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EPIDEMIC AND CLINICAL PARALLELS OF CONGENITAL ANOMALIES OF SMALL INTESTINE IN NEWBORN BABIES

Summary. Maternal exposure to certain pesticides and other chemicals may increase the risk of having a fetus or neonate affected by congenital anomalies. Problems regarding variety of clinical-anatomical variants of malformations, choice of tactic and durations of surgical treatment of partial intestinal obstruction are still unsolved.

The aim of the study – to learn the morphology of the small intestine wall, and determine epidemiologic and morphologic features of congenital obstruction of small intestine in neonates; to develop recommendations on prevention of congenital malformations of small intestine.

Materials and Methods. The study materials were small intestine of the operated newborns with congenital anomalies of small intestines at the Department of Surgery of Neonates of SamMI Clinic No 2. The object of investigation was the complex study of epidemiology and morphology of congenital obstruction of small intestine in newborn babies.

Results and Discussion. Our experimental studies show that the morphology of the small intestine in newborns and experimental animals has identical structural changes. Our research shows that the incidence of congenital malformations of the small intestine has a high degree of correlation ($R^2 = 0.8894$) with the availability of a quality water supply network and the level of pesticide use in the relevant region.

Conclusions. The risk of having children with malformations of the small intestine has a high degree of correlation with the problems of water supply in some regions and the intensity of the use of chemical plant protection products. Solving the problems associated with malformation of the small intestine in newborns should be increasingly transferred to the level of preventive measures.

Key words: newborn babies; small intestine; morphology; atresia; stenosis; pesticide; nerve; diffuse endocrine; immune; nerve apparatus.

INTRODUCTION According to modern imaginations in newborn babies as in the other mammals after birth to replace functional system mother – placenta – fetus supplying continuous antenatal harmonic development of fetus comes the next one – mother – breast milk – child [1]. Due to the data of literature sources for the present time one of the factors polluting environment (biosphere) are pesticides due to avia-chemical and ground processing of the plants. However, their influence to all regulatory structures in the complex manner (nerve, diffuse endocrine and immune), to inductive and integrative relationships of regulatory structures with each other's is still left little studied problem. The influence of extraordinary environmental factors to the formation period of organs and systems in ontogenesis sometimes is the cause of different congenital development anomalies [8, 10]. In connection with it the study of morphology of the internal organs and their regulatory structures in the periods of late prenatal and the early postnatal ontogenesis when morphofunctional differentiation of the organs and systems of the future organism is formed have a big scientific-practical importance [9]. Therefore, the problems of consequent development morphofunctional formation of regulatory structures of internal organs and the influence pesticides to them through mother's organism is not enough studied. Against the background of development of the surgery of congenital malformations of gastrointestinal tract, improvement of neonatology, antenatal ultrasound diagnostic of malformations of development determined for the last decades the survival rates of neonates with congenital obstruction of intestines have been proved [2, 4, 7]. However, problems regarding variety of clinical-anatomical variants of malformations, choice of tactic and durations of surgical treatment of partial intestinal obstruction have been left unsolved [3, 5, 6].

The aim of the study – to learn the morphology of the small intestine wall, to determine epidemiologic and morphologic features of congenital obstruction of small intestine in neonates; develop recommendations on prevention of congenital malformations of small intestine.

MATERIALS AND METHODS The study materials were small intestine of the operated newborn babies with congeni-

tal anomalies of small intestines at the Department of Surgery of Neonates of SamMI Clinic No. 2. The object of investigation was the complex study of epidemiology and morphology of congenital obstruction of the small intestine in newborn babies.

RESULTS AND DISCUSSION We, in experimental studies, have shown that the intake of pesticides with drinking water in the body of pregnant rabbits and, consequently, the intrauterine effect of these chemicals on the developing fetus poses a high risk of congenital malformations, primarily atresia and stenosis of the intestinal tube. The injected pesticide on the pregnant rabbit organism penetrates through the placental barrier and adversely affects the developing fetus and will delay their growth and development. Traces of this effect are reflected in the formation and functional formation of the morphological structures of the small intestine of rabbit offspring, its regulatory, in particular, intramural nervous, diffuse endocrine and immune apparatus during prenatal and early postnatal ontogenesis. In order to extrapolate the results of experimental studies on the negative effects of pesticides on the formation of the gastrointestinal tract of human fetuses in the next stage of the study, we studied the incidence of congenital small intestinal obstruction in newborns in the Samarkand region and in regions with different types of irrigation and drinking water supply. As it is known, the main source of pesticides entering water bodies is the surface runoff of thawed, rain and groundwater from agricultural lands, collector-drainage water discharged from irrigated areas. It is obvious that the level of pesticide intake into the human body is through drinking water.

In order to determine the presence and degree of correlation, the risk of malformations development of the small intestine in newborn babies with security of the region's population with quality drinking water, we studied the incidence rates of this disease in various parts of the Samarkand region. In this case, the areas of the regions were ranked in 3 categories based on the state of security of the population with quality drinking water and agricultural irrigation volume regions. These characteristics of a particular region, have been used by us as the risk assessment criteria of chronic poisoning by pesticides in pregnant women.

We assumed that the lowest risk level of pesticide poisoning exists among the population of Samarkand and Kattakurgan, where a technically sound quality water supply network operates with a satisfactory water cleaning level (1st category). In addition, the level of contamination of soil and water bodies should be relatively low in two districts of the region – Kushrabad and Nurabad regions, where irrigated agricultural lands are predominantly cultivated, and agrotechnical measures in which, as it is known, do not require the use of pesticides (category 2). In these areas, chemicals can be used by the population in limited quantities in private gardens.

The highest risk of negative effects of pesticides is presumably in regions with irrigated farmland with a relatively low level of supply of tap drinking water, where plant protection products against insects and pests are used intensively, and multiple field irrigation contributes to washing away chemicals in water bodies (category 3).

Over the 9-year follow-up period, the number of newborns registered in the neonatal area with an anomaly of development of the small intestine was 171 for 656289 live births (Table 1). Thus, the overall incidence of congenital small intestinal obstruction in the Samarkand region is 1 per 3838 births. As we expected, the risk of developing atresia and stenosis of the small intestine was highest in areas where pesticides in agriculture are actively used, amounting to 1 in 3.519 live births, and in regions with good centralized water supply and low application of agrochemicals, this indicator was noticeably low - 1 / 5683.1 in the cities of Samarkand and Kattakurgan and 1 / 5075.7 in the Kushrabad and Nurabad districts.

Thus, the incidence of congenital malformation of the

small intestine has a high degree of correlation ($R^2 = 0.8894$) with the availability of a quality water supply network and the level of pesticide use in the relevant region (Figure 1).

According to the tasks of the study, we studied the results of the surgical treatment of 171 newborns with congenital small intestinal obstruction hospitalized in SamMI Clinic No. 2 for the period from 2009 to 2017. Of the 171 newborns with congenital small intestinal obstruction hospitalized in the SamMI Clinic No. 2 for the period from 2009 to 2017 there were 107 boys (62.6 %), girls – 64 (37.4 %). In the structure of the causes disease, atresia of various types prevailed, which occurred in 135 (78.9 %) operated infants. Stenosis of the small intestine rarely gave the clinic manifestation of small intestinal obstruction in the early days of the postnatal period, requiring surgical treatment – in our observations, there were 7 (4.1 %) episodes. Somewhat more often 26 (15.2 %) patients) intraoperatively diagnosed intestinal maltreatment as the cause of congenital high intestinal obstruction. Ileus on the gut doubling site was noted only in 3 (1.8 %) newborns. 2/3 of the defects were attributed to abnormalities of the small intestine, the remaining 1/3 were due to ileal gut damage (Table 2).

In recent years, the early diagnosis and timely transfer of newborns with congenital small intestinal obstruction is facilitated by the practice of screening for pregnant women at risk. Since 2007, on the initiative of the rector of SamMI, professor A. M. Shamsiev created a multidisciplinary working group on screening and early detection of developmental abnormalities in the gastrointestinal tract as a part of the leading specialists of the profile departments of the Institute.

Table 1. The birth rate and amount of neonates with malformations of small intestine in the regions of Samarkand region, 2009–2017 years

Region category	Amount of deliveries	Neonates with anomalies of small intestine	Correlation of 1 case of malformation to the general amount of neonates
I	102296	18	1/5683.1
II	50757	10	1/5075.7
III	503236	143	1/3519.1
In general	656289	171	1/3837.9

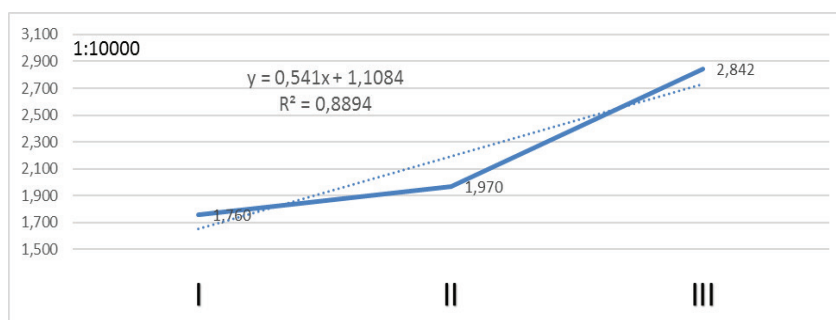


Figure 1. The frequency of the birth of children with small bowel anomalies (1:10,000) with a line and the value of the approximation (R^2)

Table 2. Causes of congenital small intestine obstruction, n=171

Type of malformation	Small intestine		Ileum		In general	
	abs.	%	abs.	%	abs.	%
Atresia	91	53.2	44	25.7	135	78.9
Stenosis	5	2.9	2	1.2	7	4.1
Malrotations	16	9.4	10	5.8	26	15.2
Duplication	1	0.6	2	1.2	3	1.8
In general	113	66.1	58	33.9	171	100.0

During the surgical intervention, the damaged portion of the small intestine was taken from the sick newborns for histological examination.

Histological examination of the operating material shows the hypoplasia of the organ and its wall structures, which should be considered a natural phenomenon, a consequence of the toxic effect of the pesticide on the processes of morpho- and organogenesis, the differentiation of structures, the formation of functional systems of various levels, integration and adaptation. Consequently, pesticides not only affect the function and morphology of organs when in direct contact with it, but they can act on the formation of structural components of internal organs, affecting and through the mother's organism.

Thus, experimental poisoning of rabbits during pregnancy with a pesticide leads to a lag in the development of both the structural components of the jejunum and its regulatory structures in its breed. Characteristic morphological changes in structural components are also observed in the small intestine of newborns with a congenital anomaly of the organ.

CONCLUSIONS Our experimental studies show that the morphology of the small intestine of experimental animals has identical structural changes with the morphology of the small intestine taken during the surgical operation in a newborn baby with a congenital small intestinal anomaly.

Proceeding from the assumption that the main ways of infection of humans, including pregnant women, with pesticides widely used in agriculture are water bodies used by the population and water supply services of settlements

as sources of drinking water, in the next stage of the investigation we studied the incidence of congenital intestinal obstruction in newborns in the Samarkand region in regions with different types of irrigation and drinking water supply. In typing the studied administrative districts of the region, two main factors were taken into account for the degree of risk of exposure to pesticides: 1) the coverage of the population with quality drinking water; 2) the intensity of agrotechnical work and the volume of irrigation of farmland in the region.

Our research shows that the incidence of congenital malformations of the small intestine has a high degree of correlation ($R^2 = 0.8894$) with the availability of a quality water supply network and the level of pesticide use in the relevant region.

In the view of the results of our experimental and subsequent epidemiological studies proving an important role in the occurrence of malformation of the small intestine of drinking water quality, it becomes obvious that the issues related to improving the supply of the population with high-quality drinking water are becoming increasingly important.

It should be noted that over the years of independence, significant work has been done in Uzbekistan to improve the provision of population with quality drinking water.

Thus, the risk of having children with malformations of the small intestine has a high degree of correlation with the problems of water supply in some regions and the intensity of the use of chemical plant protection products. Solving the problems associated with malformation of the small intestine in newborns should be increasingly transferred to the level of preventive measures.

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ЕПІДЕМІОЛОГО-КЛІНІЧНІ ПАРАЛЕЛИ УРОДЖЕНИХ ВАД ТОНКОЇ КИШКИ В НОВОНАРОДЖЕНИХ

Резюме. Вплив певних пестицидів та інших хімічних сполук може збільшити ризик народження немовлят з уродженими аномаліями. Проблеми різноманітних клініко-анатомічних варіантів розвитку мальформацій, вибору тактики та тривалості хірургічного лікування часткової кишкової непрохідності, як наслідку вроджених аномалій, залишаються невирішеними на сьогодні.

Мета дослідження – вивчити структуру стінки тонкої кишки та визначити морфологічні та епідеміологічні критерії її уродженої обструкції у немовлят; розробити рекомендації для попередження розвитку вроджених аномалій тонкої кишки.

Матеріали і методи. Досліджували зразки тонкої кишки прооперованих новонароджених немовлят з уродженими патологіями тонкої кишки, які перебували на лікуванні у відділенні дитячої хірургії СамМІ клініки № 2.

Результати досліджень та їх обговорення. Дані, які ми отримали, показують, що структура тонкої кишки новонароджених дітей та експериментальних тварин мають ідентичні морфологічні зміни. Частота розвитку вроджених мальформацій чітко корелювала із рівнем забруднення водних ресурсів пестицидами у досліджуваних регіонах ($R^2=0,8894$).

Висновки. Ризик розвитку вродженої патології тонкої кишки новонароджених чітко корелює з проблемами водопостачання та високим рівнем забруднення пестицидами водних ресурсів. Таким чином, для ефективного вирішення проблеми та профілактики мальформацій кишки необхідний цілий ряд профілактичних заходів.

Ключові слова: новонароджені; тонка кишка; морфологія; атрезія; стеноз; пестицид; нервова; дифузна ендокринна; імунна системи.

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ЭПИДЕМИОЛОГО-КЛИНИЧЕСКИЕ ПАРАЛЛЕЛИ ВРОЖДЕННЫХ ПОРОКОВ ТОНКОЙ КИШКИ У НОВОРОЖДЕННЫХ

Резюме. Влияние пестицидов и других химических соединений может увеличить риск рождения ребенка с врожденными аномалиями. Проблемы различных клинико-анатомических вариантов развития мальформаций, выбора тактики и продолжительности хирургического лечения частичной кишечной непроходимости, впоследствии врожденной патологии, остаются на сегодняшний день нерешенными.

Цель исследования – изучить структуру тонкой кишки и определить морфологические и эпидемиологические критерии её врожденной обструкции в новорожденных; разработать рекомендации для предотвращения развития врожденных аномалий тонкой кишки.

Материалы и методы. Исследовали образцы тонкой кишки прооперированных новорожденных с врожденной патологией тонкой кишки, которые лечились в отделении детской хирургии СамМІ клиники № 2.

Результаты исследований и их обсуждение. Данные, полученные нами, указывают на то, что морфология тонкой кишки экспериментальных животных имеет идентичные структурные изменения с морфологией тонкой кишки у новорожденных с врожденной тонкокишечной аномалией. Частота развития врожденных мальформаций четко коррелирует с уровнем загрязненности пестицидами водных ресурсов исследуемых регионов ($R^2=0,8894$).

Выводы. Риск развития врожденной патологии тонкой кишки имеет прямую связь с проблемами водных ресурсов и высоким уровнем загрязненности последних пестицидами. Решение проблем, связанных с пороками развития тонкой кишки у новорожденных, необходимо все активнее переносить на плоскость профилактических мер.

Ключевые слова: новорожденный; тонкая кишка; морфология; атрезия; стеноз; пестицид; нервная; диффузная эндокринная; иммунная системы.