



Scientific substantiation of medico-social prevention of digestive diseases in schoolchildren on the basis of the prediction table

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ABSTRACT

In the present work presents the results of scientific substantiation of medico-social preventive the disease of the digestive system at school students conducted on the basis of the prediction table. The development of a prognostic matrix for predicting the occurrence and development of diseases of the digestive system in schoolchildren was carried out according to a comprehensive socio-hygienic study of schoolchildren and the study of the prevalence of diseases of the digestive system according to medical examinations among schoolchildren. The influence of socio-hygienic and medico-biological factors on the occurrence and development of digestive diseases in schoolchildren was studied. To do this, we have compiled a special map of the study of socio-hygienic and biomedical factors for the formation of diseases of the digestive system, which includes 28 factors and 84 of their gradations. It was calculated all the parameters for the preparation of a prognostic matrix to assess the occurrence of diseases of the digestive system in schoolchildren by socio-hygienic and medico-biological risk factors. Taking into account the great importance of the prognostic coefficient for Pediatrics and gastroenterology, it was developed ready-made threshold values of the prognostic index that characterize the probability of the risk of digestive diseases in schoolchildren.

Keywords: factors, medical and social, relative risk, digestive disease, prognostic table, trade values

INTRODUCTION

Health of children and adolescents is of significant medical and social importance, which is determined not only by the increasing proportion of chronic diseases, but also the magnitude of economic losses of society in the future. Changes in the health of schoolchildren, often of a negative nature in recent years, cause the greatest concern (1). During the years of schooling, the number of children with visual impairment has increased 10 times, up to 70% of schoolchildren have musculoskeletal disorders, the number of children with mental health disorders has increased 4 times, and 3 times - with diseases of the digestive system. More than 60% of adolescent girls need gynecological care, more than half of young men of military age have a delay from conscription for health reasons (2). All of these negative trends develop on the background of reducing the volume of preventive measures, increased school load, the deterioration of the conditions of training and education, structure and organization of nutrition of children and adolescents, decreasing their physical fitness, reducing physical culture and sports, the closing of the institutions concerned (1,3).

Nutritional disorders in children are one of the reasons for the high incidence of digestive diseases, which occupy the first place (10-12%) in the structure of morbidity in schoolchildren, as well as in the occurrence of anemia and metabolic diseases, the prevalence of which has increased significantly in recent years (10-15% of school-age children). Approximately 10% of children have a low body weight or reduced growth, which indicates an acute or a chronic malnutrition (4).

Based on the high prevalence of diseases of the digestive system among children, especially in school-age children, it is necessary to emphasize the growing relevance of the development and implementation of prevention of diseases

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of the digestive system in schoolchildren. Therefore, in order to organize the prevention of diseases of the digestive system in schoolchildren, improve the performance of the school pediatrician and dispensary work of the district pediatrician, it is necessary to predict the onset of diseases of the digestive system in schoolchildren by socio-hygienic and medical-biological risk factors.

THE PURPOSE

The purpose of this work is to develop a prognostic matrix for predicting the occurrence and development of diseases of the digestive system in schoolchildren.

At the first stage, it was conducted a comprehensive socio-hygienic study of schoolchildren, conducted a study of the prevalence of diseases of the digestive system according to medical examinations among schoolchildren. The object of the study were students of 0-11 grades of five schools in Shymkent. The volume of the study was 1025 students.

Collection of information was carried out by the method of questioning students using a specially designed questionnaire "Medical, social and hygienic characteristics of the child."

A comprehensive social and hygienic study of schoolchildren of five schools in Shymkent showed that there are numerous factors that can negatively affect the health and affect the level of morbidity of the digestive system of schoolchildren. Thus, 24.9% of the surveyed schoolchildren live in conditions with a low level of material security, 0.9% - live in poor housing conditions; 29.1% of schoolchildren are brought up in single-parent families; in 34% of cases, only one person works in the family, 11% of parents do not allocate money for the child's food at school; 4.3% of secondary school students and 8.2% of high school students smoke; 10.3% of secondary school students and 14.6% of high school students drink alcohol; 2.25% have an unfavorable psychological climate in the family; 34.9% have conflicts with classmates; 7.1% of primary school students, 20.3% - middle school and 17.1% - high school do not eat hot meals (excluding tea, coffee and other hot drinks) at school; 9.7% of primary school students, 30.6% - middle school and 35% - high school do not eat in the dining room and more often snack in the cafeteria.; 28% of respondents consider themselves not informed in matters of proper nutrition. Our studies have shown that the incidence of digestive diseases among students, according to medical examinations, during their studies at school increased by 1.4 times (from 105.9% in primary school to 145.3% in high school). The ranking distribution of digestive diseases in schoolchildren, according to medical examinations, was as follows (**Figure 1**): first place - dyskinesia of the cystic duct and gallbladder - 40%; second - chronic gastritis - 19%; third - chronic cholecystitis, cholecystocholangitis - 18.5%; fourth - chronic duodenitis - 12.5%; fifth - functional disorders of the stomach - 7%; sixth - other - 3%.

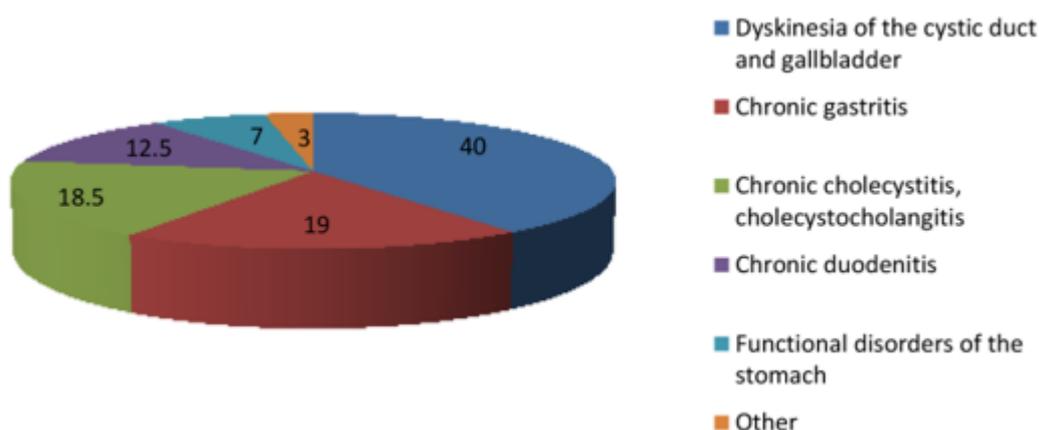


Figure 1: The structure of digestive diseases in students, according to medical examinations (%)

At the second stage, the influence of socio-hygienic and biomedical factors on the occurrence and development of diseases of the digestive system in schoolchildren was studied. To do this, we have compiled a special map of the study of socio-hygienic and biomedical factors for the formation of diseases of the digestive system, which includes 28 factors and 125 of their gradations.

The study of the influence of socio-hygienic and biomedical factors was carried out using a single-factor analysis of variance. Initially, 18 single-factor dispersion complexes were composed of 28 characteristics taken for the study. As a result, it was found that the most significant were the following factors: there are diseases of the digestive system among the next of kin - $\eta^2 = 16.3\%$; uses alcohol - $\eta^2 = 14.2\%$; does not eat hot meals at school - $\eta^2 = 11.5\%$; experiences and

worries in the event of stress, conflict situations at school - $\eta^2=7.1\%$; snacks in the buffet instead of a full meal in the dining room or uses sandwiches - $\eta^2 =6.8\%$ ($P<0.05$).

At the third stage, it was calculated all the parameters for the preparation of a prognostic matrix to assess the occurrence of digestive diseases in schoolchildren by socio-hygienic and medico-biological risk factors. The frequency of digestive diseases in schoolchildren was accepted as the evaluation criterion (the data were obtained at the first stage of the study). The obtained data on the frequency of digestive diseases in schoolchildren, expressed in coefficients, were used to predict digestive diseases in schoolchildren.

The degree of influence of gradations of each factor was determined by applying a weighting factor or relative risk index (R), which is the ratio of the maximum intensity index (C) to the minimum (d) within each specific factor ($R=c/d$).

For example, according to our study, the risk of diseases of the digestive system in fact "living conditions": gradation "bad" amounted to 77.4, and "good" 48.6 per 1000 examined. The relative risk of diseases of the digestive system in this case is $R=77.4/48.6=1.59$. If the factor has no effect, this ratio will be equal to one. The higher this figure, the more significant factor for the occurrence of this pathology. In the same way, it was calculated indicators for all other factors. It is established that the socio-hygienic and medical-biological factors have different effects on the occurrence and development of diseases of the digestive system. Therefore, R so calculated are summed up. According to our data, $\sum R=37.61$. This amount is required to determine the risk range. Such data as the prognostic coefficient (X) was identified and compiled in the form of a prognostic table.

Normalized intensive index (NII) was used to calculate X. NII find the next way. To determine the NII, it is necessary to know the indicator of the incidence of diseases of the digestive system per 1000 examined in this particular group (P) and the "normalizing" indicator (M) characterizing the intensity of diseases of the digestive system in the entire study population. Thus, the defeat of the digestive organs in persons who consume alcohol was 76.9 ($P=76.9$), and the defeat of the digestive organs in the whole population was 172.8 ($M=172.8$), hence:

$$NII=172.8/76.9=0.44$$

From this, a prognostic coefficient is obtained:

$$X=P*NII=76.9*0.44=33.83$$

The prognostic coefficients calculated in this way are given in **Table 1**.

Table 1: Prognostic matrix for a comprehensive assessment of the risk of digestive diseases in schoolchildren

Nº	Factors	Gradation of factors	Morbidity DDS for 1000 children	OR	NII	Predictive coefficient values	The prognosis for the incidence of DDS	Risk probability				
1	Sex	Male	76.5	1.55	0.44	33.7	unfavorable	most				
		Female	49.2						0.25	13.77	favorable	least
2	Class	0-4 classes	48.4	1.39	0.28	13.55	favorable	least				
		5-8 classes	54.5						0.32	17.42	favorable	least
		9-11 classes	67.4						0.34	28.9	unfavorable	most
3	Brought up	In a full family	46.3	1.48	0.27	12.5	favorable	least				
		In a single-parent family	68.7						0.39	26.9	less favourable	average
4	The level of material security of the family	Good	48.9	1.47	0.28	13.7	favorable	least				
		Bad	72.3						0.42	30.4	unfavorable	most
5	Number of working family members	One	78.3	1.51	0.45	35.63	unfavorable	most				
		Two	59.7						0.34	20.34	favorable	least
		Three	51.7						0.29	14.9	favorable	least
6	Psychological microclimate in the family	Favorable	49.1	1.36	0.28	13.7	favorable	least				
		Unfavorable	67.1						0.39	26.16	less favourable	average
7	Housing conditions	Good	48.6	1.59	0.28	13.6	favorable	least				
		Bad	77.4						0.45	34.83	unfavorable	most
8	Smoking	Not smoke	52.2	1.41	0.30	15.66	favorable	least				
		Smoke	74.1						0.42	31.12	unfavorable	most
9	Alcohol consumption	No	51.7	1.48	0.29	14.99	favorable	least				
		Yes	76.9						0.44	33.83	unfavorable	most
10	Conflicts with classmates and schoolchildren	No	54.6	1.39	0.32	17.47	favorable	least				
		Yes	75.9						0.43	32.63	unfavorable	most
11	How to respond to conflict situations	Does not pay attention or gets upset not much and forgets quickly	48.6	1.57	0.28	13.60	favorable	least				
		Pays attention to them. very upset and remembers for a long time	76.5						0.44	33.67	unfavorable	most
12	To eat hot meals (excluding tea, coffee and other hot drinks) at school	2 times	49.7	1.49	0.29	14.41	favorable	least				
		1 time	52.3						0.36	22.42	less favourable	average
		no eating	74.5						0.43	32.03	unfavorable	least

Table 1 (continued): Prognostic matrix for a comprehensive assessment of the risk of digestive diseases in schoolchildren

13	How to eat	Regularly in the dining room	49.7	1.45	0.28	13.9	favorable	most
		In the canteen or bring sandwiches	61.7		0.36	22.2	less favourable	average
		no eating	72.5		0.42	30.45	unfavorable	most
14	How often visits the canteen	doesn't attend	76.9	1.56	0.44	33.83	unfavorable	most
		One time	64.1		0.37	23.72	less favourable	average
		Two or more times	49.2		0.28	13.77	favorable	least
15	Do parents allocate money for school meals	Yes	49.1	1.58	0.28	33.74	unfavorable	most
		Not always	62.3		0.36	22.42	less favourable	average
		No	77.6		0.45	34.92	unfavorable	most
16	Does it take additional vitamin and mineral complexes	2 times a year	48.9	1.52	0.28	13.69	favorable	least
		1 time per year	61.3		0.35	21.46	less favourable	average
		No	74.8		0.43	32.16	unfavorable	most
17	Informed in matters of proper nutrition	Yes	49.6	1.56	0.28	13.88	favorable	least
		Partially	58.7		0.34	19.95	favorable	least
		No	77.4		0.45	34.83	unfavorable	most
18	Is there intolerance to certain foods	No	51.8	1.50	0.29	15.02	favorable	least
		Yes	78.1		0.41	32.02	unfavorable	most
19	The presence of diseases of the digestive system among close relatives (mother, father, brother, sister)	No	48.4	1.61	0.28	13.55	favorable	least
		Yes	77.9		0.45	35.05	unfavorable	most

To determine the degree of influence of adverse factors on the occurrence and development of diseases of the digestive system, it is necessary to find prognostic coefficients corresponding to the gradation of each factor of a particular subject (X), summarize them and divide them by the sum of the relative risk indicators for the listed gradations of factors ($\sum R$), compare the result on the scale of the risk range and then determine the group of prognosis. Taking into account the great importance of the prognostic coefficient for Pediatrics and gastroenterology, we have developed ready-made threshold values of the prognostic index, characterizing the probability of the risk of digestive diseases in schoolchildren (Table 2).

Table 2: Threshold values of prognostic index characterizing the probability of risk of digestive diseases in schoolchildren

Risk probability	The value of prognostic index	Predict the risk of diseases of the digestive system
Least	12.92-20.36	Favorable
Average	20.37-27.80	Less favourable
Most	27.81-35.25	Unfavorable

Based on the nature of the forecast, the need for dispensary observation, in the development of measures to eliminate the adverse effects of socio-hygienic and biomedical factors in this student is determined. Individual prognosis of digestive diseases in schoolchildren according to the developed matrix is proposed to be used during medical examinations of schoolchildren. To illustrate, which is given an example to determine the degree of risk of digestive diseases among schoolchildren on the basis of calculations of the prognostic index: a boy (33.7), class 9 (28.9), is brought up in a full family (12.5), the level of material security of the family is good (13.7), the number of working family members is two (20.34), the psychological microclimate of the family is favorable (13.7), housing conditions are good (13.6), smokes (31.1), alcohol uses (33.8), there are conflicts with classmates and schoolchildren (32.6), responds to conflict situations - not paying attention or is upset not much and forgets quickly (13.6), eats in school, 1 time (22.41), eats regularly in the dining room (13.9), canteen not attending (33.8), parents allocate money for food at school (33.74). Vitamin and mineral complexes did not take (32.16), in matters of nutrition is partially informed (19.9), food intolerance is not (15.02), the presence of diseases among the next of kin is not (13.55), the risk of digestive diseases in this student is 24.9. The risk of diseases of the digestive system the student is:

$$\sum X / \sum R = (33.7 + 28.9 + 12.5 + 13.7 + 20.3 + 13.7 + 13.6 + 31.1 + 33.8 + 32.6 + 13.6 + 22.4 + 13.9 + 33.8 + 33.74 + 32.16 + 19.9 + 15 + 13.5) / 19 = 22.73.$$

In this case, the forecast is less favorable, because the result is in the range of 20.37-27.80. The proposed method of forecasting allows a fairly simple way to identify persons representing a different degree of risk of diseases of the digestive system. In this final prognostic indicator determines the impact it can have any one or more of the significant components of the coefficients at the other value is unimportant. On this basis, the essence of individual measures and advice will be limited to specific activities aimed at eliminating or reducing the impact of these factors. Thus, the prognostic table and threshold values of the prognostic index developed by us allow to develop a complex of medical and social measures for the organization of prevention of the most common diseases of the digestive system among

schoolchildren, which will allow to conduct targeted prevention, choosing its rational form. This aspect can lead to a sharp decrease in digestive diseases in schoolchildren, improve the condition of patients, obtain a significant medical and economic effect. The study showed that before the beginning of the complex of measures to eliminate (mitigate) adverse factors, no significant differences were found in both groups, the average number of negative factors per surveyed student was the same (respectively - 5.9:5.9; 6.6:6.5; 10.4:10.5). This significantly increases the average number of negative risk factors in the student depending on the forecast of 5.9-10.4 in the control group and 5.9-10.5 in the main group ($P<0.05$) since the prediction during the observation period.

In accordance with the plan of measures to eliminate (weaken) adverse medical and social factors in schoolchildren with digestive diseases, in the main group there was a significant reduction in negative factors. Thus, if after 6 months of observation the number of negative factors in the main group decreased by one surveyed to 4.6, in the control group, where preventive measures were not distributed, this figure was 7.2 per student. After 12 months of follow-up in the main group, the number of adverse factors per student decreased to 3.9, after 18 months was 3.6, after 24 months - 3.5. At the same time, the number of unfavorable factors per one surveyed student in the control group in 12 months was 6.9, in 18 months - 6.8, in 24 months decreased only to 6.7 (**Table 3**).

Table 3: The effectiveness of medical and social prevention of diseases of the digestive system in schoolchildren (the number of adverse factors in the dynamics)

Group of students	Total number of students surveyed	Observation time										The number of exacerbations of diseases of the digestive system in schoolchildren per one examined
		Before the start of observation		After 6 months		After 12 months		After 18 months		After 24 months		
		Total number of factors	One of the surveyed accounts	Total number of factors	One of the surveyed accounts	Total number of factors	One of the surveyed accounts	Total number of factors	One of the surveyed accounts	Total number of factors	One of the surveyed accounts	
Control	78	556	7.1	561	7.2	544	6.9	536	6.8	529	6.7	3.7
Main	97	675	7.0	447	4.6	387	3.9	354	3.6	347	3.5	1.6
Total	175	1231	7.03	1000	5.76	931	5.32	890	5.08	876	5.0	2.7

As can be seen from **Table 1**, in the main group of 675 unfavorable factors (224+273+178) by the end of the follow-up period, 328 risk factors or 48.6% were eliminated (attenuated). In the control group, where these activities were not carried out in schoolchildren, of 556 unfavorable factors (159+231+166) only 27 unfavorable factors were eliminated, i.e. by 4.9 per cent. In the main group, compared with the control group, the number of exacerbations of digestive diseases decreased by 2.3 times ($3.7:1.6=2.3$). At the same time, the average number of negative factors per student in the control group decreased by 1.1 times ($7.1:6.7=1.0$), the main - 2 times ($7.0:3.5=2$) (**Figure 2**).

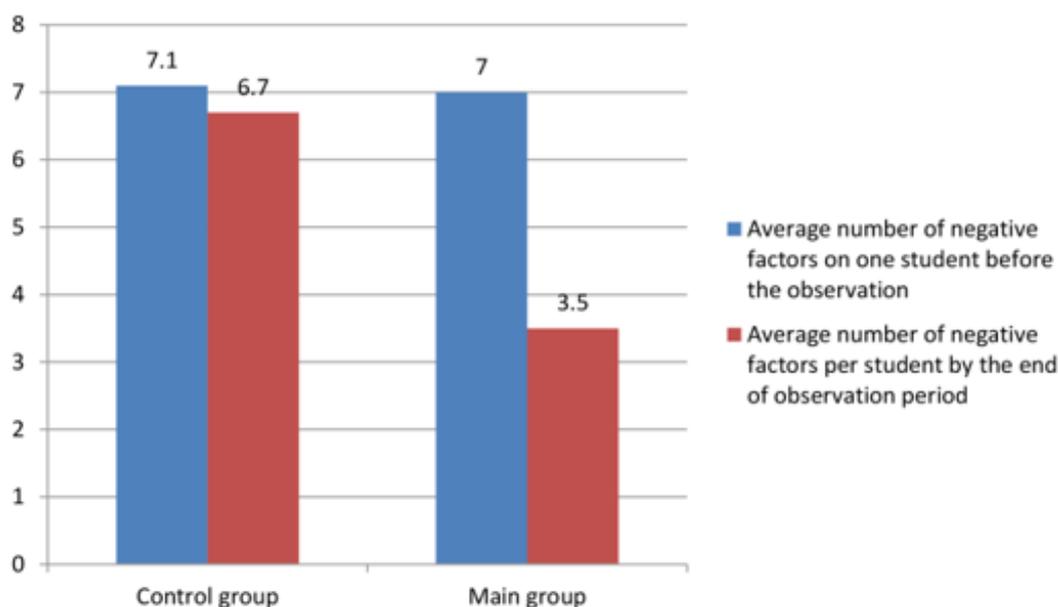


Figure 2: The results of the effectiveness of the prevention of diseases of the digestive system in schoolchildren of Shymkent

CONCLUSION

Thus, the elimination of the influence of negative socio-hygienic, biomedical, behavioral factors and lifestyle in schoolchildren allowed to reduce the number of unfavorable factors by 48.6 %, reduce the exacerbation of diseases of the digestive system by 2.3 times compared with the control group.

Therefore, the measures developed by us for the prevention of diseases of the digestive system in schoolchildren allowed to obtain a significant preventive effect in reducing the frequency of exacerbations of diseases of the digestive system and increase the effectiveness of the school doctor, pediatrician, school for the improvement of students of this school.

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