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The Role Of Helicobacter Pylori Infection In The Development Of Irron Deficiency Anemia In Chronic Gastroduodenitis In Children

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ABSTRACT

Objectives. Of particular importance is the involvement of Helicobacter pylori (Hp) infection in the occurrence of iron deficiency states and anemias, which are most often observed in children. For this purpose, we conducted a study of the general analysis of peripheral capillary blood of patients. Studies have shown that a persistent decrease in hematological parameters of peripheral blood in patients with Chronic gastroduodenitis (CGD) depending on the association of Hp. The degree of anemia in children is classified according to the WHO classification, April 20, 2020. In the first group, iron deficiency anemia of varying degrees was detected in 39 (42.8%) girls and 37 (40.6%) boys.

KEYWORDS: Helicobacter pylori. children, iron deficiency anemia, ferrokinetics.

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INTRODUCTION

The end of the 19th and 20th centuries were marked by a breakthrough in understanding the etiology, pathogenesis, diagnosis and treatment of diseases of the upper gastrointestinal tract (UGT), which is associated with the discovery Hp. This discovery is considered a turning point in the history of gastroenterology. It defined a new direction of scientific research and changed approaches to the treatment of gastrointestinal tract (GIT) diseases in adults and children for many years.

Today, it is well known that Hp infection is the cause of chronic gastritis in most patients and plays an important role in the development of peptic ulcer disease and neoplasms in the stomach [4; pp. 21-32, 5; pp. 143-150, 9; pp. 899-905, 13; pp. 681-685]. Epidemiological studies in various countries have shown that the overall global prevalence of Hp in adults is estimated at more than 50%, depending on the geographic location and economic development. South and Central America, the African continent, and West Asia have the highest prevalence rates (70–90%). On the contrary, Western Europe and North America have the lowest prevalence rates – from 34.3 to 37.1% [2; pp. 53-54, 6; p.19-25]. According to world statistics, associations of Hp with chronic gastritis, and gastric ulcer, duodenal ulcer in adults are detected in almost 100% of cases, non-ulcer dyspepsia within 30-90% [7; p.176-178, 8; p.991-1003].

In the pediatric population, the prevalence of Hp infection in gastrointestinal pathologies was established at more than 50% in the 7-11-year-old population, and at 80% in high school students [10; pp. 1233-1243, 11; p. 701-723]. In cases of duodenal ulcer diseases, it was within 96-100%, erosive lesions of the gastric mucosa (GL) and duodenal ulcer (DLD) - 58-85%, gastritis/gastroduodenitis without destructive changes - 43-74% [12; pp. 125-129]. Among the population of children of the Russian Federation, the epidemiology of Hp reaches 60-70% of cases. These statistics are given in the study of N.I. Ursova (2000), focusing on infection in early childhood. In 10-year- old children, the incidence of Hp reaches 33.3%, increasing to 56.3% by the age of 17. Such a percentage range depends on the diagnostic test used. In this regard, the problem of early diagnosis and the effectiveness of appropriate treatment of UOT in children is a major issue in both medical and social terms. Detection of Hp infection in children with dyspeptic symptoms and the development of effective treatment regimens is becoming a key issue in modern gastroenterology, especially in outpatient settings [1; pp.15-22].

MATERIAL AND METHODS

The degree of anemia did not depend on the sex of the children: the 1st degree of anemia was established in 23 (38.3%), in boys 22 (36.6%), respectively. The 2nd degree was established in 16 (51.6%) girls and 15 (48.5%) boys of Hp-associated CGD. In the control group of patients, 7 (46.6%) girls and 8 (53.3%) boys did not show symptoms of anemia. The rest showed clinical and laboratory signs of mild iron deficiency anemia.

In the Hp-positive group, anemia was higher than in the control group, which indicates a correlation between the underlying disease and hematological disorders in children with HP-associated CHD. Erythrocyte indicators indicate processes related to iron metabolism disorders.

Consequently, the mean corpuscular volume, mean corpuscular hemoglobin content and concentration in erythrocytes of patients with Hp infection have reduced erythrocyte-infected characteristics compared to individuals without the infection.

Mercantilles HCh, or Mean Corpuscular Hemoglobin Concentration, is the average concentration of hemoglobin in an erythrocyte, which determines the degree of hydration and vascularization of erythrocytes. Our study has shown that absolute hypochromia of erythrocytes is indicated by a drop in the MSHC index below 30%, as evidenced by the MSHC index below 30%. At the same time, children with chronic gastritis without Hp had an MSHC index slightly higher than with chronic gastritis with Hp. It should be noted that a decrease in MSG leads to macrocytic and megalocytic forms of anemia. In this case, an unproportionally high increase in the volume of erythrocytes is observed with an increase in their saturation with hemoglobin. (Table 1.).

Table 1. Characteristics of hematological parameters of peripheral blood of patients with chronic gastroduodenitis depending on the association of Helicobacter pylori

Blood counts	Group I, (n=76)	Group II, (n=30)
Hemoglobin, g/l	93,0±2,72	118,9±4,86***
erythrocytes, x1012/l	3,0±0,123	3,7±0,20**
Color indicator	1,0±0,029	0,85±0,05**
Leukocytes x109/l	6,0±2,739	5,63±1,5
Nuclear neutrophils,%	3,0±2,341	3,03 ±1,7
Segment-nuclear, %	50,0±6,568	50,3±10,19
MSN, pg	25,1±0,71*	28,6±0,69**
MSNS, %	29,8±1,16*	33,8±2,04**
Eosinophils,%	2,0±1,359	2,03±0,77
Lymphocytes,%	41,0±7,606	40,9±10,3
Monocytes,%	5,0±4,493	4,3±1,98
Platelets	393,0±10,60	155,7±141,8
ESR	6,0 ±5,822	6,37±4,58

Note: *P<0.05; **P<0.01; ***P<0.001; reliability of differences compared to the control group.

Depending on the presence of a relationship between Hg and CGD, the hemoglobin level was found to be lower in the main group compared to the comparison group (P<0.01) an integral part of the study of iron metabolism in the blood is the analysis of the results of the content of serum iron, ferritin and transferrin, TIBC. Analysis of the relationship between iron deficiency anemia and Hp infection found that serum iron was significantly lower in the group of Hp-positive children than in the comparison group (9.5 mmol / l versus 22.05 ± 0.79 mmol / l, with normative data of 23.05 ± 0.89 mmol / l, (P <0.01).

In children with chronic hepatitis D with Hp, we noted a persistent decrease in the ferritin level. In particular, in this group, the ferritin level was reduced to 30.01±6.86 ng/ml compared with the comparison group of 54.9±0.69 ng/ml, with the norm being 56.26±13.61 ng/ml (P <0.01). A strong correlation was found between Hp and serum transferrin in the Hp -positive group (r = 0.855, P <0.001) .

The relationship between the total iron content in the child's body and the proportional ferritin concentration in the blood serum is the state of iron reserves, which we investigated for transferrin.

The function of transferrin is to deliver iron absorbed in the intestines to the liver and spleen, to reticulocytes and their precursors in the bone marrow. Transferrin was elevated to 319,0±18,55 mg/dl in the first group compared to 244,05±15,85 mg/dl in the second comparison group (P<0,01), with indicators of 254,05±15,85 mg/dl in healthy children. Transferrin is synthesized in the liver and is determined by iron reserves in the body.

Transferrin binds to 2 iron atoms (Fe3+ ion and 1 g transferrin), which is approximately 1.25 mg of iron per atom. For this, the amount of iron associated with serum transferrin is calculated, which is close to the value of the total serum iron-binding capacity (TIBS). In the first group of children with TIBS, it increased by 77.3±1.12 mmol/l, in the comparison group by 71.7±0.89 mmol/l and 72.59±2.38 mmol/l (P<0.05), which indicates the degree of serum fasting and iron saturation with transferrin.

59 (77.6%) had pale skin and sclera, 16 (21.1%) complained of increased weakness and fatigue, headache was noted by 17 (22.4%), 19 (11.8%) patients - tinnitus, "flies" before the eyes were noted by 17 (22.3%), 15 (19.7%) patients had rapid heartbeat (tachycardia), 27 (35.5%) were diagnosed with systolic murmur at the apex of the heart during auscultation (anemic murmur) . In addition to the listed symptoms, certain signs of tissue iron deficiency may be observed in the form of: glossitis, which was diagnosed in 19 (25%) patients, angular stomatitis - in 7 (9.2%); esophagitis - in 7 (9.2%); "koilonychia" - (spoon-shaped nails) - in 5 (6.6%), perversion of appetite and taste - in 12 (15.7%) and 7 (9.2%) patients, respectively.

Thus, we found a significant association between iron deficiency anemia and Hp infection. Our results partially pave the way for the most important recommendations for preventing iron deficiency anemia in Hp-infected people, especially in the younger generation.

As an example, we present several clinical observations of patients with chronic gastritis associated with Hp.

Clinical case 1
Extract from medical history No. 2255 Patient O.M. 20.07.2009 born Admitted to the gastroenterology department of the Republican Scientific and Practical Medical Center of the Ministry of Health of the Republic of Uzbekistan on 02/27/2022.

Diagnosis: Chronic gastroduodenitis, associated with Hp, period of exacerbation (K.29.9) Concomitant: Anemia 1 st.Anamnesis: according to the patient, he has been ill for a week, the disease began with pain in the epigastric zone, unpleasant sensations in the right hypochondrium. He was treated on an outpatient basis, but since there was no effect, he was hospitalized for examination and treatment in the gastroenterology department. A month ago, the patient had a high temperature for 5 days, due to which he received intramuscular ceftriaxone. Several times a year he suffered from acute respiratory infections, often uses antibiotics without indications and as prescribed by a doctor. Heredity is burdened with gallstone disease.

Complaints on admission: epigastric pain, heaviness in the right hypochondrium, nausea, bitterness in the mouth, decreased appetite, constipation, restless sleep. Objectively: General condition of moderate severity. Severity of the condition is associated with symptoms of general intoxication. Consciousness is clear. The child is of normal build. Skin and visible mucous membranes are clean, pale. The musculoskeletal system is developed satisfactorily. Nasal breathing is free.

Vesicular breathing is heard over the lungs during auscultation. Heart sounds are muffled. Tongue is pale pink, moist, coated. Abdomen is soft, pain in the epigastrium and right hypochondrium is felt on palpation. Liver is not enlarged. Pasternatsky's symptom is negative on both sides. Stool is 1 time per day, passage is difficult.

Urination is regular.
Weight – 50 kg; height – 156 cm, MRI – 16.6.

Laboratory data: **Complete blood count:** Hb - 98 g/l; erythrocytes - 2.9; cirrhosis - 0.8; leucoproteins - 9.0; s/y - 64; eosinophils - 2; lymphocytes - 29; monocytes - 3; ESR - 5 mm/s.

Blood biochemistry tests: ALT-30 mmol/l, AST-28 mmol/l; Total protein - 59 g/l; total bilirubin - 16.6 mmol/l, bound bilirubin - 4.0 mmol/l; free bilirubin - 12.6 mmol/l; ALP – 525 U/l; amylase - 297 U/l; glucose - 4.2, HbsAg - neg.

General analysis of feces: color brown, neutral fat +, soaps +, starch +, Iodophilic flora + leukocytes - 5-6/1, fungi +.
Antibodies to Ig G r Hp (+) **Ultrasound -** The liver is unchanged. The anteroposterior size of the right lobe is 13 cm, the left lobe of the liver is 7.9 cm. The liver parenchyma has moderately increased echogenicity and an uneven structure. The intra- and extrahepatic bile ducts are not dilated. The diameter of the portal vein is 0.9 cm. The pancreas has the following dimensions: head - 2.5 cm, body - 1.3 cm, tail - 2.4 cm. The contours of the organ are smooth and clear. The structure of the parenchyma is heterogeneous.

The Wirsung duct is not dilated. The gallbladder is located in a typical position, size - 61x330 mm, bend in the neck area.

EGD - Focal antrum gastritis. Catarrhal duodenitis. Catarrhal esophagitis, moderate cardiac ring insufficiency.
Conclusion: Helicobacter pylori, the patient is recommended to have 5-6 meals a day, which normalizes the pressure in the duodenum and helps regular emptying of the gallbladder. Recommended treatment according to the standard of management of patients with chronic hepatitis with Hp and correction of anemia after eradication of Hp. With this therapy for 3 months, Hp was

eliminated.

Clinical case 2

Extract from medical history No. 2302 Patient Sh.A. born 02/25/2012 Admitted to the gastroenterology department of the Republican Scientific and Practical Medical Center of the Ministry of Health of the Republic of Uzbekistan on March 12, 2022.

Diagnosis: Chronic gastroduodenitis, with Hp- associated period of exacerbation (K.29.9) Associated: Food allergy. Chronic cholecystitis. Biliary sludge.

It is known from the anamnesis that the child has been ill since the age of 5.
The disease began with abdominal pain. After outpatient treatment, the condition did not improve. Did not follow the regimen and diet. Recently, he has noted weight loss.

Past illnesses: ARI 2-3 times a year. Heredity is burdened with peptic ulcer of the duodenum.

Complaints upon admission included pain in the epigastrium and right hypochondrium, nausea, vomiting, loss of appetite, constipation, restless sleep, and irritability.

Objectively: General condition is moderate due to symptoms of general intoxication. The child is conscious. The child has normal build. Skin and visible mucous membranes are clean and pale. The musculoskeletal system is developed satisfactorily. Nasal breathing is free. Vesicular breathing is heard over the lungs during auscultation. Heart sounds are muffled. The tongue is pale pink, moist, coated. The abdomen is soft, there is pain in the epigastrium and right hypochondrium. The liver is not enlarged. Murphy's symptom is positive.

Pasternatsky's symptom is negative on both sides. Weight - 46 kg; height - 151 cm MRI-20.2.

Laboratory data: **Complete blood count:** Hb - 94 g/l; er - 3.0; CP - 0.8; leu - 7.0; s/y - 49; p/y - 3; eos - 2; lym - 39; mon - 6; ESR - 5 mm/s **Blood biochemistry tests:** ALT-28 mmol/l, AST-27 mmol/l; total protein - 69 g/l; total bilirubin - 13.7 mmol/l; bound bilirubin - 3.0 mmol/l, free bilirubin - 10.7 mmol/l; alkaline phosphatase - 510 U/l; amylase -129 U/l.

HbsA g - neg. Antiela to Ig G r Hp (+). Total immunogloyulin E - 189 U/ml.
General analysis of feces: color brown, muscle fibers per.+, neutral fat+, plant fiber++, starch+, iodine flora+, crystals +.

Ultrasound - the liver is not enlarged. The liver has a heterogeneous parenchyma with unevenly increased echogenicity and the presence of segments of higher echogenicity. The intra- and extrahepatic bile ducts are not dilated. The diameter of the portal vein is 1.0 cm. The pancreas is as follows: head - 2.8 cm, body - 1.9 cm, tail - 2.2 cm. The contours are unclear, and the structure of the parenchyma is heterogeneous with increased echogenicity. The Wirsung duct is not dilated. The gallbladder has a typical location, measuring 6.2 by 2.7 cm. Deformed due to a kink in the body. The contours are clear, the wall thickness is 0.3 cm, contains linear hyperechoic inclusions. The gallbladder contents are non-homogeneous: there is a slightly mobile level of putty-like (echo-positive) bile in the lumen, but there are no signs of stones. Conclusion: Helicobacter pylori, the patient is recommended to have 5-6 times a day hypoallergenic meals, which normalizes the pressure in the duodenum and helps regular emptying of the gallbladder. Standard anti- Helicobacter therapy is recommended, taking ursodeoxycholic acid 15 mg per 1 kg of weight per day, once, after dinner. With this therapy for 3 months, Hp was eliminated.

Clinical case 3

Extract from medical history No. 2315 Patient K.M. born on September 21, 2011. Admitted to the gastroentrology department of the Republican Scientific and Practical Medical Center of the Ministry of Health of the Republic of Uzbekistan on April 1, 2022.

Diagnosis: Chronic gastroduodenitis, exacerbation period (K.29.9) Associated: Dysfunction of the biliary tract. Biliary sludge.

History: according to the patient, there have been abdominal pains for the last month, he was consulted by a surgeon who ruled out a surgical disease. He took No- Spa as an outpatient, but his condition did not improve, and the patient came to our department.

Complaints upon admission: loss of appetite, nausea, abdominal pain not associated with food intake, constipation.

Objectively: General condition is of moderate severity. The severity of the condition is associated with symptoms of general intoxication. Consciousness is clear. The child has normal build. Skin and visible mucous membranes are clean and pale. The musculoskeletal system is developed satisfactorily. Nasal breathing is free.

Vesicular breathing is heard over the lungs during auscultation. Heart sounds are muffled. The tongue is pale pink, moist, and coated. The oral cavity is clean; the tongue is coated. The abdomen is soft, there is pain in the epigastrium and periumbilical region. The liver is not enlarged. Stool is 1 time in 2-3 days, passage is difficult. Urination is regular. Weight - 24.5 kg; height - 130 cm, MRI - 1SD (14.4).

Laboratory data: **Complete blood count:** Hb - 114 g/l; er - 4.0; CP - 0.8; leu - 5.8; s/y - 50; p/y - 3; eos - 2; lym - 40; mon - 5;

ESR - 5 mm/s **Blood biochemistry tests:** ALT - 24, AST - 31; total protein - 69; total bilirubin - 14.6; conjugated bilirubin - 3.0, free bilirubin - 11.6; alkaline phosphatase - 519 U/l; amylase - 130 U/l, **HbsAg** - negative, antibodies to IgG to Hp - (+) - 1.1 U/ml positive.

General analysis of feces: brown color, neutral fat+, vegetable fiber ++, starch+, iodine flora+, mucus +. **Ultrasound:** the liver is not enlarged. The anteroposterior size of the right lobe is 12 cm, the left lobe is 4.2 cm.

The liver parenchyma has a slightly increased echogenicity and a uniform structure. The bile ducts inside and outside the liver have no dilations. The diameter of the portal vein is 0.9 cm. The pancreas has the following dimensions: head - 2.0 cm, body - 0.9 cm, tail - 1.8 cm. The liver contours are smooth and clear. The parenchyma has a moderately heterogeneous structure due to the presence of small hyperechoic inclusions. The Wirsung duct has no dilations.

The shape of the gallbladder is deformed, there is a pronounced bend in the neck and body. Dimensions 48x14 mm. The walls are thickened, hyperechoic, wall thickness 2.5 mm. The contents are stagnant, hyperechoic, there are no stones.

EGDS – Subatrophic gastroduodenitis. Distal esophagitis.
The patient was recommended a diet with frequent meals (5-6 meals a day), which helps normalize pressure in the duodenum, regulate emptying of the gallbladder.

Against the background of antihelicobacter therapy, as well as taking ursodeoxycholic acid at a daily dose of 15 mg per 1 kg of body weight with a single dose one hour after dinner. Against the background of the therapy conducted for 3 months, H pi was eliminated.

CONCLUSION

Thus, the frequency and severity of the numerous symptoms of Helicobacter infection that we identified, taking into account the comorbidity index in chronic hepatitis D associated with Hp, suggests that Helicobacter pylori infection acts as a kind of trigger in the occurrence and development of gastrointestinal and extraintestinal diseases, which must be taken into account when treating these children, which requires additional research taking into account the choice of corrective therapy.

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