SIMILARITY ESTIMATION OF TIME SERIES BY METHODS OF FRACTAL ANALYSIS

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In studying the regularities of the development of occupationally conditioned diseases among workers of chemical and pharmaceutical industry enterprises, information was collected on the manifestations of these diseases in work experience groups. As a result of this research we obtained time series $X_j(t)=\{x_j(t_i)\}$, $j=\overline{1,3}, i=\overline{1,40}$, corresponding to different risk groups of occupationally caused allergic dermatoses. Namely the series $X_1(t)$ describing the dynamics of the number of patients with allergic dermatoses in the anamnesis (Sick patients and Group 1), the series $X_2(t)$ analyzing the dynamics of morbidity of workers with various somatic pathologies (Group 2), and the series $X_3(t)$ containing data on workers with various skin diseases of non-allergic genesis (Group 3).

Appearance of occupationally conditioned allergic dermatoses occurs both against the background of allergic reactions existing in the anamnesis, and in their absence. Statistical analysis of the collected information showed that when examining the workers of the enterprise "Zdorov'e", Kharkiv, with various somatic diseases, it turned out that 72% of them had manifestations of allergodermatosis and other skin diseases.

In this regard, the problem arises of estimation the degree of similarity of time series $X_1(t)$ and $X_2(t)$, which, perhaps, will give an explanation for this fact or determine the direction of further research.

It should be noted that today there already exist software products for evaluating the similarity of time series, focused on the use of methods of nonlinear dynamics. In this case, the similarity estimation is formed by the results of the sequential R/S-analysis and phase analysis.

As a result of applying the above methods of time series analysis, phase trajectories were constructed, quasi-cycles were identified, sequences of H-trajectories and R/S-trajectories were obtained.

The similarity measure of time series $X_1(t)$ and $X_2(t)$ in this case also has the form of a vector $\mu(X_1(t),X_2(t))=\mu\left(\mu_\delta^1(X_1(t),X_2(t)),\mu_\delta^2(X_1(t),X_2(t))\right)$, where μ_δ^1 is the measure of closeness of series according to R/S-analysis data, and μ_δ^2 is the measure of closeness of series according to phase analysis data. The calculations have shown that $\mu(X_1(t),X_2(t))=\mu(0{,}63;0{,}77)$ in this research.