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DISCRIMINANT MODELS OF SEBORRHEIC DERMATITIS POSSIBILITIES OF OCCURRENCE AND COURSE IN MEN AND WOMEN DEPENDING ON THE CHARACTERISTICS OF ANTHRO-SOMATOTYPOLICAL PARAMETERS

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Based on anthropometric indicators developed reliable discriminant models that allow to predict with high probability the possibility of generalized fatty seborrheic dermatitis in Ukrainian men and women (respectively correctness of 87.7 % and 91.8 % of cases, Wilks' Lambda statistics=0.063 and 0.174). The constructed models in men most often include girth (42.8 %) and thickness of skin and fat folds (28.6 %); in women – the thickness of skin and fat folds (42.8 %) and body diameters (28.6 %). In the constructed models, the greatest contribution to discrimination in men is made by the shoulder girths in the tense and unstressed state, and in women – the thickness of the skin and fat folds on the thighs and the width of the shoulders.

Key words: skin diseases, seborrheic dermatitis, Ukrainian men and women, body structure and size, anthropometry, discriminant analysis.

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ДИСКРИМІНАНТНІ МОДЕЛІ МОЖЛИВОСТІ ВИНИКНЕННЯ ТА ОСОБЛИВОСТЕЙ ПЕРЕБІГУ СЕБОРЕЙНОГО ДЕРМАТИТУ У ЧОЛОВІКІВ ТА ЖІНОК У ЗАЛЕЖНОСТІ ВІД ОСОБЛИВОСТЕЙ АНТРО-СОМАТОТИПОЛОГІЧНИХ ПОКАЗНИКІВ

У ході дослідження на основі антропометричних показників розроблені достовірні дискримінантні моделі, що дозволяють з високою ймовірністю прогнозувати можливість виникнення генералізованої жирної форми себорейного дерматиту в українських чоловіків і жінок (відповідно коректність 87,7 % і 91,8 % випадків, статистика Wilks' Lambda=0,063 і 0,174). До складу побудованих моделей у чоловіків найбільш часто входять обхватні розміри тіла (42,8 %) та товщина шкірно-жирових складок (28,6 %); у жінок – товщина шкірно-жирових складок (42,8 %) і діаметри тіла (28,6 %). В побудованих моделях найбільший внесок у дискримінацію у чоловіків вносять обхвати плеча в напруженому та ненапруженому стані, а у жінок – товщина шкірно-жирової складки на стегні та ширина плечей.

Ключові слова: захворювання шкіри, себорейний дерматит, українські чоловіки та жінки, будова та розміри тіла, антропометрія, дискримінантний аналіз.

The study is a fragment of the research project "Origin and course of seborrheic dermatitis: clinical-instrumental and anthropo-somatotypological aspects", state registration No. 0121U113155.

Up to 10 % of the adult population suffers from seborrheic dermatitis. The annual increase in morbidity persists despite obvious advances in understanding the mechanisms of the disease and the steady increase in the production of antiseborrheic drugs. Exacerbation of seborrheic dermatitis leads to temporary and sometimes permanent loss of ability to work, which impairs the quality of life during periods of pronounced social and professional activity [4, 14].

Over the last decade, there has been a trend in medicine to personalize approaches to the diagnosis and treatment of dermatological diseases. In this regard, one of the ways to increase the effectiveness of treatment of seborrheic dermatitis is to solve prediction problems. Prognosis of the consequences and course of the disease is an important element of the treatment and diagnostic process. The established prognosis largely determines the strategy and tactics of treatment according to the projected period [13].

It is known that the prediction of variants of the disease can be approached from different mathematical positions. From a mathematical point of view, in this case it is necessary to solve the problem of pattern recognition in the multidimensional feature space [15]. Usually the course of the disease is characterized by the presence or absence of exacerbations (period of exacerbation and period out of exacerbation) [11].

Given the above, the timely formation of high-risk groups for dermatitis and the creation of prognostic models is especially important, which will determine the likelihood of severe forms in each patient, prescribe differentiated prevention and adequate therapy to reduce complications and chronicity.

The purpose of the study was to develop and analyze prognostic discriminant models of the possibility and features of seborrheic dermatitis in men and young women depending on anthropometric and somatotypological indicators.

Materials and methods. Clinical and anthropo-somatotypological (according to the schemes of Bunak V.V. (1941), Carter J. and Heath B. (1990) [3]) examination of 40 men and 40 young women (25–

44 years according to the age periodization of the WHO, 2015) patients with generalized fatty seborrheic dermatitis of mild and severe severity. All patients signed an informed consent to participate in the study. Committee on Bioethics of National Pirogov Memorial Medical University, Vinnytsya (protocol № 10 From 26.11.2020) found that the studies do not contradict the basic bioethical standards of the Declaration of Helsinki, the Council of Europe Convention on Human Rights and Biomedicine (1977), the relevant WHO regulations and laws of Ukraine.

The control group consisted of anthropometric indices of practically healthy men (n=82) and women (n=154) of the same age group were selected from the data bank of the National Pirogov Memorial Medical University, Vinnytsya Research Center.

Construction of discriminant models of the possibility of occurrence and features of seborrheic dermatitis depending on anthropo-somatotypological indicators was carried out in the license package "Statistica 6.0". Degree of discrimination expression between groups was assessed using Wilks' Lambda statistics. The statistical significance of all discriminant functions was determined using the criterion χ^2 .

Results of the study and their discussion. Taking into account anthropo-somatotypological indicators in practically healthy and patients with generalized fatty seborrheic dermatitis of mild and severe severity of men, discriminant function covers 87.7 % of cases. Among healthy and sick men with seborrheic dermatitis of varying severity, the discriminant variables are shoulder width (ACR), minimum head width (N_SH_GL), unstressed shoulder girth (OBPL2), tense shoulder girth (OBPL1), skin-fold thickness (SFT) on the thigh (GBD), SFT on the side (GB) and shin girth at the top (OBG1). Among the above indicators, the most significant contribution to discrimination between groups should be the shoulder girth in the tense and unstressed state. The totality of all anthropo-somatotypological variables has a pronounced (Wilks' Lambda=0.063; $p < 0.001$) discrimination between groups of healthy and patients with mild and severe seborrheic dermatitis men.

For practically healthy and patients with seborrheic dermatitis of mild and severe severity of men, a classification index (Df) was determined, by which these groups of men can be classified as "typical" for healthy or patients with seborrheic dermatitis of varying severity. In the form of equations, the definition of the classification index is given, where the attribution to practically healthy men is possible with a Df value close to 248.8; to men with mild seborrheic dermatitis – with a Df value close to 227.6; to men with severe seborrheic dermatitis – with a Df value close to 225.6:

– Df (for healthy men) = $ACR \times 4.875 + N_SH_GL \times 12.94 - OBPL2 \times 6.789 + OBPL1 \times 6.354 + GBD \times 0.936 - GB \times 2.303 + OBG1 \times 3.564 - 248.8$;

– Df (for men with mild seborrheic dermatitis) = $ACR \times 3.432 + N_SH_GL \times 17.34 + OBPL2 \times 0.197 - OBPL1 \times 0.280 - GBD \times 0.343 - GB \times 1.356 + OBG1 \times 2.587 - 227.6$;

– Df (for men with severe seborrheic dermatitis) = $ACR \times 3.275 + N_SH_GL \times 17.36 - OBPL2 \times 0.040 + OBPL1 \times 0.134 - GBD \times 0.227 - GB \times 1.361 + OBG1 \times 2.516 - 225.6$;

where (here and hereafter), body diameters – in cm; head size – in cm; circumferential body dimensions – in cm; SFT – in mm.

The statistical significance of all discriminant functions determined by the χ^2 criterion indicates that taking into account the above anthropometric indicators, a reliable interpretation of the obtained classification indicators is possible only between healthy and patients with mild or severe seborrheic dermatitis men.

Considering anthropo-somatotypological indices in practically healthy and patients with generalized fatty seborrheic dermatitis of mild and severe severity women, discriminant function covers 91.8 % of cases. Among healthy and sick women with seborrheic dermatitis of varying severity, the discriminant variables are shoulder width (ACR), anterior-posterior mid-thoracic diameter (SGK), thigh SFT (GBD), inspiratory chest circumference (OBGK1), on shin SFT (GGL), face width (SH_LICA) and SFT on the side (GB). Among the above indicators, the most significant contributors to discrimination between groups are thigh SFT and shoulder width. The totality of all anthropo-somatotypological variables has a pronounced (Wilks' Lambda=0.174; $p < 0.001$) discrimination between groups of healthy and patients with mild and severe seborrheic dermatitis women.

In the form of equations, the definition of the index of classification where assignment to healthy women is possible at Df value close to 209.2 is given; to women with seborrheic dermatitis of mild severity – with a Df value close to 244.2; to women with severe seborrheic dermatitis – with a Df value close to 259.3:

– Df (for healthy women) = $ACR \times 3.036 + SGK \times 4.415 - GBD \times 2.340 + OBGK1 \times 1.201 + GGL \times 2.375 + SH_LICA \times 11.50 - GB \times 0.645 - 209.2$;

– Df (for women with mild seborrheic dermatitis) = $ACR \times 1.705 + SGK \times 5.925 - GBD \times 4.173 + OBGK1 \times 1.544 + GGL \times 3.460 + SH_LICA \times 13.28 - GB \times 0.159 - 244.2$;

– Df (for women with severe seborrheic dermatitis) = $ACR \times 1.710 + SGK \times 6.136 - GBD \times 4.114 + OBGK1 \times 1.539 + GGL \times 3.408 + SH_LICA \times 14.12 - GB \times 0.141 - 259.3$.

The results of the evaluation of the criterion χ^2 , as in men, indicate that including the above anthropometric indicators, a reliable interpretation of the obtained classification indicators is possible only between healthy and patients with mild or severe seborrheic dermatitis women.

Thus, in the analysis of discriminant equations it was found that in men and women possible reliable ($p < 0.001$) interpretation of the obtained classification indices only between healthy and patients with generalized fatty seborrheic dermatitis (statistics Wilks' Lambda=0.063 in men, statistics Wilks' Lambda=0.174 in women). Discriminant models in men include comprehensive body size (42.8 %), SFT (28.6 %), body diameter and cephalometric parameters (14.3 % each); in women – SFT (42.8 %), body diameters (28.6 %), body circumference and cephalometric indices (14.3 % each). Moreover, the greatest contribution to discrimination in men is made by the girth of the shoulder in a tense and unstressed state, and in women – SFT on the thigh and shoulder width. Similar results (high percentage of inclusion in the models of body size and SFT, which are low genetically determined), indicate a slight genetic predisposition and a pronounced influence of external factors (more pronounced in men) on this multifactorial disease [3].

In dermatology there are still significant difficulties in conducting a comprehensive assessment of all information about the patient for clinical diagnosis, the choice of the most individualized treatment tactics, forecasting the course of the disease. In practice, the doctor has to deal with complex combinations of active factors that cannot be specifically identified and studied in isolation, which makes it difficult to make the right clinical decision. Multidimensional implementation is used for a reasonable way of solving problems in such cases. In these cases, the use of mathematical modeling equipment can be invaluable. Significant practical value in creating prognostic models is to bear in mind the individual characteristics of a particular subject, which permits to adjust the parameters of the group model and get a more reliable individual forecast [7, 9].

The severity of the disease is usually of major interest in the clinical setting, and is therefore the main focus of comparison of model and data. Prediction of disease activity and severity has so far been largely assessed by researchers with a combination of multiple clinical features (eg dermatoscopic examination) and anamnestic data, which may be somewhat objective (human factor, technical limitations) to make the model clinically or biologically significant [8, 10].

The constitutional approach to mathematical modeling provides logical and mechanistic ways to define new therapeutic goals by identifying disease-related mechanisms and identifying possible effects of critical intervention that acts on critical points to normalize dysregulation. Discriminant analysis of the origin and course of skin disease using anthropometric data of an individual patient begins with determining the system to be modeled and the hypothesis to be investigated. Sensitive parameters, whose small changes dramatically change the behavior of the system, are carefully measured by preliminary correlation analysis, while “insensitive” parameters are possible goals to reduce the parameters to simplify the model. During the analysis it becomes possible to explain different phenotypic manifestations of the same disease in individuals of different somatotypes, which also allows to rationally extend the mathematical models of a particular disease to other diseases with common molecular mechanisms [6].

The constitutional approach to modeling has great potential to enhance the power of traditional experimental approaches in dermatology in the post-genomic era. However, there are virtually no research activities using mathematical modeling, including models based on constitutional indicators.

Among such works, the study of Makarchuk I.M. and others should be noted [2, 5], where discriminant models were built on the basis of anthropometric and somatotypological indicators, which allow to predict the possibility of acne in boys and girls of the Podillia region of Ukraine without and considering the severity of the disease.

I.O. Chaplyk-Chyzho [1] conducted a discriminant analysis based on a practical test of discriminant models of the possibility of pyoderma depending on the features of the constitutional parameters of the body in men and women in the western regions of Ukraine.

Obadeh Bassam Abdel-Rahman Al-Qaraleh and others [12] analyzed and conducted an analysis of discriminant models of the possibility and features of psoriasis in Ukrainian men without and including somatotype depending on the structure and size of the body.

Thus, to draw conclusions that enrich basic and clinical dermatology, researchers must guide and guide interdisciplinary research to address the most fundamental biological and medical problems.

Conclusions

1. Developed on the basis of body sizes reliable discriminant models permit with high probability to predict the possibility of generalized oily seborrheic dermatitis in both men (correctness 87.7 % of cases, statistics Wilks' Lambda=0.063; $p < 0.001$) and women (correctness 91.8 % of cases, statistics Wilks' Lambda=0.174, $p < 0.001$). Significant discrimination of the severity of seborrheic dermatitis based on the characteristics of established anthropometric indices in both men and women is impossible.

2. The most commonly constructed discriminant equations in men include girth body sizes (42.8 %) and SFT (28.6 %); in women – SFT (42.8 %) and body diameters (28.6 %).

3. The greatest contribution to discrimination in men is made by the girth of the shoulder in a tense and unstressed state, and in women – SFT on the thigh and shoulder width.

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