APPLYING STATISTICAL ANALYSIS METHODS FOR IDENTIFYING CHARACTERISTICS OF DIFFERENT FORMS OF BRONCHIAL ASTHMA

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Nowadays mathematical methods in medicine close up with cybernetic and information methods, that allow obtaining more accurate conclusions and recommendations, introduce new facilities and treatment modes and diagnostics. Statistical methods of data processing are widely used by medical persons, it facilitated by that fact that standard packages of application programmes ensure processing main operations of statistical data processing.

Asthma is a disease characterized by inflammation of the bronchial tubes. A primary treatment for asthma is reducing inflammation through medications such as prednisone, thereby increasing oxygen flow.

Bronchial asthma remains a worldwide problem. Up to 7-10 % of population in developed countries has asthma. Every 3 minutes 1 patient dies in the world due to asthma. Two thirds of patients with asthma doubles and reasons of this are not known.

One of the most popular statistic tasks is a task of comparing the results of examination any indication in different conditions of measuring (i.e. before and after some influence) or examination control and experimental group. Moreover, often there is necessity of estimation the nature of any psychological characteristic in one or in several groups in different time periods or to detect dynamics of this characteristic by influence of experimental effect. There are a lot of statistical methods, which are called criterias of differences. These criteria allow estimating authenticity of statistical differences between different characteristics [1].

The goal of this work was to identify if psychological and physiological indices of bronchial asthma patients with different types of diagnosis before and after audio-visual stimulation are different or not.

That is, there is a task of estimating authenticity of statistical differences, using one of statistical criteria.

Regularity was explored by 83 patients who did different medicine and psychological tests, all results and data was put together in one file (fig.1). It is information about psychological and physiological condition of patients. Patients are divided into groups according to diagnosis. There are for forms of bronchial asthma:

- BANP – bronchial asthma no psychogenic
- BASP – bronchial asthma somatical-psychogenic
- BAPI – bronchial asthma psychogenic - induced
- PD – psychogenic dyspnea

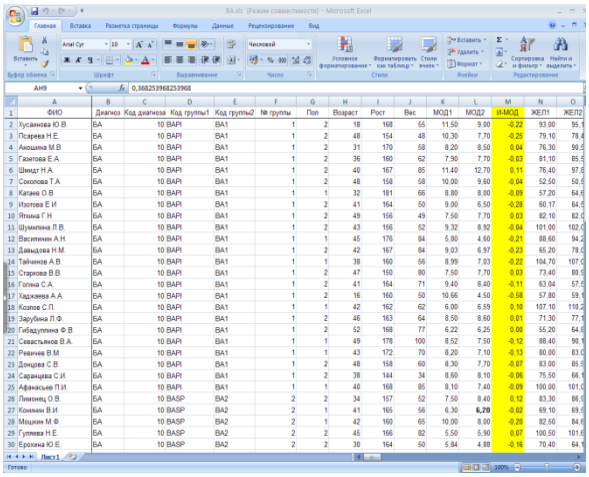

Fig.1 A fragment of the experimental data bases

First of all it is necessary to select one of statistical criteria. We should to compare 2 variables from one sample: medical indexes of patients before and after treatment with the help of audio-video stimulation.

In this case Wilcoxon test is used. The Wilcoxon signed-rank test (T - test) is a non-parametric criteria for the case of two related samples or repeated measurements on a single sample. The test is named for Frank Wilcoxon. It allows establishing direction and intensity of changes. These criteria have such algorithm:

1. State the null hypothesis - in this case it is that the median difference, M, is equal to zero.
2. Calculate each paired difference, $d_i = x_i - y_i$, where x_i, y_i are the pairs of observations.
3. Rank the d_is, ignoring the signs (i.e. assign rank 1 to the smallest $|d_i|$, rank 2 to the next etc.)
4. Label each rank with its sign, according to the sign of d_i.
5. Calculate W+, the sum of the ranks of the positive dis, and W−, the sum of the ranks of the negative d_is. (As a check the total, W+ + W−, should be equal to $\frac{n*(n+1)}{2}$, where n is the number of pairs of observations in the sample).

Under the null hypothesis, we would expect the distribution of the differences to be approximately symmetric around zero and the the distribution of positives and negatives to be distributed at random among the ranks. Under this assumption, it is possible to work out the exact probability of every possible outcome for W. To carry out the test, we therefore proceed as follows:

6. Choose W = min (W−, W+).
7. Use tables of critical values for the Wilcoxon signed rank sum test to find the probability of observing a value of W or more extreme. Most tables give both one-sided and two-sided p-values. If not, double the one-sided p-value to obtain the two-sided p-value [2].

For realization of this mathematical method we chose such statistical package as STATGRAPHICS, that perform and explain basic and advanced statistical functions. This package have statistical advisor (StatAdvisor)(Fig.2), which interprets derived results, defines important effects or show possible defects of analyzing.

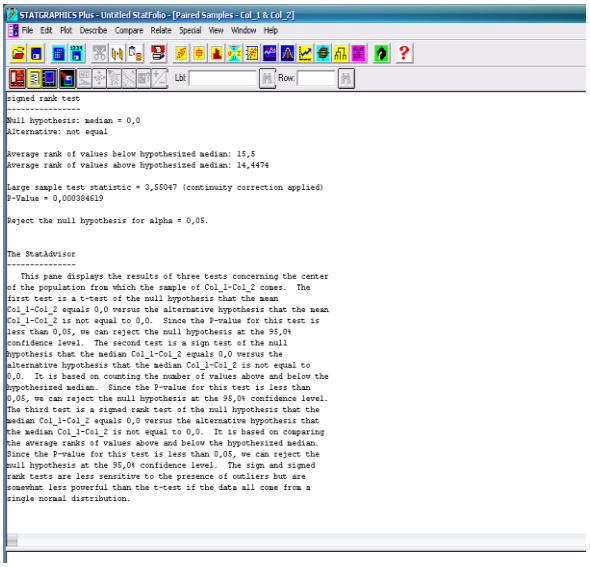

Fig.2 StatAdvisor

Thereby, comparison of psychological and physiological indices of bronchial asthma patients with different types of diagnosis before and after audio-visual stimulation was realized in statistical package STATGRAPHICS, using Wilcoxon test.

At the result of this work statistical criteria was chosen and realized for analyzing such experimental medical data as psychological and physiological indices bronchial asthma patients with different types of diagnosis.

The research was led with help of Wilcoxon test. This method was realized in statistical package STATGRAPHICS. For the reason of this test, the table with results was composed (fig.3). This table includes information about significance label (p). Afterwards data in the table was analysed.

For the reason of derived results was made conclusions about the influence of audio-visual stimulation on patients with different types of bronchial asthma diagnosis: the greatest changes after the course of audio-video stimulation was noticed at patients with BAPI diagnosis. The lowest influence was exerted on patients with PD diagnosis.

The results of this research were transferred to the hospital №3 for further analysis.

	BAPI	BASP	BANP	PD
	p	p	p	p
TAS 1-2	0,1922	1,0	0,9999	0,9999
SHIXAN	***0,0366***	0,2282	0,3458	0,9999
LT 1-2	1,0	0,6625	***0,0023***	***0,0041***
PT 1-2	***0,0074***	0,4717	0,4616	0,7236
DCYNG 1-2	***0,0354***	0,3262	0,6966	0,5298
DBEK1-2	***0,00013***	***0,0100***	***0,017***	0,0228
IZS Z1-2	***0,000024***	***0,0221***	***0,0131***	***0,0068***
IZS -H1-2	***0,00019***	0,0549	0,0848	***0,0240***
IZS G1-2	0,9999	0,7935	0,9999	0,1576
FIZS 1-2	***0,0012***	0,0608	***0,0205***	0,2090
IZS E1-2	***0,0003***	***0,0234***	***0,0348***	***0,0304***
IZS D1-2	***0,0035***	0,1978	0,3603	0,1075
IZS C1-2	***0,00004***	0,0056	***0,0085***	0,1435
IZS B1-2	***0,0483***	0,6312	0,1114	0,2711
IZS A1-2	***0,00022***	0,1904	***0,0116***	0,3068
MIL 01-02	1,0	0,9999	0,4105	0,7238
MIL 9	***0,0004***	0,9999	0,4495	0,2731

Fig.3 The fragment of table with results of T-test

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