів для прогнозування виникнення і тяжкості перебігу даного захворювання є одним із ключових нереалізованих напрямків сучасної медицини в області захворювань шкіри. Мета дослідження - побудувати та провести аналіз дискримінантних моделей можливості виникнення та особливостей перебігу псоріазу в українських чоловіків без і з урахуванням соматотипу в залежності від особливостей будови та розмірів тіла.

Проведено антропометричне та соматотипологічне обстеження 82 практично здорових і 100 хворих на псоріаз легкого та тяжкого перебігу чоловіків. Побудова дискримінантних моделей можливості виникнення та особливостей перебігу псоріазу в залежності від антропо-соматотипологічних показників виконана в ліцензійному пакеті "Statistica 5.5". Встановлено, що у чоловіків загальної групи та представників мезоморфного соматотипу можлива достовірна інтерпретація отриманих показників класифікації як між здоровими та хворими на псоріаз різного перебігу, так і між хворими на псоріаз легкого та тяжкого перебігу чоловіками (коректність 84,1% випадків, статистика Wilks' Lambda=0,074, $p<0,001$ у загальній групі; коректність 83,6% випадків, статистика Wilks' Lambda=0,077, $p<0,001$ у представників мезоморфного соматотипу). У чоловіків ендо-мезоморфного соматотипу достовірна інтерпретація отриманих показників класифікації можлива лише між здоровими та хворими на псоріаз чоловіками (коректність 84,6%, статистика Wilks' Lambda=0,027, $p<0,001$). До складу дискримінантних моделей у чоловіків загальної групи входять діаметри тіла і ТШЖС (по 44,4%) та жировий компонент маси тіла (по 11,1%); у чоловіків мезоморфного соматотипу - діаметри тіла (57,1%), ТШЖС (28,6%) і площа поверхні тіла (14,3%); у чоловіків ендо-мезоморфного соматотипу - діаметри тіла (60,0%) та ТШЖС на стегні і висота пальцевої антропометричної точки (по 20,0%). Найбільший внесок у дискримінацію у чоловіків загальної групи та представників мезоморфного соматотипу вносить ширина плечей, а у чоловіків ендо-мезоморфного соматотипу - ширина плечей, міжкостьова та міжребенева відстані таза. Отримані результати, особливо при розподілі чоловіків на соматотипи, вказують на високу генетичну схильність псоріазу.

Ключові слова: псоріаз, антропометричні та соматотипологічні показники, дискримінантний аналіз, чоловіки.
