Discriminant models of possibilities occurrence and features of the course of different forms of eczema in men depending on the characteristics of anthropometric indicators

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Eczema is a skin disease with a multifaceted clinical picture, numerous forms of manifestation and course and, last but not least, a life-modifying pathology that often requires lifestyle changes and reduces its quality. Identifying prognostic signs to predict the occurrence and severity of this disease is a priority for modern science. The purpose of the study is to build and analyze discriminant models of the possibility of occurrence and features of course of different forms of eczema in Ukrainian men of the first mature age depending on the characteristics of anthropometric parameters of the body. For men aged 22 to 35 years with true (n=34, including 16 mild and 18 severe) and microbial (n=38, including 28 mild and 10 severe) eczema, anthropometric examination according to the scheme of Bunak V.V. performed. Diagnosis of eczema was performed according to the nomenclature of ICD-10. The control group according to anthropometric data consisted of 82 practically healthy men of the same age, who were selected from the database of the research center of National Pirogov Memorial Medical University, Vinnytsya. Construction of discriminant models of the possibility of occurrence and features of the course of different forms of eczema depending on the anthropometric parameters of the body was carried out in the license package “Statistica 5.5”. It was found that the distribution of sick men on the truth of mild and severe eczema and microbial eczema of mild and severe course is possible only reliable interpretation of the obtained classification indicators between healthy and groups of patients (correct function in 76.0% of cases, statistics Wilks' Lambda = 0.074); when dividing sick men only into truth and microbial eczema - a reliable interpretation of the obtained classification indicators both between healthy and sick, and between sick truth and microbial eczema is possible (function is correct in 87.7% of cases, Wilks' Lambda statistics = 0.088); in the distribution of sick men only for mild or severe eczema - possible reliable interpretation of the obtained classification indicators both between healthy and sick, and between sick truth and microbial eczema is possible (function is correct in 87.7% of cases, Wilks' Lambda statistics = 0.088); in the distribution of sick men only for mild or severe eczema - possible reliable interpretation of the obtained classification indicators both between healthy and sick, and between patients with mild or severe eczema only a slight tendency to interpret the obtained classification indicators (correct function in 84.4% of cases, statistics Wilks' Lambda = 0.088). In all cases, the constructed discriminant equations most often include the thickness of skin and fat folds (62.5%, 57.1% and 71.4%, respectively) and body diameters (37.5%, 42.9% and 28.6%, respectively). The obtained results confirm the prospects of using anthropometric research methods to predict the possibilities and features of eczema course and occurrence.

Keywords: eczema, anthropometric body parameters, discriminant analysis, men.

Introduction

Eczema, or atopic dermatitis, is a disease that has plagued mankind for a long time. From the point of view of dermatology, it is a chronic inflammatory skin disease that has a recurrent nature and manifests itself in the form of various elements of the rash with severe itching. Quite often this disease is associated with allergic rhinitis and asthma (known as the atopic triad) [22]. However, despite the seemingly simple clinic, eczema is the product of a complex interaction of both genetic factors inside the person and the action of the environment.
on it from the outside. The skin is a human barrier that primarily performs a protective function, and according to genetic studies of biopsy material of the skin, it is a violation of this, the main function is the key to understanding the mechanisms of origin and onset of this disease [4].

The immediate cause of such increased attention to dermatological disease is not only not fully identified mechanisms of occurrence and treatment, but the widespread prevalence of this pathology. Deckers I. A. and co-authors [9] performed a large-scale study of literature sources in the period 1990-2010 on the epidemiological situation of atopic dermatitis. 2464 scientific sources were analyzed, from which 69 studies were selected, covering countries in Asia, Africa, Europe, the Americas and Oceania. Disappointing conclusions of this analysis were the data on the increase, which was heterogeneous on different continents (a sharp increase in Africa and a slight increase in Asia), the number of cases of atopic dermatitis among children.

Data from studies in Italy indicate the prevalence of eczema at 8.1 % (95 % CI: 7.6-8.7 %) (more patients regionally belonged to residents of central and southern Italy). About 60 % of patients had the onset of the disease in adulthood; it was also found that the predominance of patients is female, older people living in the area with nearby industrial enterprises and heavy traffic [17].

Among the population of Sweden, the prevalence of eczema is 40.7 %. As in Italy, the disease was mostly observed among women and people living in urban settlements with pollution from dust, automobile gases and industrial vapors. In addition, the family history and association of eczema with allergic rhinitis and asthma were clearly traced [18].

In the United States, the prevalence of eczema varies from state to state and ranges from 8.7 to 18.1 %, reaching the highest rates on the East Coast of the United States. Similarly, to previous studies, living in large cities is a significant factor in the occurrence of the disease with a chance factor of 1.67 (95 % confidence interval 1.19-2.35, \( p=0.008 \)). There is also a higher prevalence of eczema among blacks (odds ratio 1.70, \( p=0.005 \)) [20].

In addition to physical discomfort, patients with eczema also have psychological health problems. A study by Hon K. L and others found that patients with atopic dermatitis had higher symptoms of stress and depression. Thus, symptoms of depression were found in 21 % of patients, symptoms of anxiety in 33 %, and symptoms of stress in 23 % of patients. Statistical analysis of the data showed that these symptoms correlated with low quality of life in patients (partial correlations 0.40-0.49; \( p<0.001 \)). Interestingly, according to the results of the study, only 6 % of patients sought help from a psychologist [11].

The same trend is confirmed in another study, where signs of anxiety were found in 20 % and signs of depression in 14 % of patients. At the same time, worse indicators were found in women compared to men [3].

No less important element that indicates the severity of the problem of this disease is the material cost of the disease. Given its chronic and recurrent nature, this component must be considered. According to a German study, the annual cost of eczema averages 8,799 euros, of which 70 % are indirect costs [10].

Given all these data, researchers are looking for effective but simple and cheap methods of early detection, predicting the occurrence of this disease, predicting the severity and form of its course. One of the promising areas that is already being studied by scientists is the constitutional approach to identifying specific and reliable anthropometric markers of eczema [8], so it is appropriate to conduct a similar type of study using the Ukrainian population.

The purpose of the study is to build and analyze discriminant models of the possibility of occurrence and features of course of different forms of eczema in Ukrainian men of the first mature age depending on the characteristics of anthropometric parameters of the body.

Materials and methods

On the basis of the Military Medical Clinical Center of the Central Region and the Department of Dermatology and Venereal Diseases with a course of postgraduate education National Pirogov Memorial Medical University, Vinnytsya, men aged 22 to 35 years with the truth (n=34, including 16 with mild and 18 with severe course) and microbial (n=38, including 28 with mild and 10 with severe course) eczema, anthropometric examination was performed according to the scheme of Bunak V. V. [6].

The diagnosis of eczema was performed according to the nomenclature ICD-10 (https://zakononline.com.ua/documents/show/116857_531218).

As the control was used anthropometric data of 82 practically healthy men of the same age group, which were selected from the database of the research center National Pirogov Memorial Medical University, Vinnytsya.

Construction of discriminant models of the possibility of occurrence and features of the course of different forms of eczema depending on the anthropometric parameters of the body was carried out in the license package “Statistica 5.5”.

Results

When dividing sick men into true eczema of mild and severe course and microbial eczema of mild and severe course, taking into account the structure and size of the body, the discriminant function is correct in 76.0% of cases. It was found that between healthy and sick men discriminant variables are shoulder width, transverse mid-chest diameter, skinfold thickness (SFT) on the back of the shoulder, SFT on the side, SFT on thigh, intercriscital distance, SFT on the foream and SFT at the lower angle of the shoulder blade, among whose greatest contribution to discrimination is shoulder width. In general, the totality of all anthropometric variables has a pronounced (Wilks’ Lambda statistics=0.074; \( p<0.001 \)) discrimination between healthy
and sick men with different forms of eczema.

The determined coefficients of classification discriminant functions make it possible to determine the classification index (Df), which allows to classify anthropo-somatotypical indicators as "typical" for healthy or patients with different forms of eczema of different courses of men. In the form of equations, the definition of the indicator Df is given, where reference to healthy men is possible at the value of Df close to 197.7; to men with true eczema of mild course - at a value of Df close to 177.1; to men with true eczema of severe course - with a Df value close to 186.7; to men with mild microbial eczema - at a Df value close to 170.4; to men with severe microbial eczema - with a Df value close to 174.6.

\[
Df (\text{for healthy men}) = \text{shoulder width} \times 6.122 - \text{transverse middle thoracic diameter} \times 1.450 + \text{SFT on the back of the shoulder} \times 1.183 - \text{SFT on the side} \times 1.996 + \text{SFT on the thigh} \times 0.302 + \text{intercristal distance} \times 6.711 + \text{SFT on the forearm} \times 0.783 - \text{SFT at the lower angle of the scapula} \times 1.051 - 197.7;
\]

\[
Df (\text{for men with true eczema of mild course}) = \text{shoulder width} \times 3.759 - \text{transverse middle thoracic diameter} \times 0.234 - \text{SFT on the back of the shoulder} \times 1.335 - \text{SFT on the side} \times 1.050 - \text{SFT on the thigh} \times 0.259 + \text{intercristal distance} \times 7.986 + \text{SFT on the forearm} \times 3.308 - \text{SFT at the lower angle of the scapula} \times 1.719 - 177.1;
\]

\[
Df (\text{for men with true severe eczema}) = \text{shoulder width} \times 4.017 - \text{transverse middle thoracic diameter} \times 0.202 - \text{SFT on the back of the shoulder} \times 1.186 - \text{SFT on the side} \times 0.885 - \text{SFT on the thigh} \times 0.446 + \text{intercristal distance} \times 7.975 + \text{SFT on the forearm} \times 3.045 - \text{SFT at the lower angle of the scapula} \times 1.782 - 186.7;
\]

\[
Df (\text{for men with microbial eczema of mild course}) = \text{shoulder width} \times 3.885 - \text{transverse middle thoracic diameter} \times 0.087 - \text{SFT on the back of the shoulder} \times 1.271 - \text{SFT on the side} \times 0.820 - \text{SFT on the thigh} \times 0.221 + \text{intercristal distance} \times 7.414 + \text{SFT on the forearm} \times 3.000 - \text{SFT at the lower angle of the scapula} \times 1.703 - 170.4;
\]

\[
Df (\text{for men with severe microbial eczema}) = \text{shoulder width} \times 4.069 - \text{transverse middle thoracic diameter} \times 0.110 - \text{SFT on the back of the shoulder} \times 0.989 - \text{SFT on the side} \times 0.701 - \text{SFT on the thigh} \times 0.382 + \text{intercristal distance} \times 7.336 + \text{SFT on the forearm} \times 2.273 - \text{SFT at the lower angle of the scapula} \times 1.696 - 174.6;
\]

where (here and hereafter), transverse dimensions - in cm; SFT dimensions - in mm.

The statistical significance of all discriminant functions was determined using the criterion \(\chi^2\). It is established that taking into account anthropo-somatotypical indicators, a reliable interpretation of the obtained classification indicators is possible only between healthy and sick men.

When sick men are divided only into truth and microbial eczema, the discriminant function is correct in 87.7 % of cases. It was found that between healthy and sick men discriminant variables are shoulder width, transverse mid-chest diameter, SFT on the back of the shoulder, SFT on the side, SFT on thigh, intercristal distance and SFT on shin, among which the greatest contribution to discrimination is shoulder width. In general, the totality of all anthropometric variables has a pronounced (Wilks' Lambda statistics=0.088; p<0.001) discrimination between healthy and true men and patients with microbial eczema.

In the form of equations, the definition of the indicator Df is given, where reference to healthy men is possible at the value of Df close to 192.7; to men with true eczema - with a Df value close to 170.0; to men with microbial eczema - with a Df value close to 161.7.

\[
Df (\text{for healthy men}) = \text{shoulder width} \times 6.038 - \text{transverse middle thoracic diameter} \times 1.668 + \text{SFT on the back of the shoulder} \times 1.291 - \text{SFT on the side} \times 2.779 + \text{SFT on the thigh} \times 0.035 + \text{intercristal distance} \times 6.416 + \text{SFT on the shin} \times 0.957 - 192.7;
\]

\[
Df (\text{for men with true eczema}) = \text{shoulder width} \times 3.949 - \text{transverse middle thoracic diameter} \times 0.532 - \text{SFT on the back of the shoulder} \times 0.436 - \text{SFT on the side} \times 2.210 - \text{SFT on the thigh} \times 1.149 + \text{intercristal distance} \times 7.310 + \text{SFT on the shin} \times 2.039 - 170.0;
\]

\[
Df (\text{for men with microbial eczema}) = \text{shoulder width} \times 3.927 - \text{transverse middle thoracic diameter} \times 0.412 - \text{SFT on the back of the shoulder} \times 0.425 - \text{SFT on the side} \times 1.994 - \text{SFT on the thigh} \times 0.945 + \text{intercristal distance} \times 6.868 + \text{SFT on the shin} \times 1.800 - 161.7.
\]

Using the criterion \(\chi^2\), it is established that taking into account anthropo-somatotypical indicators, a reliable interpretation of the obtained classification indicators is possible not only between healthy and sick men, but also between men with various forms of eczema.

At distribution of sick men only on eczema of mild or severe course, discriminant function is correct in 84.4 % of cases. It was found that between healthy and sick men discriminant variables are shoulder width, transverse mid-chest diameter, SFT on the back of the shoulder, SFT on the side, SFT on thigh, SFT on the forearm and SFT at the lower angle of the shoulder blade, among which the greatest contribution to discrimination is width shoulders. In general, the set of all anthropometric variables has a pronounced (Wilks' Lambda statistics=0.088; p<0.001) discrimination between healthy and mild to severe eczema patients.

In the form of equations, the definition of the indicator Df is given, where reference to healthy men is possible at the value of Df close to 154.4; to men with mild eczema - with a Df value close to 114.7; to men with true eczema of mild course - with a Df value close to 170.0; to men with severe microbial eczema - with a Df value close to 122.7.

\[
Df (\text{for healthy men}) = \text{shoulder width} \times 7.040 + \text{transverse middle thoracic diameter} \times 0.673 + \text{SFT on the back of the shoulder} \times 1.917 - \text{SFT on the side} \times 1.110 + \text{SFT on the thigh} \times 0.453 - \text{SFT on the forearm} \times 2.141 - \text{SFT at the lower angle of the scapula} \times 0.547 - 154.4;
\]

\[
Df (\text{for men with mild eczema}) = \text{shoulder width} \times 4.817 + \text{transverse middle thoracic diameter} \times 2.302 - \text{SFT on the back of the shoulder} \times 0.513 + \text{SFT on the side} \times 0.105 - \text{SFT on the thigh} \times 0.062 - \text{SFT on the forearm} \times 0.124 - \text{SFT at the shoulder} \times 0.547 - 154.4;
\]
lower angle of the scapula x 1.134 - 114.7;

Di (for men with severe eczema) = shoulder width x 5.060 + transverse middle thoracic diameter x 2.294 - SFT on the back of the shoulder x 0.306 + SFT on the side x 0.227 - SFT on the thigh x 0.254 - SFT on the forearm x 0.579 - SFT at the lower angle of the scapula x 1.185 - 122.7.

Using the criterion \( \chi^2 \), it is established that taking into account anthropo-somatotypological indicators it is possible to reliably interpret the obtained classification indicators between healthy and sick men, and between men with mild or severe eczema there is only a slight tendency to interpret the obtained classification indicators.

Discussion

Thus, when dividing sick men into true eczema of mild and severe course and microbial eczema of mild and severe course, it was found that possible reliable (p<0.001) interpretation of the obtained classification indicators only between healthy and groups of sick men (discriminant function is correct in 76.0 % cases, statistics Wilks Lambda=0.074); when dividing sick men only into truth and microbial eczema - a reliable interpretation of the obtained classification indicators is possible not only between healthy and sick (p<0.001), but also between patients with various forms of eczema (p<0.05) men (discriminant function is correct in 87.7 % cases, statistics Wilks Lambda=0.088); in the distribution of sick men only on eczema of mild or severe course - possible reliable (p<0.001) interpretation of the obtained classification indicators between healthy and sick men, and between patients with eczema of mild or severe course - only a slight trend (p=0.088) the possibility of interpretation of the obtained classification indicators (discriminant function is correct in 84.4 % of cases, Wilks' Lambda statistics=0.086).

Discriminant models in the distribution of patients with true eczema of mild and severe course and microbial eczema of mild and severe course include body diameters (37.5 %) and SFT (62.5 %); in the distribution of sick men only for truth and microbial eczema - body diameters (42.9 %) and SFT (57.1 %); in the distribution of sick men only on eczema of mild or severe course - also body diameters (28.6 %) and SFT (71.4 %). Moreover, the greatest contribution to discrimination between groups of healthy and sick (regardless of the division into groups of patients) men makes the width of the shoulders. The obtained results (percentage of inclusion in the models of torso and pelvic diameters) indicate a higher genetic predisposition [16] of the form, rather than the course of this multifactorial disease.

Data from foreign studies on the study of constitutional markers in skin diseases are very encouraging [12]. Egyptian researchers found a statistically significant difference between waist circumference and diastolic blood pressure, which can be used to predict the severity of acne [1].

5249 cases of rosacea in American women were analyzed. It was found that the higher risk of this pathology in persons with elevated values of body mass index and waist circumference and thighs \((p_{\text{pred}}<0.0001)\) [14]. At the same time, Iranian scientists, when examining adolescents with acne, found no significant correlations with such indicators as body mass index, waist circumference, systolic and diastolic pressure, sugar levels, total cholesterol \((P>0.05)\) [19].

Studies concerning the study of atopic dermatitis strongly suggest the existence of a relationship between anthropometric parameters and the risk of disease [12]. Thus, a massive review of literature sources, covering a total of 90 thousand people, showed that elevated human body mass index is associated with an increased risk of atopic dermatitis [2]. In another publication, which analyzed the data of 30 studies, this information is also confirmed, but a significant correlation was found in studies conducted on populations in North America and Asia, but not in Europe [23].

Budu-Aggrey A. and co-authors [5] found that an increase in body mass index increases the risk of eczema \((8 \% \text{ of patients})\); \(\text{OR}=1.02 \text{ (1.00 to 1.03)} \) per 1 kg/m\(^2\); \(p=0.09\). Changes in body mass index at the age of 1 to 4 years and high physical activity in combination with changes in body weight index at the age of 6-10 years are positively correlated with the risk of atopic dermatitis at 10.8 years [7].

A group of scientists led by Hu Y. [13] found a relationship between the risk of atopic dermatitis and the index of body mass index, waist circumference, the percentage of body fat. This connection was especially seen in young women. Another study in the United States also found an association between obesity and the risk of eczema in children [21].

The study, which covered 266 people from Harbin (PRC), found that all components of the atopic triad also correlated positively with elevated body mass index values \((\text{OR}=3.2, \text{ CI: 1.8, 5.7})\). For atopic dermatitis in particular \(\text{OR}=2.7, \text{ CI: 1.2, 6.3}) \) [15].

The results obtained during our study, as well as data from the scientific literature, confirm the prospects of using anthropometric research methods to predict the possibility and features of various multifactorial diseases, including eczema.

Conclusion

1. Developed on the basis of anthropometric parameters of the body reliable discriminant models allow with a high probability to predict only the possibility of occurrence and form of eczema in men.

2. The composition of the constructed discriminant equations in all groups of men (in the distribution of patients with true eczema of mild and severe course and microbial eczema of mild and severe course; in the distribution of patients only for true and microbial eczema; in the distribution of patients with only eczema of mild or severe course) most often include SFT (62.5 %, 57.1 % and 71.4 %, respectively) and body diameters (37.5 %, 42.9 % and 28.6 %, respectively).

3. Shoulder width makes the largest contribution to discrimination in all groups of men.
References


від особливостей антропометричних параметрів тіла. Чоловікам, віком від 22 до 35 років, хворим на істинну (n=34, серед яких 16 з легким перебігом і 18 з тяжким перебігом) та мікробну (n=38, серед яких 28 з легким перебігом і 10 з тяжким перебігом) екзему, проведено антропометричне обстеження відповідно до схеми Бунака В.В. Встановлення діагнозу екземи проводили згідно номенклатури МКХ-10. Контрольну (за антропометричними даними) групу становили 82 практично здорових чоловіків аналогічного віку, які були відібрани з банку даних науково-дослідного центру Вінницького національного медичного університету ім. М.І.Пирогова. Побудова дискримінантних моделей можливості виникнення та особливостей перебігу різних форм екземи в залежності від антропометричних параметрів тіла проведена в ліцензійному пакеті "Statistica 5.5". Встановлено, що при розподілі хворих чоловіків на істинну екзему легкого і тяжкого перебігу та мікробну екзему легкого і тяжкого перебігу можлива лише достовірна інтерпретація отриманих показників класифікації між здоровими та групами хворих (функція коректна в 76.0% випадків, статистика Wilks’ Lambda = 0,074); при розподілі хворих чоловіків лише на істинну та мікробну екзему - можлива достовірна інтерпретація отриманих показників класифікації як між здоровим та хворим, так і між хворими на істинну та мікробну екзему (функція коректна в 87.7% випадків, статистика Wilks’ Lambda = 0,088); при розподілі хворих чоловіків лише на екзему легкого або тяжкого перебігу - можлива достовірна інтерпретація отриманих показників класифікації між здоровими та хворими, а між хворими на екзему легкого або тяжкого перебігу лише незначна тенденція можливості інтерпретації отриманих показників класифікації (функція коректна у 84.4% випадків, статистика Wilks’ Lambda = 0,088). До складу побудованих дискримінантних рівнянь в усіх випадках найбільш часто входять товщина шкірно-жирових складок (відповідно 62.5%, 57.1% і 71.4%) і діаметри тіла (відповідно 37.5%, 42.9% і 28.6%). Отримані результати підтверджують перспективність використання антропометричних методів дослідження для прогнозування можливостей виникнення та особливостей перебігу екземи.

Ключові слова: екзема, антропометричні параметри тіла, дискримінантний аналіз, чоловіки.