

STUDY OF THE FREQUENCY OF THE IRON DEFICIENCY ANEMIA AND HELICOBACTER PYLORI INFECTION AMONG SCHOOL-AGE CHILDREN WITH CHRONIC GASTRODUODENAL PATHOLOGY

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Abstract

The participation of Helicobacter pylori infection in the development of iron deficiency conditions and iron deficiency anemia (IDA) are more characteristic for the pediatric population. Anemia, according to World Health Organization (WHO) estimates, affects about 2 billion people in the world. Approximately 50% of all cases of anemia are iron deficiency anemia. It is the most common nutritional deficiency in both developing and developed countries of the world.

Keywords: Gastroduodenal Pathology, Helicobacter Pylori, Anemia, Children.

Purpose of the Study was a study of the incidence of iron deficiency anemia in school-age children with chronic gastroduodenal pathology.

MATERIALS AND METHODS

A special monitoring chart for the condition of sick children with extragastric manifestations of Helicobacter pylori infection in school-age children has been developed. General clinical examination of patients included medical history, objective examination, and instrumental and laboratory research methods. Consultations of the specialized specialists (allergist, hematologist, endocrinologist, etc.). When collecting a family history, attention is paid to the health status of parents and immediate relatives: the presence of an allergic background, chronic and hereditary diseases, bad habits. Indicators of physical development were assessed according to the standards of growth and development of children recommended by WHO (2006).

RESULTS OF THE RESEARCH

We have analyzed the clinical course in 76 children aged 7 to 17 years with Helicobacter pylori associated gastroduodenal pathology. The control group included 30 children with chronic gastroduodenal pathology not associated with Helicobacter pylori of a similar age.

Table 1: Distribution of children by gender and age

Nosology	Boys n=27	Girls n=49	7-11 years		12-17 years	
			abs	%	abs	%
Chronic gastroduodenitis n= 76	27 (35,5%)	49 (64,5%)	15	19,7	61	80,3

Among those surveyed, the number of children of primary school age was (19.7%) aged 7-11 years, and senior school age (80.3%). The number of girls prevailed by 1.8 times.

Analysis of the clinical manifestations of *Helicobacter pylori* associated gastroduodenal pathology revealed the features of chronic gastroduodenitis. It has been established that with a combined course of diseases, the duration of the history of the manifestation of symptoms of dyspepsia increases with the presence of *Helicobacter pylori* infection.

It is noteworthy that patients with *Helicobacter*-associated chronic gastritis and gastroduodenitis of combined and isolated variants, as well as peptic ulcer disease, presented almost the same complaints - abdominalgia localized in the upper abdomen and epigastrium, belching, heartburn, periodic feeling nausea and bitterness in the mouth, extremely rarely - vomiting. Retrospectively, an ulcer history can be established in 2/3 (72.5%) of patients with peptic ulcer. The features of helicobacteriosis occurring in combination compared with the isolated variant include the many times more frequently recorded symptoms - loss of appetite and a tendency to constipation - 11.6 times in the first group and 5.3 times in the second group, respectively.

In the first group of patients, in 75% of cases, children had symptoms of gastric and intestinal dyspepsia. Frequent involvement of the gallbladder in the pathological process in gastroduodenal pathology, especially duodenal localization, is associated with the anatomical and embryonic unity of the duodenum and gallbladder. This was manifested by various clinical signs: abdominal pain, nausea, heartburn, belching, bitterness in the mouth, bloating, decreased appetite, diarrhea or constipation, which are characteristic of this pathology. Characteristics of pain included: localization; character; duration; prevalence; time of occurrence; dyspeptic disorders accompanying pain; provoking factors; solutions.

The complaints presented could be related to existing diseases of the upper and lower digestive tract and hypomotor type gallbladder dysfunction (in 17% of cases). When analyzing the nature of abdominal pain, it was found that patients in the main group more often complained of prolonged (25.0%; $P < 0.05$), aching (36.14%), dull pain (52.6%; $P < 0.05$). The remaining patients were also found to have cramping, stabbing, cutting pain.

The average age (years) of the observed children was 11.3 ± 0.6 years. In 32 (56.1%) of the examined children with chronic gastroduodenitis associated with *Helicobacter pylori*, early clinical manifestations were often late epigastric pain, white coating of the tongue at the root, its swelling with teeth marks on the lateral surfaces, unpleasant odor from the mouth, pain when palpations in the epigastrium and pyloroduodenal region.

In the clinical picture in children of all comparison groups, dyspeptic symptoms predominated, they were observed in 82.9%, the same number of children presented with complaints of the astheno-vegetative spectrum (headaches, dizziness, weakness, fatigue). All these symptoms,

characteristic of Helicobacteriosis in most patients, first appeared 1-2 months ago in 38 patients, and more than a year ago in the remaining 7 patients.

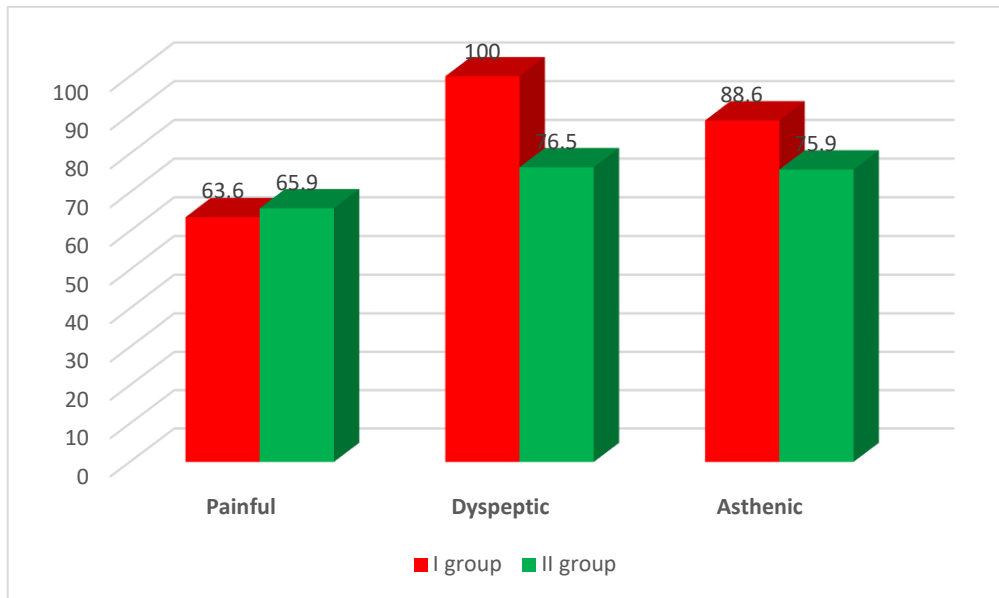


Figure 1: Prevalence of pain, dyspeptic and asthenic symptoms in comparison groups.

69.8% of children from the first group complained of abdominal pain. Thus, the majority of patients in the first group had a combination of pain, dyspeptic and asthenovegetative syndromes. At the same time, in the comparison groups there were certain differences in the prevalence and severity of the listed syndromes. In addition, it should be noted that in I group, abdominal pain was more intense; a quarter of the children in this group indicated that they were bothered by severe pain. Less intense pain is typical for children of the second group. In the majority of patients in I group, the pain was constant (60.9% compared to 52.0% in II group) and mixed pain was noted only in patients of the first group. We also conducted a comparative analysis of dyspeptic symptoms in clinical groups.

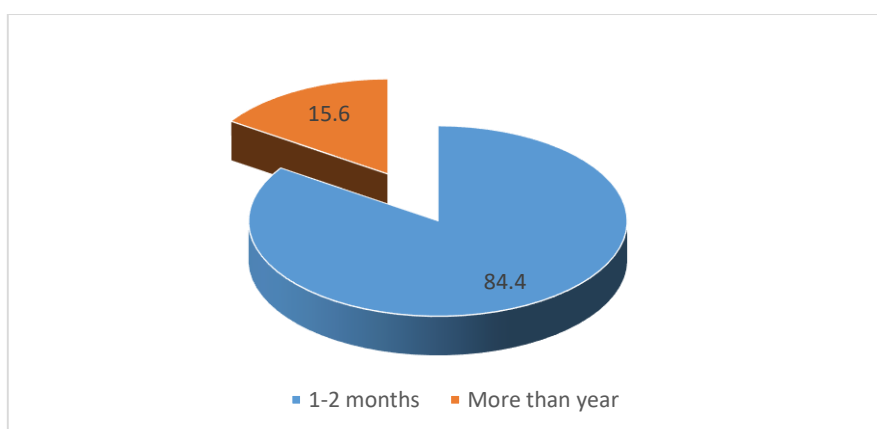


Figure 2: Characteristics of the first group by duration of medical history

When analyzing the nature of abdominal pain, it was found that patients in the main group more often complained of prolonged (25.0%; $P < 0.05$), aching (36.14%), dull pain (52.6%; $P < 0.05$). The remaining patients were also found to have cramping, stabbing, cutting pain. When studying the prevalence of abdominal pain, it was found that in children with CGD they most often radiated to the right scapula (30.1%) and right shoulder (22.8%), while in children of the comparison group - with the same frequency to the right (16.6%) and left scapula (16.7%; $p < 0.01$).

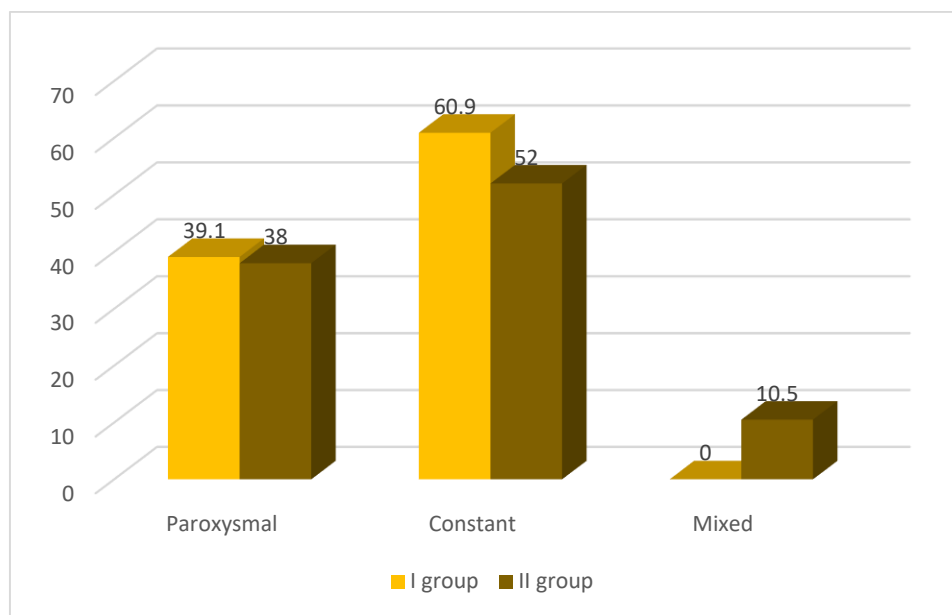


Figure 3: Features of pain syndrome according to the nature of pain in comparison groups

Every third child (36.1%) of the main group noted that abdominal pain was of a girdling nature, which was significantly more common than in the comparison group (26.6%). Attacks of abdominal pain in children of both groups were equally accompanied by symptoms of autonomic dysfunction in the form of increased sweating and anxiety. In children of the I group, abdominal pain was accompanied by dyspeptic disorders of the upper digestive tract in the form of nausea (35.5%), belching (77.6%), heartburn (25%), feelings of bitterness in the mouth (21.1%), which was slightly more common than in children from the comparison group (30.0%; 43.3; 16.7 and 26.7%), respectively).

We also conducted a comparative analysis of dyspeptic symptoms in clinical groups. It was revealed that dyspepsia in children with aggravated allergic background is characterized by epigastric discomfort and belching of air, and nausea and vomiting are less common in this group than in the first group, the differences are significant at $p < 0.05$.

In the group of children with *Helicobacter pylori*, nausea was detected in (35.5%) children, belching in (77.6%), heartburn in (25%), bitterness in the mouth in (21.1%) cases, which was somewhat more common than in children from the comparison group (30.0%; 43.3; 16.7 and

26.7%), respectively. Children of the main group associated the appearance of pain with disturbances in the volume (55.6%) and quality composition of food in the form of abuse of fatty foods (51.1%), which was significantly ($p < 0.001$) more often than in the comparison group (10.0 % and 13.0%) respectively.

Analysis of anamnestic data showed that a history of pregnancy pathology occurred in 39.4% (30 children); the most common complications were preeclampsia and toxicosis of pregnancy. Every fourth child had a history of an unfavorable course of labor: asphyxia, premature birth, or birth by cesarean section. Complications during childbirth were especially common in children of the first group. Delivery by cesarean section was observed in 15 children from this group (19.7%), while in the second group they occurred in 4 (13.6%).

Table 2: Clinical characteristics of abdominal pain syndrome in children with chronic gastroduodenitis depending on the association of Helicobacter pylori

Symptoms	Children with Hp n=76		Children without Hp n=30	
	abs.	%	abs.	%
According to the nature of the pain syndrome				
- Cramping	14	18,4	2	6,7*
- Cutting	5	6,6	1	3,3
- Piercing	11	14,4	2	6,7**
- Dumb	40	52,6	8	26,7*
- Aching	14	18,4	5	16,7
- Long-term pain	19	25,0	2	6,7*
- In the right hypochondrium	14	18,4	2	6,7
By time of pain onset				
- Early pain	20	26,3%	3	10%
- Late pain	25	32,9%	3	10%
- Before meals	23	30,3%	6	20%
- After meal	32	42,1%	8	26,7%
- Hunger pains	22	28,9%	4	13,3%
- After fatty foods	58	76,3%	5	16,7%
By location of pain				
In the umbilical region	44	57,9	8	26,7*
In the epigastric region	56	73,7	6	20*
In the right hypochondrium	32	42,1%	1	3,3*
Pain in the right hypochondrium radiating to the back and right shoulder blade	8	10,5	-	-
Pain in the upper abdomen, which can be paroxysmal or constant aching	52	68,4	15	16,7*

Note: * significance value between the compared groups, where * - $P < 0.05$; ** - $P < 0.01$;

Table 3: Clinical characteristics of dyspeptic syndrome in children with chronic gastroduodenitis depending on the association of Helicobacter pylori

Symptoms	Children with Hp n=76		Children without Hp n=30	
	n	%	n	%
-Bitterness in the mouth	16	21,1	8	26,7
-Vomit:	17	22,4	2	6,7*
-Nature of vomit: with food	9	11,8	1	3,3
With bile	7	9,2	1	3,3
-Vomiting does not bring relief	5	6,6	1	3,3
-Appetite disturbance	51	67,1	11	36,7*
-Nausea	27	35,5	9	30
-Feeling of heaviness in the right hypochondrium	32	42,1%	3	10*
-Flatulence	30	39,5	11	36,6
-Heartburn	19	25	5	16,7*
-Burping	59	77,6	13	43,3*
-Impaired bowel habits: constipation	35	46,1	13	43,3
-unstable	12	15,7	5	16,6
Blistering symptoms				
-Murphy-	9	11,8	1	3,3
-Kera-	7	9,2	2	6,7
-Lepene-	2	2,6	-	-
-Ortner-		-	-	-

Note: * significance value between the compared groups, where * - $P < 0.05$

Premature births also have an unfavorable effect on the development of the microbial landscape, which occurred 2.1 times more often in the group of children of the first group than in the comparison group (9.4%). In this case, apparently, the causes of development could be transient enzyme deficiency, characteristic of prematurely born children, and antibiotic therapy, which is often noted in the history of premature infants. As would be expected, there were features of hereditary burden in the comparison groups.

Heredity for allergic diseases and gastrointestinal diseases was burdened, including in I group in 35.3% and 31.8%, in II group— in 6.6% and 5.2%, ($P < 0.05$), but the total burden (for one or more diseases) turned out to be significantly higher in children of the I group compared to the II group, which is 3 times more often than in the second group. We noted the same trend with regard to food and drug intolerance, which occurred in the anamnesis of three quarters of children from the main group (74.3%), in a third of children from the II group (31.7%).

Table 4: Features of nutrition of sick children depending on the association of *Helicobacter pylori* in the first year of life.

Peculiarities of feeding	1 group (n=76)		2 group (n=30)		P
	abs.	%	abs.	%	
Exclusive breastfeeding up to 6 months	8	10,5	18	60,0	<0,05
Feeding with adapted formulas from birth	25	32,8	2	6,6	<0,05
Feeding with non-adapted formulas from 3 months.	18	36,8	3	10,0	>0,05
Violations of timing of introduction and types of complementary foods	49	64,4	10	33,3	>0,05

Note: P - significance of the difference between the compared groups

Note: * significance value between the compared groups, where * - $P < 0.05$

Table 4 presents the results of an analysis of nutritional characteristics in the first year of life of children with chronic gastroduodenitis, depending on the association of *Helicobacter pylori*. Nutrition is very important for the health, growth and development of a child at any age. An important aspect in the development of a child is the nature of feeding. It is well known that breastfeeding not only has a positive effect on the physical, neuropsychic development of the child, but also, as research shows, reduces the risk of diseases in adulthood. We assessed the delayed influence of infant feeding patterns on the development of *Helicobacter pylori* in children. For this purpose, the duration of breastfeeding, timing of introduction, types of complementary foods, feeding with non-adapted formulas and cow's milk were analyzed. It turned out that the absence of breastfeeding or its short duration was more common among children with *Helicobacter pylori* ($P < 0.05$). It was revealed that in the group of children with *Helicobacter pylori*, violations of the regime and timing of introduction of complementary foods were observed more often than in the control group.

A history of exclusive breastfeeding up to 6 months was detected in 17.7% of the I group and 60.0% of children in the control group. Feeding defects in the form of early and inconsistent introduction of complementary foods, the use of foods in the diet that do not meet the physiological needs of the child's body were identified in children with detected *Helicobacter pylori*, which is almost 2 times more often than in the control group ($P < 0.05$). The same high percentage (33.3%) was made up of children from the main group who were bottle-fed with unadapted milk formulas and undiluted cow's milk, while adapted formulas were used to feed only 2 children. In 40% of children, feeding with non-adapted formulas from 3 months was observed in the main group of children ($P < 0.05$).

A typical mistake was the early (at 3-4 months) introduction of cereal complementary foods, which did not meet the baby's needs, excess food volume, and abuse of carbohydrate foods (juices, cookies, bread, potatoes) in the 2nd half of life.

Hereditary burden of anemia was also found more often in the first observation group. According to our data, in a general blood test in children with CGD with *Helicobacter pylori*, there is a significant increase in the number of eosinophils, as well as a decrease in hemoglobin levels. Individual analysis showed that in the group of children of the first group, eosinophilia

occurred in every third child. In this regard, we conducted a study on parasitosis (giardiasis and helminthic infestations, coprologically and by determining the level of ELISA in the blood serum and Ig E). It was revealed that parasitosis aggravated the course of helicobacteriosis in more than a third of cases - 31 children (40.7%), which is 2.2 times higher than in the second group, where such children were 15.9%. In the structure of parasitoses, according to our data, giardiasis and enterobiasis predominated, which accounted for up to 90% of all identified cases of invasion.

Pronounced endoscopic changes were noted in the vast majority of patients in the I group. The inflammatory process was diagnosed in 70 (92.1%). In 6 children of the II group, no pathological changes were recorded during endoscopy. The leading form of lesions in the I group were superficial lesions, when the only endoscopic criterion of inflammation was hyperemia, focal or diffuse (erythema), while the diagnosis of "superficial gastritis" appeared in the conclusions. In 31.8%, along with hyperemia, there was swelling of the gastric mucosa, which was considered as a sign of severe gastritis; in 7, erosions and/or hemorrhages were found.

Hyperemia of the lower third of the esophagus, which we regarded as a sign of reflux esophagitis, was present in every fifth person examined (20.7%). The most common type of movement disorders detected during endoscopy was duodenogastric reflux (DGR) - 38.7% of children; gastroesophageal reflux (GER) was found in 15 patients (10.4%). Motor disorders were found in 32.4% in group I and in 13.1% in group II.

As a result of an endoscopic study of the upper parts of the digestive tract, it was found that for a group of children with Helicobacter gastritis, characteristic changes in the mucous membrane of the gastroduodenal zone are changes of the type of gastroduodenitis. At the same time, patients with non-Helicobacter gastritis are characterized by changes such as isolated gastritis, noted in 30% of children, and gastroduodenitis, characteristic of 70% of patients. This is consistent with clinical data on the predominance of "late" and "night" pain in patients of the first group

Concomitant lesions of the esophagus are detected with high frequency - in more than half of the patients in each group. At the same time, erosive esophagitis is almost twice as common in the group of patients with non-Helicobacter gastritis. This also, to some extent, correlates with clinical data on the prevalence of dyspeptic complaints in patients in this group.

Table 5: Scatological indicators of patients depending on the Helicobacter pylori association in %

Signs	ChGD with Hp n=76		ChGD without Hp n=30	
Feces for hidden bleeding	11	14,4	1	1,3*
Creatorea	19	25,0	2	2,6*
Amilorrhea	53	69,7	5	6,5*
Steatorrhea	34	44,7	5	6,5*

Note: * significance value between the compared groups, where * - $P < 0.05$

All children in the main and control groups underwent scatology analysis. A distinctive point in the group of patients of the I group was the prevalence of the number of children with amilorrhea - 53 (69.7%) versus the II group of patients - 5 (16.7%), respectively. Steatorrhea of the first type with the appearance of neutral fat in the feces, which indicated pancreatic insufficiency, was detected in 34 (44.7%) patients in the first group, and 5 (16.7%) in the control group, respectively. Bile acids and soaps in feces, i.e. steatorrhea of the second type, which indicated insufficient flow of bile into the small intestine, i.e. for bile stagnation, we detected in 34 (44.7%) and 31 (40.8%), against the control group indicators of 5 (16.7%) and 4 (13.3%), respectively.

CONCLUSIONS

Thus, with *Helicobacter pylori* associated gastroduodenal pathology in children, most children have more pronounced clinical symptoms. An increase in the severity of *Helicobacter pylori* infection is accompanied by longer lasting abdominal symptoms. Heredity for allergic diseases and anemia was more often burdened in the first group of patients, which may have contributed to the formation of extragastric manifestations of *Helicobacter pylori* associated gastroduodenal pathology in children.

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