

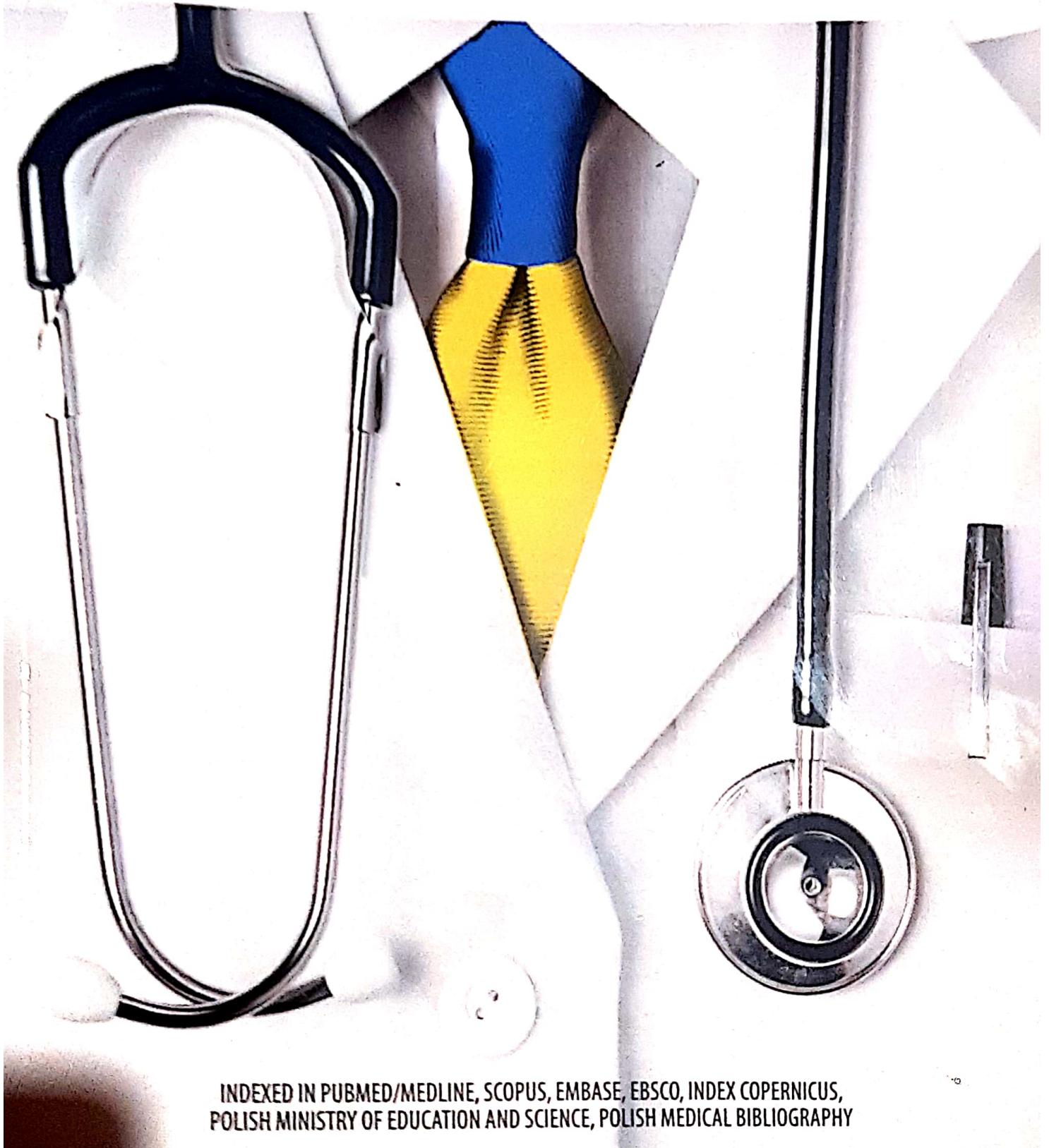
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T-CRITERION AS A TOOL FOR DETERMINING THE RISK OF COMPLICATIONS OF THE GESTATIONAL PROCESS

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ABSTRACT

The aim: To conduct analyses of the course of the gestational process of women who contracted acute hepatitis A before pregnancy in order to predict and prevent obstetric complications and the possibilities of using the t-test for this.

Materials and methods: Clinical and statistical analysis of 500 gestational processes of women who suffered from acute hepatitis A before pregnancy, of which 100 cases were included in the main study by randomization.

Results: All pregnant women were divided into two groups – with obstetric complications during childbirth and without pathological obstetric changes during childbirth. Based on the analysis of 54 factors, the 8 most significant factors were selected in order to predict the occurrence of obstetric complications in childbirth for women who had hepatitis before pregnancy.

Conclusions: this method can be used as a marker of the success of treatment and prevention measures in any field of medical science.

KEY WORDS: hepatitis, prognosis, complications, pregnancy

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INTRODUCTION

Despite the achievements of medicine and the constant introduction of new medical technologies into practice in order to control infectious processes, viral hepatitis is a significant cause of increased morbidity and mortality [1-5]. Despite that hepatitis A /HA/ is an infection, which is vaccine-preventable, there are 1,4 million new cases globally occur annually [6]. This amount of a cases of a newly diagnosed HA infection is lower in high-income countries. On the other hand poor hygienic conditions, lack of clean drinking water, malnutrition that are common for low-income countries lead to rapid spread of the disease [7].

At the same time, the development and implementation of new methods of prevention and treatment is always accompanied by a number of issues related to both the integral assessment of the effect of pharmaceuticals (or other means) on the main pathological process and on accompanying complications. Indeed, when analyzing statistical data regarding the specific results of treatment approaches, one can always find significant positive shifts, but also minor or even negative outcomes. Even more difficult questions arise when comparing the effects of different drugs (methods), especially if there is no quantitative assessment of the severity of the patients' condition. In other words, there

is an urgent need to create a relatively simple method for comparing therapeutic and preventive means and assessing the risks of complications during the gestational period.

We suggest using the t-test for such problems. The logical basis for its use is that the quantitative value of this criterion is proportional to the distance between the compared indicators. On the other hand, taking into account the statistical error makes it possible to avoid random changes in the selected indexes. Accordingly, the use of the additive function can provide a comprehensive description of the clinical situation.

THE AIM

Monitor the impact of hepatitis A, which has been overcome in the past, on the course of pregnancy, childbirth, and the postpartum period and the early neonatal period of their newborns in order to predict and prevent obstetric complications and the possibilities of using the t-test for this.

MATERIALS AND METHODS

A comprehensive examination of 500 convalescent women with hepatitis A (HA) was conducted, of which

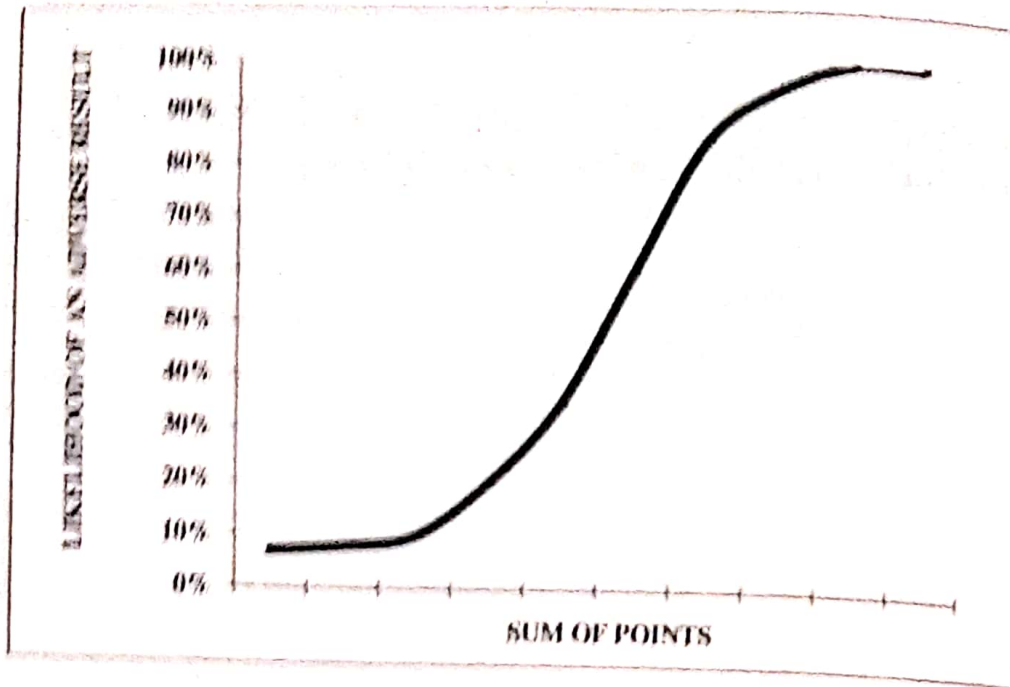


Fig. 1. General view of the dependence of the probability of an adverse outcome on the sum of risk points

100 cases were included in the main study by randomization along with an analysis of the condition of their babies in the early neonatal period and 100 somatically healthy women and their newborns.

Groups of women are homogeneous in age, social status (women are married), to a certain extent in specialty (housewives, or work in a profession not related to physical exertion and contact with teratogenic substances), live within the same time zone and conditions temperate continental climate.

Statistical processing of the observation results was carried out using the Statistika and Excel software packages. To calculate the prognostic significance of signs, the Student's criterion in the modification of N.M. Amosov and co-authors (1975) was used. This relatively simple approach assumes statistical independence of signs (symptoms and syndromes) that are used to describe the nature of the disease.

The essence of the methodology is to compare the frequency of an unfavorable result in patients with the investigated symptom (P1) with the average frequency of an unfavorable result in all patients examined for this indicator (P0). The corresponding mathematical value has the following form:

$$t = \frac{P_1 - P_0}{\sqrt{m_1 + m_0}}$$

where t is the "weight" of the feature (in points); m1 and m0 are average errors of P1 and P0 values.

In accordance with the formula, the parameter t was calculated for each symptom, and only positive characteristics of prognostic importance of the symptom were taken into account (that is, only risk factors). For

further use, those clinical signs were taken for which the values of the t criterion were greater than one. In the case of a small number of observations, insufficient for a statistically reliable conclusion, expert assessments were again used.

At the next stage, the relationship (correlation) of the selected parameters was checked. With a correlation coefficient of $r \geq 0.7$, two parameters were replaced by a generalized one or one of them was chosen in order to avoid overestimating the prognostic importance of a set of features. If $0.3 < r < 0.7$, then to reduce the error attention was paid only to the extreme values of each of the indicators, compared with the possible value of the other. If $r < 0.3$, the parameters were considered uncorrelated.

The most significant indicators were combined into a risk map.

Experimental verification of the risk map was carried out on the basis of three samples:

- 1) On the so-called "training" sample (observations with verified conclusions), which was used to assess the prognostic significance of clinical indicators;
- 2) The control sample, which also combined observations with verified conclusions, but which were not included in the training sample;
- 3) "Examination" selection of medical histories (the truth of the conclusions was checked by observations).

At the last stages, the dependence between the sum of points characterizing the condition of the patients and the probability of an adverse outcome was determined as well as the degrees of risk were substantiated. The relationship between the sum of points, which characterizes the condition of patients, and the probability of

T-CRITERION AS A TOOL FOR DETERMINING THE RISK OF COMPLICATIONS OF THE GESTATIONAL PROCESS

Table I. Prognostic significance of factors that determine obstetric complications during childbirth in women who contracted Gk before pregnancy

Factor	Number of observations	Result			Average frequency of adverse results, %	Meaning, points
		Good persons	Bad persons	%		
Suffering from HA less than 1 year before pregnancy	18	6	12	66,7	32,0	2,25
The threat of late spontaneous abortion	19	8	11	57,9	32,0	1,55
Obesity	2	0	2	100,0	32,0	1,00
Suffering from HA more than 10 years before pregnancy	2	0	2	100,0	32,0	1,00
Age from 26 to 30 years	28	13	15	53,6	32,0	1,20
Anemia during pregnancy	15	7	8	53,3	32,0	1,16
Spontaneous miscarriage in the anamnesis	10	4	6	60,0	47,5	1,16
Threat of spontaneous abortion	11	5	6	54,6	32,0	1,02

Table II. Dependence of the probability of obstetric complications in pregnant women who are convalescents of hepatitis A from degree of risk

Degree of risk	Total points	Number of observations	Result			Average theoretical frequency of adverse results, %
			Good	Bad persons	%	
I	< 2,0	63	55	8	12,7	< 15,9
II	2,0-4,0	30	13	17	56,7	56,7
III	4,1-6,0	6	0	6	100,0	100,0
IV	> 6,0	1	0	1	100	100,0
Overall		100	68	32	32,0	

an adverse outcome, as a rule, was non-linear and most often had an S-shaped character. For an integral assessment of complications, complications of the gestational process, which are the most significant in the opinion of the obstetrician, were identified and systematized:

- during pregnancy – threat of spontaneous miscarriage, threat of late spontaneous miscarriage, threat of premature birth, early toxicosis, gestational edema, pre-eclampsia, pyelonephritis, placental insufficiency, anemia, acute respiratory viral infections, drug addiction;
- during childbirth and the postpartum period – premature birth, delayed pregnancy, rapid childbirth, weakness of labor forces, inefficiency of labor induction, labor induction, labor augmentation, prenatal and early fusion of amniotic fluid, defect of the placenta and/or membranes, manual or instrumental revision of the uterine cavity, hypotonia, hyperthermia, anemia, postpartum endometritis, lochiometra, oligohydramnios and polyhydramnios, green or meconium amniotic fluid;
- regarding the condition of the fetus – antenatal death, asphyxia, cephalohematomas, clavicle fracture, acute ischemic damage of the central nervous system, hyporeflexia, respiratory disorders syndrome, cyanosis, intrauterine hypotrophy, prematurity, immaturity, hemolytic or conjugation jaundice, withdrawal syndrome and Erb's paresis.

RESULTS

All pregnant women were divided into two groups:

- with obstetric complications during childbirth;
- without pathological obstetric changes during childbirth.

Based on the analysis of 54 factors, the 8 most significant factors were selected in order to predict the occurrence of obstetric complications in childbirth for women who had hepatitis A before pregnancy. As in the previous groups, the factors that are easy to observe and accessible to a doctor even in the conditions of a women's consultation were selected (Table I).

In the table is shown only factors with positive values, i.e., those that increase the likelihood of obstetric complications during childbirth in women who had hepatitis A before pregnancy. A number of signs listed in the table rarely occurred. However, their clinical importance is not in doubt; the value in points was determined using heuristic evaluation.

In the future, in the process of dispensation or for short-term forecasting, indicators of prognostically important signs (points) were added. Given the danger of incorrectly increasing the sum of points due to the use of closely related factors, correlations between selected clinical indicators were checked. It turned out that there is no significant relationship between them (in no case did the correlation coefficient exceed 0.3).

As can be seen from the obtained results, the main number of risk factors is consistent with the data of other

scientists, which mainly characterize the period from hepatitis disease to the onset of pregnancy (less than one year) and the presence of extragenital pathology (obesity, anemia). It is unexpected to get into the factors that determine the occurrence of obstetric complications, the suffering of hepatitis A 10 or more years before pregnancy. Threats of termination, in particular, the threat of spontaneous abortion and late spontaneous abortion, play an important role in predicting the pathology of childbirth.

For practical convenience, in the process of predicting the course of childbirth in pregnant women who are convalescing, hepatitis A identified four degrees of probability of an adverse outcome:

- I degree – the sum of points is less than 2.0;
- II degree – 2.0-4.0 points;
- III degree – 4.1-6.0 points;
- IV degree – > 6.0 points.

By adding the indicators of the signs of each pregnant woman, the total number of points was determined. The division of women depending on the sum of points is shown in the table II.

A statistically significant increase in the probability of adverse outcomes was noted as the degree of risk increases (Fig. 1).

DISCUSSION

The results of the study are consistent with the data of other scientists that the combination of hepatitis with the gestational process leads to an increase in the frequency of complications [8-11].

Along with it, the course of the gestational process in convalescents was not studied, since it is believed that

the long-term impact of hepatitis A on the course of pregnancy, childbirth, the postpartum period and the early neonatal period of newborns from mothers who contracted this type of acute viral hepatitis before the onset of pregnancy is unlikely.

The analysis of the gestational process in women who contracted acute viral hepatitis A before pregnancy showed that for them there is a statistically significant increase in the frequency of acute respiratory virus infections, rapid childbirth, pyelonephritis during pregnancy and early confluence of amniotic fluid during childbirth itself.

The probability of occurrence of obstetric complications is statistically likely ($p < 0.05$) to increase as the degree of risk increases. At the I-st degree of risk, the probability of obstetric complications does not exceed 15.9%, while at the II-nd degree it reaches 56.7% ($p < 0.05$). Such a sharp increase in the probability of complications during childbirth in women who have hepatitis A before pregnancy indicates the need to find additional risk factors to ensure a smoother increase in the integral risk of complications. On the other hand, it can be argued that the definition of II, and even more so III or IV degree of risk requires the mandatory use of preventive measures in the system of providing medical care to women suffering from HA.

CONCLUSIONS

In our opinion, this method can be used as a marker of the success of treatment and prevention measures in any field of medical science.

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Conflict of interest:

The Authors declare no conflict of interest.

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