

## THE PHARMA INNOVATION - JOURNAL

### Development of Chronic Pancreatitis in Children: Risk Factors and Prognosis

I. S. Lembryk<sup>1\*</sup>

1. Department of pediatrics, High State Educational Institution “Ivano-Frankivsk National Medical University” Ukraine.  
[E-mail: [irunka80@ukr.net](mailto:irunka80@ukr.net); Tel: (050)2086350]

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In the article factors of risk which determine prognosis of pancreatitis in children are discussed. 129 children of school age were thoroughly examined by usage of questionnaire. Due to the results of this questioning we divide patients into two groups: main (65 children with dysfunction of Oddi's sphincter, pancreatic type, with the tendency to transformation into chronic form) and comparative (64 children without signs of chronic pancreatitis during a course of therapy). At the step of formalization of medical knowledge we have formed a special document which contained 120 risk factors. We were able to create special mathematical model for prognosis of chronic pancreatitis in children. The factors of risk are as follows: duration of breastfeeding at first year of life (due to anamnesis) – up to 1 month; irregular walks; frequent eating of fast-food; infections in anamnesis (especially chicken pox); lack of proteins and vitamins in mother's diet during pregnancy.

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*Keyword:* Children, Risk Factors, Algorithm, Prognosis.

#### 1. Introduction

Prognosis of clinical course is significantly important for a practitioner because it reveals the tendency to transformation into chronic form, risk of complications or protracted course of pathology<sup>1, 3, 4</sup>. Today each pediatrician needs to know the risk factors for prevention or adequate therapy of possible clinical findings in somatic diseases, particularly in pancreatitis<sup>2, 5</sup>.

**Objectives of investigation.** To determine factors of risk which improve development of chronic pancreatitis in children.

#### 2. Materials and methods of investigation.

For determination of medical, biological, social and economical risk factors we created specialized questionnaire for sick children which

contains 120 questions. They fulfilled it thoroughly and due to the results of this questioning we divide patients into two groups: main (65 children with dysfunction of Oddi's sphincter, pancreatic type, with the tendency to transformation into chronic form) and comparative (64 children without signs of chronic pancreatitis during a course of therapy). For statistical calculation and creation of a mathematical model of prognosis we have used patometric procedure of recognition adopted by E. Gubler *et al.*

It includes the following steps:

1. formalization of medical knowledge,
2. choice of prognostic indexes, value of validity for their difference,

3. calculation of prognostic indexes and value of its informative qualities,
4. reation of prognostic coefficient,
5. optimization of algorithm, creation of resulting algorithm.

At the step of formalization of medical knowledge we have formed a special document which contained 120 risk factors. We also chose a model of data which adequately shows the structure and connection between indexes of the document; we also made a base of indexes for further work. In that base information about 129 children with pancreatitis was included.

Algorithm of prognosis of chronic pancreatitis could be created only on the basis of risk factors after solving such scientific tasks as: prognosis of pathological condition  $A_1$  – high risk of chronic pancreatitis, prognosis of pathological condition  $A_2$  – low risk of chronic pancreatitis.

Due to these two conditions we have formed two groups of children mentioned above: 65 children with high risk of chronic pancreatitis, 64 children with low risk of pancreatitis.

Further examination was performed on computer with usage of specialized computer program for calculation of such indexes. Frequency of each index was also calculated. We also did exact detection of difference between percentages due to Fisher method ( $\varphi$  criterion).

### 3. Results of investigation and its discussion.

Among social factors of risk we admitted prevalence of the following factor: duration of accommodation of a sick child in uncomfortable conditions (11,1% in comparison to 3,2% in healthy one,  $p < 0,05$ ). This is the result of clean

water shortage, poor ecology, and harmful enterprises nearby *et cetra*.

Highly informative for us was such factor like “complicated family anamnesis – presence of tumors of different origin in relatives of the sick child” (48,5% in comparison to 24,2%,  $p < 0,05$ ).

It was proved that for developing of chronic pancreatitis the following factors are important: frequent conflicts between relatives and/or parents (16,5 against 7,8% in healthy ones,  $p < 0,05$ ) – total informative quality of index makes  $I = 60,6$ ; misunderstandings between teachers and pupils (25,8 against 6,3%,  $p < 0,05$ ), total informative quality of index makes  $I = 112,9$ ; misunderstandings between pupils (27,3 against 4,8%,  $p < 0,05$ ), total informative quality of index makes  $I = 262,6$ ; connection of clinical symptoms with a stress situation in family (34,8 against 9,7%,  $p < 0,05$ ), total informative quality of index makes  $I = 87,9$ .

These factors were highly informative among adolescents who need much love and support from relatives or caregivers, who suffer from individual changes in psycho emotional sphere explained by age peculiarities.

Among indexes which characterize social condition in family and presence of harmful habits among relatives the most informative are the following: occupation of father (public servant (34,9 against 18,6%,  $p < 0,05$ )) or unemployed (28,6 against 11,9 %,  $p < 0,05$ ), total informative quality of the index makes  $I = 117,6$ ; father – active smoker (65,1 against 32,8 %,  $p < 0,05$ ), total informative quality of the index makes  $I = 126,2$ .

The most informative risk factors which determine prognosis of pancreatitis are shown in the following table 1.

**Table 1:** Risk factors of development of chronic pancreatitis in children (due to statistic calculations)

Index	Meaning of index	Group of examination		I
		Main	Comparative	
1. Sick family members	0-no	30,3	33,9	116,4
	1-rare illnesses (1-3 times per year)	7,6*	32,3	
	2-frequent illnesses (4 and more times per year)	12,1	9,7	
2. Mutual relations of teacher and child	0-good	37,9*	68,3	112,9
	1-satisfactory	34,8*	22,2	
	2-misunderstandings	25,8*	6,3	

	3- frequent conflicts	1,5	3,2	
3.Mutual relations between pupils	0-kind	31,8*	76,2	262,6
	1-satisfactory	40,9*	12,7	
	2-misunderstandings	27,3*	4,8	
	3- frequent conflicts	0	6,3	
4.Father's social state (occupation)	1-student	0	0	117,6
	2-worker	25,4*	59,3	
	3-farmhand	9,5	8,5	
	4- office manager	1,0	1,7	
	5- unemployed	28,6*	11,9	
5.Father's harmful habits	0- absent	20,6*	55,7	126,2
	1-smokes	65,1*	32,8	
	2-smoker and drunker	4,8	4,9	
	3- is a drug or alcohol abuser	9,5	6,6	
6. Mother's meal during pregnancy	0-the balanced ration	21,5	75,0	273,3
	1-prevalence of carbons in diet	44,6	16,7	
	2-prevalence of fats in diet	30,8	8,3	
	3- prevalence of fats and frequent alcohol intake	3,1	1,0	
7. Presence of proteins in mother's meal during pregnancy	0-not enough	72,1	22,8	232,4
	1-enough	27,9	77,2	
8. Presence of vitamins in mother's meal during pregnancy	1-enough	80,4	26,9	279,8
	0-not enough	19,6	73,1	
9.Duration of breastfeeding at the first year of life (due to anamnesis)	0-up to 1 month	56,3	13,0	406,3
	1-up to 3 months	35,9	29,6	
	2-up to 6 months	7,8	27,8	
	3-up to 1 year	1,0	29,6	
10.Violations of meal during first year of life (due to anamnesis)	0-absent	10,6	53,3	271,4
	1-application of weaning not in time	9,1	6,7	
	2-application of juices not in time	22,7	3,3	
	3- early application of milk products and cereals	42,4	35,0	
	4- early application of formula feeding	10,6	1,7	
11.Infections in anamnesis	0- absent	10,6	55,6	225,7
	1-viral hepatitis	3,0	3,2	
	2-EBV-infection	6,1	3,2	
	3-chicken pox	60,6	27,0	
	4- epidemic parotitis (for boys), rubella (for girls)	7,6	9,5	
12.Walks	0-regular	15,2	76,6	387,9
	1-irregular	80,3	21,9	
	2-absent	4,5	1,6	
13.Schoolboy meal	0-regular	4,5	48,4	290,6
	1-periodically irregular	37,9	25,8	
	2-irregular	57,6	25,8	
14.Frequent eating of fast-food	0-seldom	30,8	83,9	295,5
	1-not less than 1-2 times a week	29,2	9,7	
	2-each day a week	40,0	6,5	

**Table 2:** Differential-prognostic table for prognosis of chronic pancreatitis in children

Index	Meaning of index	Prognostic coefficient	I
1. Duration of breastfeeding at first year of life (due to anamnesis)	0-up to 1 month	3,187	406,3
	1-up to 3 months	0,419	
	2-up to 6 months	-2,755	
	3-up to 1 year	-7,359	
2. Walks	0-regular	-3,518	387,9
	1-irregular	2,824	
	2-absent	2,319	
3. Frequent eating of fast-food	0-seldom	-2,177	295,5
	1-not less than 1-2 times per week	2,400	
	0-regular	3,962	
4. Schoolboy meal	1-periodically irregular	-5,136	290,6
	2-irregular	0,833	
	0-regular	1,743	
5. Presence of proteins in mother's meal during pregnancy	0-not enough	2,375	279,8
	1-enough	-2,857	
6. Presence of vitamins in mother's meal during pregnancy	1-enough	-2,709	273,3
	0-not enough	2,138	
	0-not enough	2,836	
	1-enough	2,441	
7. Violations of meal during the first year of life (due to anamnesis)	0-absent	-3,507	271,4
	1-application of weaning not in time	0,673	
	2-application of juices not in time	4,168	
	3-early application of milk products and cereals	0,418	
	4-early application of formula feeding	4,019	
8. Mutual relations between pupils	0-kind	-1,896	262,6
	1-satisfactory	2,540	
	2-misunderstandings	3,790	
	3-frequent conflicts	-4,014	
9. Diseases of biliary system	0-cholelithiasis	1,003	247,9
	1-chronic hepatitis	0,000	
	2-dysfunctions of Oddi's sphincter	2,280	
	3-chronic cholecystitis	-1,442	
	4-combination of these pathologies	5,519	
10. Frequent eating of fast-food	0-seldom	-1,539	238,5
	1-not less than 1-2 times a week	1,471	
	2-each day a week	6,119	
14. Frequent eating of fast-food	0-seldom	-3,596	225,7
	1-viral hepatitis	-0,101	
	2-EBV-infection	1,404	
	3-chickenpox	1,757	
	4-epidemic parotitis (for boys), rubella (for girls)	-0,497	
15. Presence of anomalies of biliary tract	0-absent	-1,234	179,6
	1-present	3,386	

Notes. PC – prognostic coefficient, I – informative quality of each index.

So, the most informative factors (with total informative quality more than 175 units) are: duration of breastfeeding at first year of life (due

to anamnesis) – up to 1 month; irregular walks; frequent eating of fast-food; infections in anamnesis (especially chicken pox); lack of

proteins and vitamins in mother's diet during pregnancy.

After analysis of indexes for their correlation we have found close direct connection between indexes "presence of vitamins in mother's diet during pregnancy" and "presence of proteins in mother's diet during pregnancy" ( $r = 0,67$ ). That is why we have excluded the last one from our calculation.

Then we created table of prognostic coefficients mentioned earlier (table 2).

We are taking into account empirical thresholds for each index for effective work of algorithm at the level  $a_1 = 11$ ,  $a_2 = -11$  (possibility of mistakes is equal to 0,05).

So we could create the algorithm and test it in 40 school-aged children examined by us thoroughly at the hospital (they were divided into two groups: 20 children with pancreatitis and 20 children – without pancreatitis). Due to prognosis high risk of development of chronic pancreatitis was more characteristic for 22 children (20 children with signs of pancreatitis and 2 –without significant symptoms of the disease). In others we have found low risk of chronic pancreatitis (prognosis was true!). So we made only two mistakes in verification of diagnosis (exact prognosis made 95,0%).

#### 4. Conclusions

Risk factor of chronic pancreatitis are the following: violations in diet of the child during first year of life and in school age, irregular walks, lack of nutrients in meal of mother during pregnancy.

Algorithm created by us could solve two clinical tasks: high risk of chronic pancreatitis and low risk of its development. Application of this algorithm could help in prognosis of clinical course of the disease for adequate therapy and prevention.

#### 5. References

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