Clinical and anamnestic features of the dynamics and transformation of iron-deficiency anemia in adolescent girls

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Abstract. According to the World Health Organization, in any population, for every person suffering from IDA, there are three with iron deficiency (ID). The risk group for the anemia development includes children, women of reproductive age and the elderly. A special group among them are girls of pubertal age, who have a high potential for the formation of various organ dysfunctions. The purpose of this work was to study the clinical and anamnestic features of the dynamics and transformation of iron deficiency anemia in adolescent girls. Object and methods of the study: adolescent girls aged 12-14 years (n=177) of the Uzbek population, respectively, with LID (45), mild IDA (56) and moderate IDA (25), and the control group (51). For the study, whole blood and serum of adolescent girls with IDA were used. General clinical, instrumental, biochemical and statistical methods were used. From the data of our material, it follows that the clinical picture of IDA in schoolgirls was somewhat transformed and among them the syndrome of decreased immunological resistance of the body and gastrointestinal syndrome began to prevail, their frequency increased by more than 2-5 times compared to the above authors. The clinical picture of iron deficiency anemia in adolescent girls is characterized by polymorphism of symptoms and syndromes, which indicates the involvement of many organs and systems in the pathological process. We've concluded that it is necessary to update data on the ID clinical symptoms in adolescent girls, depending on age, gender and regions of residence.

1 Introduction

The somatic health usefulness of puberty children is associated with the formation of reproductive functions, fertility, childbearing prognosis and the health level of future offspring, which determine the state potential and country development of the future. In recent decades, there has been no tendency to reduce the incidence of iron deficiency anemia (IDA), and the problem remains acute in health services in many regions of the world [1, 2, 3, 4, 5, 6, 7]. According to the World Health Organization, in any population, for every person suffering from IDA, there are three ones with iron deficiency (ID). The risk group for the anemia development includes children, women of reproductive age and the elderly. A special group among them are girls of puberty, who have a high potential for the formation of various

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organ dysfunctions. Today, iron deficiency is the most common nutritional problem in the world, showing its impact on the health of the population, affects the mental potential of the nation, the intelligence and physical development of children, reproductive and somatic health. Interest in the study of iron deficiency states is increasing since a violation of iron metabolism in the early development stages can serve as an indicator of the child's health state and a criterion for the timely diagnosis of the deviation development in the process of children growth and development.

IDA clinical features in children of different ages have been studied and described in detail by many researchers [1, 4, 5]. However, as the analysis of modern literary sources shows [10, 11, 12, 13, 14, 23], the IDA clinical course in children depends on many factors - age, gender, family history of anemia, region of residence, degree and stage of iron deficiency, and many others, which requires periodic updating of information on this issue. Judging by the literature data, IDA clinical and anamnestic features in adolescent girls have not been studied enough. Given the vulnerability of this period to the IDA development, due to the discrepancy between iron stores in the body, its intake, on the one hand, and iron intake, on the other [12, 13, 14, 15, 16], then the importance of studying this issue becomes obvious.

As is known, IDA in adolescent girls for a long period was called juvenile chlorosis due to the pronounced pallor of the skin with a greenish tinge [1, 2, 3, 4]. However, later it turned out that the IDA clinic in children, as in adults, is multifaceted and includes multiple syndromes or symptom complexes [16, 17].

When describing the clinical presentation of IDA in children, researchers distinguish sideropenic, anemic hypoxia, and metabolic intoxication syndrome [13, 14].

Considering the lability of the autonomic vegetative nervous system and cardiovascular system indicators, as well as the high gastrointestinal tract damage in schoolchildren due to frequent eating disorders, we consider the last variant of the syndromic approach to describe the IDA clinic in adolescent girls to be the most acceptable. At the same time, one should note that the sensitivity and specificity of these syndromes in the IDA diagnosis in children have not been finally established, because some of their symptoms are also found among healthy children. The relevance of this problem is determined not only by its wide distribution, but also in connection with the development of polysystemic disorders in it, dystrophy of internal organs, which is highly associated with low physical and mental capacity of adults and children.

The variety of anemia, the ease of their occurrence and the severity of the course among high-risk groups, which include children of adolescence, makes it necessary to periodically update data on the study of the frequency and patterns of development of IDA, depending on geographical, social and living conditions, age and sex, the rate of physical and sexual development of adolescent children.

The purpose of this work was to study the clinical and anamnestic features of the dynamics and transformation of iron deficiency anemia in adolescent girls.

Object and methods of research. To detect iron deficiency among schoolchildren, we used the method of randomization. The starting material for determining the number of schoolchildren in the city of Andijan was the list (alphabetical) of students aged 7–14 years (12,000). From this number of students, 1,200 children aged 7–14 years were selected using the Bradford table (10% sample). 930 children aged 7–10 years were examined, which accounted for 77.5% of the selected sample of schoolchildren (1200). For prospective long-term follow-up and preventive ID therapy, 177 girls aged 12–14 years were selected, respectively, with LID (45), mild IDA (56), and moderate IDA (25). The control group of schoolgirls consisted of 51 girls of the same age who did not have clinical and laboratory signs of iron deficiency.

The main criteria for assessing the diagnosis of IDA in schoolchildren were low levels of serum iron (≤18 μmol/l), high total (TIBC, ≥60 μmol/l) and latent (LIBC, ≥40 μmol/l) iron-

binding capacity of blood serum, low coefficient of saturation of iron in transferrin (≤20.0%), hemoglobin level (≤120 g/l), erythrocyte count (3.75·1012/l), Ht (≤0.36 l/l), mean corpuscular haemoglobin (MCH, ≤27 pg or ≤1.68 fmol) and concentration (MCHC, ≤31% or ≤19.2 mmol/L), low volume of one erythrocyte (≤75 μm3 or fl).

When assessing the state of latent iron deficiency (LID), we focused on a decrease in the level of serum iron (≤18 μmol/l), Hb (≥120 g/l), erythrocytes (4,25 – $375 \cdot 10^{12}$/l), a decrease in the level of ferritin (Fe) in the blood (≤40 ng/ml), a trend towards an increase in the level of transferrin Tf (≥5.3 g/l). When determining the ID degree and severity in the examined girls, we followed the principles of standardization and unification of clinical and laboratory indicators of iron deficiency conditions (17, 18). We performed the penultimate studies based on the laboratory of biochemistry and biotechnology of the NIIG and PK of the Ministry of Health of the Republic of Uzbekistan in the period 2018–2020. For a clinical study (screening) of iron deficiency among adolescent girls, we used a survey card for schoolchildren (applications), which is based on a questionnaire card for pre-medical determination of iron deficiency and an algorithm for diagnosing iron deficiency conditions.

As a biochemical laboratory test for the detection of iron deficiency, we used the determination of serum iron concentration using ferrozine (17, 18) according to the formula:

C=A/B*447.5 (mmol/l).

where A is the relative density of the sample, B is the relative density of the calibration sample, C is the concentration of serum iron in the blood serum (μmol/l).

Determination of blood serum transferrin by immunochemical method (19). This method is based on the specific interaction of transferrin with polyclonal or monoclonal antibodies of the immune complex, which is quantified.

Based on the content of transferrin in the blood serum, it is possible to calculate the saturation ratio of transferrin with iron (CST%):

CST=A*100/B*1.37*0.18%,

where A is the content of serum iron in μmol/l, B is the content of serum transferrin (mg/100 ml). For example: serum iron is 12.4 μmol/l, and the content of transferrin is 3.1 g/l:

CST=120*100/230*1.37*0.18=1240/7640=16.2%.

Since the denominator of this equation means the total immunobinding capacity of blood serum (TIBC), then by subtracting the level of serum iron from it, one can also determine the latent iron-binding capacity of blood serum (LIBC). Normal values of the TIBS (fasting) are 44.8-71.6 μmol/l = 0.179 μg/100 ml and μg/100 ml = 55.85 μmol/l.

The average content of hemoglobin in one erythrocyte is mean corpuscular hemoglobin (MCH), expressed in pictograms (pg) or Fmol:

MCH =Hb(g/l)/erythrocyte count(ml),

conversion factor of MCH to pg per fmol (pg 0.06206), and fmol per pg (fmol · 16.11).

The average concentration of hemoglobin in one erythrocyte is corpuscular hemoglobin concentration (MCHC), in g% or mol / l:

MCHC=Hb(g/l)/Ht(l/l)*10,

conversion factor of MCHC in g% per mol/l (g% · 0.626) or mol/l per g% (mol/l · 1.611).

The volume of one erythrocyte (ROE) or mean corpuscular volume (MCV), μm3 or fl:

ROE(MSV)=Ht(l/l)*1000/number of erythrocytes (million);

where μm3 or fl (normal value 76-96 fl).

Indicators of iron metabolism, qualitative and quantitative indicators of peripheral blood were studied in the dynamics of observation and treatment - a total of four times (initial data by the end of the period of saturation of the body with iron, after six months and a year).

To study the association of iron deficiency in adolescent girls with indicators of physical development, we studied the main anthropometric indicators (length, circumference): body weight (kg), body length, arms, legs (cm), head circumference, chest (cm), absolute (APT) and relative (OPT, cm2/kg) body surface.

Based on the indicators of physical development, we calculated the somatic types (macro-, meso- and microsomatotype) of the examined adolescent girls).

The direction of growth at the time of the study (dolicho, meso- and brachymorphy) (20) was calculated, as well as their harmony and disharmony based on indicators of physical development.

The degree of secondary sexual characteristics development in girls (1, 2, 3, 4 points) was studied according to the scheme A - axis, P - pubis, Ma - mammalis, Me - menarhe.

To determine the prognostic value of symptoms and syndromes of ID, the method of normalized intensive indicators (NII) was used according to the recommendation (21), which reveals their frequency (f), sensitivity

%=a/a+c*100

and specificity according to the four-field table

% = d/b+d*100.

Having previously determined more than 46 symptoms with a correlation dependence of more than ≥ ± 0.30 values, the weight index (K) of each of these signs was determined.

During statistical processing of scientific material, methods of parametric (M, ±σ, ±m, t - Student-Fisher criteria) and non-parametric statistics were used - Fisher's exact method (TMF) with angular transformation for relative values, correlation, regression analysis of data (22). Digital material processed using Microsoft Office XP (Excel 2003).

2 Results and Discussion

Table 1 presents data on the frequency of clinical ID syndromes in the examined girls.

Table 1. The occurrence frequency of iron deficiency clinical syndromes in girls aged 12-14 years (%)

No	Clinical Syndromes	Control group (n=51)	LID (n=45)	Up	pφ	I-degree IDA (n=56)	Up	pφ	IDA II degree (n=25)	Up	pφ
1	Immunological syndrome	7.84	11.1	0.54	N.d.	28.6	2.75	p<0.003	44.0	3.63	p<0.001
2	Gastrointestinal syndrome	9.1	16.4	1.08	N.d.	26.0	1.22	N.d.	38.0	2.93	p<0.001
3	Cardiovascular Syndrome	4.8	7.8	0.61	N.d.	22.9	2.87	p<0.002	37.7	3.61	p<0.001
4	Astheno-vegetative syndrome	5.51	7.5	0.4	N.d.	21.1	2.49	p<0.006	30.1	2.82	p<0.002
5	Epithelial syndrome	6.54	12.2	0.93	N.d.	18.6	1.94	p<0.026	30.9	2.71	p<0.003

Note: hereinafter N.d. – not statistically significant (p>0.05) compared with children in the control group with Up<1.64, one-sided TMF test.

Table 1 shows that the leading place among them is occupied by the immunological syndrome, which was found, respectively, in I and II degrees of IDA severity (28.6% and 44.0%, p<0.003, p<0.001), which is much higher than the data of children in the control group (7.84%) and LID (11.1%). The second most common was gastrointestinal syndrome (26.0% and 38.0% versus 9.1% and 16.4%, p>0.05, p<0.001). Further, in descending order, the ID syndrome was distributed accordingly - cardiovascular (22.9% and 37.7% versus 4.8% and 7.8%, p <0.002, p <0.001), asthenovegetative (21.1% and 30 .1% vs. 5.51% vs. 7.5%,

p<0.006, p<0.002) and epithelial syndrome (18.6% vs. 30.9% vs. 6.54% vs. 12.2%, p<0.026, p<0.002).

According to M.G. Ganieva (1995), more than twenty years ago, epithelial (93.6%), cardiovascular (53.4%) and astheno-vegetative syndromes (48.2%) prevailed in the IDA clinic in school-age children) than immunological (40.2%) and gastrointestinal syndromes (12.8%).

From the data of our study, it becomes obvious (Ex. 9) that the clinic of IDA in girls of school age has somewhat transformed and among them immunological and gastrointestinal syndromes began to predominate, their frequency increased by 2-3 times compared to the cited authors. Modern schoolgirls aged 12-14 years according to the frequency of cardiovascular (53.4 vs. 60.6%, p>0.05) and asthenic-vegetative syndrome (51.2% vs. 48.2%, p>0.05) do not differ from the data of the previous study. Meanwhile, epithelial syndrome became much less common among them (49.5% versus 93.6%, p<0.01).

The immunological syndrome, according to researchers, is a collective concept that includes a group of frequently ill (more than 4 times a year) children with respiratory and other viral infections, as well as exacerbation of chronic foci of infection. Numerous studies show that with ID, the resistance of children to infections decreases [1, 3, 5, 12, 13, 14], which is due to a metabolism violation of iron-containing enzymes (cytochrome, cytochrome oxidase, peroxidase, catalase), especially leukocytes enzymes (myeloperoxidase, ketone proteins, flavoproteins)), a decrease in secretory Ig A, properdin, lysozyme, and many immunological defenses of the body [3]. Appendix 10 provides data on the study of the infection chronic foci frequency and exacerbation of viral infections in the examined girls with ID.

As one can see from the data in Table 2, the share of frequently ill children in the LDV group does not statistically differ (11.1%, p>0.05) from those in the control group (7.84%), their proportion is significantly increased in I and II degrees of IDA severity (28, 6% and 44.0%, p<0.001). Sensitivity (80.0% and 54.0%), especially the specificity of this condition increases with IDA degree II (73.3-77.0%). Isolated chronic foci of infection also did not differ between the control group and LID (25.5% and 40.0%, p>0.05) and increased in I and II-degree IDA girls (50.0% and 44.0%, p <0.003, p<0.049). According to the frequency of combined foci of infection, only girls with IDA severity II differed (32.1%, p<0.01). At the same time, chronic foci of infection, both in isolated (45.8-68.3%) and in combined form (51.4-58.1%), do not have high sensitivity and specificity in IDA degree I girls, their relative role increases with II degree of IDA, respectively, with their isolated form (73.0%) and with their combination (84.6%), they become specific for the diagnosis of IDA (73.1-84.6%).

Table 2. The frequency of occurrence of immunological syndrome in iron deficiency in girls aged 12-14 years (%)

No	Characteristics of the immunological syndrome	Control group (n=51)		LID (n=45)		I-degree IDA (n=56)		II-degree IDA (n=25)	
		Abs	%	Abs	%	Abs	%	Abs	%
1	2	3	4	5	6	7	8	9	10
1	Frequent (more than 4 times a year) colds (SARS, influenza, catarrhal tonsillitis, pharyngitis, otitis media)	4	7.84	5	11.1*	16	28.6	11	44.0
	Sensitivity	-	-	-	55.6	-	80.0	-	73.3
	Specificity	-	-	-	54.0	-	54.0	-	77.0
2	Chronic foci of infection (isolated): Chronic tonsillitis	2	3.92	3	6.67*	4	7.14*	3	12.0
	Chronic adenoiditis	1	1.96	2	4.44*	3	5.36*	2	8.0

	Dental caries	8	15,7	10	2.22*	15	26.8	4	16.0*
	Chronic otitis media	-	-	1	2.22*	1	1.79*	-	-
	Sinusitis (sinusitis, ethmoiditis, frontal sinusitis)	2	3.92	2	4.44*	5	5.36*	2	8.0*
	Frequency, f	13	25.5	18	40.0*	28	50.0	11	44.0
	Sensitivity	-	-	-	58.1	-	68.3	-	45.8
	Specificity	-	-	-	45.8	-	57.6	-	73.1
3	Chronic foci of infection (combined): Chronic tonsillitis + adenoiditis	1	1.96	2	4.44*	4	7.14	2	8.0
	Chronic tonsillitis + dental caries	2	3.92	3	6.67*	2	3.57*	1	16.0
	Dental caries + adenoiditis	1	1.96	2	4.44*	3	5.36*	1	4.0*
	Chronic tonsillitis + sinusitis	1	1.96	-	-	1	1.79*	1	4.0*
	Frequency, f	5	9.8	7	15.6	10	17.9*	8	32.0
	Sensitivity	-	-	-	58.3	-	66.7	-	38.1
	Specificity	-	-	-	54.8	-	50.0	-	69.0
Total chronic foci of infection		18	35.3	25	55.6	38	67.9	19	76.0
Sensitivity		-	-	-	58.1	-	67.9	-	51.4
Specificity		-	-	-	62.3	-	64.7	-	84.6

Note: data are statistically significant ($p<0.05 - 0.001$), compared with the control group, except for those marked with *

As mentioned above, gastrointestinal syndrome ranks second in prevalence among the symptoms of ID. Table 3 shows the characteristics of the gastrointestinal syndrome in the examined girls.

Table 3. The frequency of gastrointestinal syndrome occurrence in adolescent girls, depending on the ID severity (%)

No	Characteristics of the gastrointestinal syndrome	Control group (n=51)		LID (n=45)		I-degree IDA (n=56)		II-degree IDA (n=25)	
		abs	%	abs	%	abs	%	abs	%
1	2	3	4	5	6	7	8	9	10
1	Cheilosis (angular stomatitis, "zayeda")	2	3.92	4	8.9*	9	16.1	6	24.0
2	Sideropenic glossitis (decrease in taste sensations, tingling, burning sensation, feeling of fullness at the tip of the tongue, aggravated after hot, sour and salty foods, atrophy of the papillae of the tongue - Günter's glossitis)	4	7.84	6	13.3*	12	21.4	8	32.0
3	Sideropenic dysphagia (dry mouth, impaired swallowing of dry and solid foods (Plumer-Vinson syndrome)	-	-	2	4.44*	10	17.9	5	20.0
4	Perversion of taste: eating lime, chalk, earth, ice gulvat, frozen foods (pago-fagia), raw cereals, dough, meat (minced meat), tea leaves, etc.	4	7.84	6	13.3*	11	19.6	7	28.0
5	Perversion of appetite (addiction to salty and spicy foods, kurtob, hot dogs, chewing gum, abuse of carbonated drinks)	9	17.6	15	33.3	21	37.5	12	48.0
6	Perversion of smell (addiction to the smells of gasoline, kerosene, fuel oil,	5	9.8	9	20.0*	21	37.5	12	48.0

	car exhaust, building paints, acetone, shoe polish, nail polish, freshly cut grass, plowed land)								
7	Nausea, vomiting	4	7.84	5	11.1*	25	44.6	13	52.0
8	Decreased appetite	6	11.8	9	20.0*	21	37.6	18	60.0
9	Chronic gastritis (hypo- and anacid)	3	5.88	4	8.9*	9	16.1	5	20.0
10	Chronic colitis (diarrhea, constipation)	2	3.92	6	13.3*	7	12.5*	6	24.0
11	Chronic diseases of the liver and biliary tract	1	1.96	-	-	6	10.7	4	16.0
12	Worm infestation	11	21.6	15	33.3*	23	41.1	18	72.0
	treated	6	11.8	10	22.2	14	25.0	10	40.0
	untreated	5	9.8	5	11.1	9	16.1	8	32.0
Frequency, f		-	9.10	-	16.4		26.0		38.0
Sensitivity		-	-	-	58.3		75.0		66.7
Specificity		-	-	-	54.8		52.9		75.4

Note: data are statistically significant ($p<0.05$ - 0.001), compared with the control group, except for those marked with *

As can be seen from the data in Table. 3, this syndrome in frequency in girls with LID does not differ from that in the control group ($p>0.05$) and is increased in I and II degrees of IDA severity (26.0% and 38.0%, $p<0.001$). As evidenced by the data of Ex. 11, in girls with I- and II-degree IDA, the frequency of gastrointestinal symptoms was distributed in descending order as follows: helminthic invasion (50.6%), decreased appetite (48.9%), nausea, vomiting (46.9 %), smell perversion (40.7%), appetite perversion (40.7%), sideropenic glossitis (24.7%), taste perversion (22.2%), sideropenic dysphagia (18.5%), cheilosis (18.5%), chronic diseases of the stomach (17.8%), intestines (16.0%), liver and biliary tract (12.3%).

In such a large distribution of the gastrointestinal syndrome in girls with ID at the age of 12-14 years, the frequency of violations and nutritional errors apparently matters. So, schoolgirls to the question: “Do you like meat dishes?” answered in the affirmative only in 84.5%, 80.0%, 66.1% and 64.0% of cases, respectively, in the control groups, LID, I- and II-anemia severity IDA ($p>0.05$, $p<0.013$, $p<0.026$).

As iron deficiency intensified, the number of girls who often consumed flour dishes rather than meat ones increased among them (66.7%, 71.1%, 82.1% and 88.0%, $p>0.05$, $p<0.033$, $p<0.016$). Schoolgirls at this age rarely consumed vegetable (3.92%, 6.66%, 3.57%, $p>0.05$), dairy dishes (5.88%, 8.89%, 8.93% and 10%, $p>0.05$). Those who consume fruits at least 2 times a week among them are significantly reduced both in LID (13.3%, $p<0.033$), and in I- and II-degree IDA (16.1% and 8.0%, $p<0.05$, $p<0.024$) than in the control group (27.5%). This is the dynamics of the number of girls in the consumption of vegetables (11.1%, 12.5% and 8.0%, $p>0.05$, $p>0.05$, $p<0.037$) than their counterparts in the control group (23.5 %). Among girls with LID and I- and II-degree IDA, the proportion of irregular eaters is increased (22.2%, 33.4% and 44.0%, $p>0.05$, $p<0.026$, $p<0.008$) in comparison with the control group (17.6%). Among the girls of the control group, regular breakfast children ranged from 49.0% to 72.5% per week, while their proportion among girls of I-degree IDA (41.1-44.6%) and II-degree IDA (28.0-38.0%) is significantly reduced ($p<0.05$-0.01). Girls with grade I and II IDA rarely consumed sausages, breakfast sausages (12.0%, 8.93% versus control 23.5%, $p<0.05$, $p<0.01$), butter, breakfast creams (33.3%, 14.3% and 12.0% vs control 47.1%, $p<0.05$-$p<0.001$).

Among girls with I- and II-degree IDA, there is a negligible number of children (12.5% and 8.0%) who consume dairy products for breakfast (milk, sour cream, cottage cheese, kaimak, etc.), although their proportion is not high among control group children (13.7%) and LID (17.8%, $p>0.05$). School-age children, regardless of the severity of ID, eat little food for breakfast, such as jam, honey, eggs, biscuits and dried fruits (1.96-8.9%). We have found

that among girls with LID, I- and II-degree IDA, the proportion of children who consume a hot lunch with meals is significantly reduced (63.3%, 51.8% and 40.0%, $p>0.05$, $p<0.05$, $p<0.01$) than in the control (74.5%), the number of children eating dry food is higher (37.8%, 32.1% and 28.0% versus 19.6 in the control, $p< 0.01$, $p<0.05$) and consuming various fast-food (13.3%, 16.1% and 20.0% versus 5.9% control, $p>0.05$, $p<0.05$) . Among the sick girls with LID and I- and II-degree IDA, the proportion of children who consume hot dinner is reduced (66.7%, 64.3% and 56.0%, $p<0.05$, $p<0.01$) in comparison with the control group (86.3%).

Summarizing the clinic of the gastrointestinal syndrome with I- and II-degree IDA in girls aged 12-14 years, it is necessary to note the high prevalence of helminthic invasion among them (41.1% and 72.0%, $p<0.01$ and $p<0.001$) than in the control group (21.6%) and LID (33.3%). Moreover, as the data show, ½ of schoolgirls diagnosed with helminthic invasion did not undergo a course of deworming. Obviously, the high frequency of ID clinical symptoms, such as decreased appetite, nausea, and vomiting in these girls, partly depends on the high frequency of helminthic invasion, as well as due to the prevalence of other chronic diseases of the stomach, intestines, liver, and biliary tract. These factors, apparently, contribute to the development of competitive (deficiency of B vitamins) deficient anemia in helminthic invasion, as well as malabsorption syndrome, maldigestion in chronic gastrointestinal diseases [6, 8,]. It seems to us that some other symptoms such as cheilosis (cracks in the corners of the mouth, seizures), as well as signs of sideropenic glossitis (21.4% and 32.0%, $p<0.01$), are also associated with a combined imbalance of iron and vitamins, microelements.

As shown in Table 3, the ID gastrointestinal symptoms characteristic, such as sideropenic dysphagia (Plumer-Vinson syndrome), as well as impaired taste and smell (pica chloratica, pica sideropenica), are more specific than other symptoms (nausea, vomiting, appetite disturbance). In our studies, for girls aged 11-14 years with ID, the perversion of smell was more characteristic, respectively, with I- and II-degree IDA (37.5% and 48.0% versus 9.8% and 20.0% in children in the control group and LID, $p<0.001$) than the incidence of sideropenic dysphagia (17.9% and 20.0%, $p<0.012$, $p<0.022$) and taste perversion in the examined girls (19.6% and 28.0, $p<0.057$, $p<0.012$). We also distinguish between appetite perversion (addiction to salty and spicy food, consumption of kurtopa, go-dog, abuse of carbonated drinks, which occurred with a high frequency among girls with I- and II-degree IDA (37.5% and 48.0% vs control 17.6%, 17.6%, $p<0.01$, $p<0.001$). This symptom is also increased among girls with LID (33.3%, $p<0.038$).

The origin of symptoms, such as sideropenic dysphagia, perversion of taste, smell, researchers associate with degenerative changes in the mucous membranes of the gastrointestinal tract (oral cavity, esophagus, stomach, intestines) and pharyngeal muscles due to iron deficiency [80; pp.54-57, 92; P.4-8]. It has been shown that peripheral taste sensitivity is impaired in ID [1, 5, 7]. However, there is another opinion that hyposalivation, hypoenzymemia in the gastrointestinal tract develop in IDA in adults and children due to a violation of the motor-evacuation, secretory and enzymatic activity of the stomach, pancreas [3, 4, 9], since in IDA develops signs of chronic gastritis, gastroduodenitis with reduced secretion of gastric and other glands of the gastrointestinal tract. It is assumed that taste perversion, especially appetite with addiction to salty and spicy foods in patients with IDA, is aimed at compensating for decreases in amylolytic secretion of the salivary glands and with reduced hydrochloric acid secretion in the stomach.

Table 4 shows the incidence of cardiovascular syndrome in girls aged 12-14 years, depending on the severity of ID.

Table 4. The frequency of occurrence of cardiovascular syndrome in girls aged 12-14 years, depending on the ID severity (%)

No	Characteristics of the cardiovascular syndrome	Control group (n=51)		LID (n=45)		I-degree IDA (n=56)		II-degree IDA (n=25)	
		abs	%	abs	%	abs	%	abs	%
1	Weakness in the lower and upper limbs	4	7.84	3	6.7*	24	42.9	16	64.0
2	Fast fatiguability	6	11.8	5	11.1*	28	50.0	14	56.0
3	Feeling of pain and heaviness in the region of the heart	1	1.96	-	-	4	7.14	7	28.0
4	Palpitations (tachycardia), "interruptions", "fading" of the heart	1	1.96	1	2.22*	14	25.0	9	36.0
5	Weakened, split I heart sound at the apex, systolic murmur in the heart and large vessels (the noise of the "top", "nuns", venous buzzing)	2	3.92	4	8.9	8	14.3	6	24.0
6	Arterial hypotension, mainly diastolic	2	3.82	5	11.1	7	12.5	9	36.0
7	ECG (ST-T) changes	1	1.96	3	6.7*	5	8.93	5	20.0
Frequency, f		-	4.8	-	7.8*	-	22.9	-	37.7
Sensitivity		-	-	-	66.7	-	86.7	-	81.8
Specificity		-	-	-	54.4	-	53.3	-	75.4

Note: data are statistically significant ($p<0.05$ - 0.001), compared with the control group, except for those marked with *

As can be seen from the data in Table 4, that the most common symptom in this group was muscle weakness in the upper and lower extremities, which was observed in 42.9% and 64.0% of children with I- and II-severity degree IDA ($p<0.001$) than with LID (6.7%) and the control group (7.84%). A common symptom was also rapid fatigue, respectively, in 50.0% and 56.0% ($p<0.001$) of children with I- and II-severity degree IDA than in the control group (11.8%) and LID (11.1%).

One should note that these symptoms, according to some researchers, refer to the syndrome of metabolic intoxication [4,8]. However, we are more impressed by the old name for muscle weakness ("pale weakness" or Eisenmglladyamnia), due to the lack of myoglobin, i.e., the respiratory protein of the heart and skeletal muscles. We indicate below that with the IDA development in girls in this age period, the factor of hypodynamia (hypokinesia) is important. This is confirmed by the fact that 31.1%, 46.4% and 72.0% ($p<0.05$, $p<0.001$, $p<0.001$) of girls with LID, I- and II-degree IDA, easily experienced a feeling of fatigue during normal classes by the second and third lessons of school, while this phenomenon in girls of the control group was detected only in 17.6% of cases.

Schoolchildren with ID more often preferred medical and biological (20.0%, 21.4% and 24.0%), physical and mathematical (17.9% and 20.0%) disciplines than physical education lessons (2.22% and 4.0%, $p<0.05$, $p<0.01$). Among girls with ID, there are significantly more girls who watch TV programs for more than 5 hours a day (20.0%, 23.2% and 24.0% versus the control group (17.6%, $p>0.05$, $p>0.05$, $p<0.05$) and talking on the phone (more than 1 hour a day), respectively, with I and II degrees of IDA (23.2% and 22.2%, $p<0.001$), than in control group (5.9%) and LID (8.9%), already at the stage of LID (86.7%), girls are limited to physical education only at school, which is aggravated with I and II degrees of IDA (89.3% and 92.0%) than in control (78.4%, $p<0.05$, $p<0.01$), they rarely attend sports clubs (4.4-5.36% vs. control 11.8%, $p<0.05$).

We consider that schoolgirls with ID due to impaired iron metabolism are prone to hypodynamia, and the latter is even more aggravated due to the accumulation of pyruvate and lactate due to myoglobin deficiency [43, 54], due to low reutilization of the latter due to the above frequent chronic diseases of the stomach and intestines. This leads to a decrease in the myoglobin iron reuse for the needs of erythropoiesis [14, 15, 16].

In connection with the above circumstances, a high frequency of such symptoms as tachycardia, "interruptions", a feeling of "fading" of the heart (25.0% and 36.0%, $p<0.001$), arterial hypotension, most often minimal blood pressure (12.5 % and 36.0%, $p<0.046$, $p<0.001$), feeling of pain and heaviness in the region of the heart with II-degree IDA (28.0%, $p<0.001$), functional cardiac and vascular murmurs (12.5% and 36 0.0%, $p<0.025$, $p<0.005$) and ECG changes in the form of repolarization (ST-T) disturbances (8.93% and 20.0%, $p<0.045$, $p<0.001$). The sensitivity of clinical signs of cardiovascular syndrome is quite high - from 75.0% (functional murmurs) to 90.0% (palpitations, interruptions, arterial hypotension). The most specific symptoms (≥80.0%) of the cardiovascular system for ID were muscle weakness, fatigue, pain and heaviness in the heart area.

Table 5 presents data on the frequency of asthenic-vegetative syndrome in girls, depending on the ID severity.

Table 5. The frequency of occurrence of astheno-vegetative syndrome in girls aged 12-14 years, depending on the ID severity (%)

№	Characteristics of astheno-vegetative syndrome	Control group (n=51)		LID (n=45)		I-degree IDA (n=56)		II-degree IDA (n=25)	
		abs	%	abs	%	abs	%	abs	%
1	2	3	4	5	6	7	8	9	10
1	Irritability, tearfulness	4	7.84	5	11.1*	21	37.5	11	44.0
2	Causeless anxiety	3	5.88	4	8.9*	11	19.6	9	36.0
3	Lethargy, low mood	2	3.92	3	6.7*	16	28.6	8	32.0
4	Sleep disturbance (sleepwalking, night terrors, startling)	3	5.88	2	4.4*	7	12.5	7	28.0
5	Sweating of palms, soles	2	3.92	5	11.1	14	25.0	10	40.0
6	Coldness of the extremities, paresthesias on the extremities	5	9.8	3	6.7*	16	28.6	9	36.0
7	Feeling of heat on the face, torso	3	5.88	2	4.4*	12	21.4	7	28.0
8	Intolerance to stuffy rooms, transport	3	5.88	3	6.7*	14	25.0	6	24.0
9	Noise in ears, head	2	3.92	-	-	11	19.6	6	24.0
10	Headaches, dizziness	6	11.8	6	13.3*	19	33.9	11	44.0
11	"Goosebumps" before the eyes (when standing up)	3	5.88	7	15.6	14	25.0	10	40.0
12	Weakening of memory and attention	2	3.92	4	8.9*	13	23.2	9	36.0
13	Impaired vision and hearing	1	1.96	2	4.4*	7	12.5	6	24.0
14	Feeling short of breath, "sighs"	1	1.96	2	4.4*	10	17.9	7	28.0
15	Biting hair and nails	3	5.88	1	2.2*	5	8.93	4	16.0
16	Imperative urge to urinate (with excitement, mental stress)	2	3.92	4	8.9*	9	16.1	5	20.0
17	Subfebrile condition (iron deficiency fever)	-	-	1	2,2*	2	3.6	3	12.0

Frequency, f	-	5.51	-	7.5*	-	21.1	-	30.1
Sensitivity	-	-	-	60.0	-	85.7	-	80.0
Specificity	-	-	-	52.1	-	52.6	-	77.2

Note: data are statistically significant ($p<0.05$ - 0.001), compared with the control group, except for those marked with *

As can be seen from the data in Table 5, this syndrome does not differ statistically in frequency in girls of the control group and LID ($p>0.05$) and is significantly increased in I- and II-degree IDA (21.1% and 30.1%, $p<0.006$, $p<0.002$). Symptoms of asthenic-vegetative syndrome among girls with I- and II-severity IDA were distributed in descending order: irritability, tearfulness (39.6%), headaches, dizziness (37.0%), cold extremities, paresthesia (numbness) in the fingers of the extremities (20.9%), lethargy, low mood, sweating of the palms and soles, "goosebumps" before the eyes (29.6%), weakening of memory and attention (27.2%), anxiety, intolerance to stuffy rooms, urban transport (24.7%), feeling of heat on the face, torso (23.5%), noise in the ears, head, feeling of "lack" of air - "sighs" (20.9%), sleep disturbance (17.3%), visual impairment and hearing (16.0%), biting hair and nails during exercise (11.1%) and unexplained subfebrile (37.2-37.5°C) body temperature, not associated with exacerbation of chronic foci of infection and periods of acute respiratory diseases (6.2%). It should be noted that the general group sensitivity of these symptoms was 80.0%, and the specificity was 77.2%. The most sensitive symptoms were lethargy, adynamia (80.0%), sweating of the palms and soles (83.3%), weakening of memory and attention (81.2%), deterioration of vision and hearing (85.7%), feeling " lack of air (87.5%). High specificity (≥75.0%) had such symptoms as irritability, anxiety, tearfulness, sweating of the palms, soles, headaches, dizziness, memory and attention impairment.

Table 5 shows the characteristics of the epithelial syndrome in the examined girls.

Table 6. The incidence of epithelial syndrome in girls aged 12-14 years, depending on the ID severity (%)

No	Characteristics of epithelial syndrome	Control group (n=51)		LID (n=45)		I-degree IDA (n=56)		II-degree IDA (n=25)	
		abs	%	abs	%	abs	%	abs	%
1	Paleness of the skin and sclera with a bluish tint	3	5.9	5	11.1*	16	28.1	14	56.0
2	Paleness of the skin with a yellowish tinge around the mouth, "yellow mustache" of chlorotics (a symptom of Guinot de Mussy)	-	-	-	-	4	7.14	3	12.0
3	Pale skin with a greenish tint (chlorosis)	-	-	-	-	3	5.4	2	8.0
4	Dryness, roughness, peeling of the skin	4	7.84	6	13.3*	13	23.2	13	52.0
5	Hair changes (dullness, brittleness, striation, loss)	3	5.9	7	15.5*	17	30.4	7	28.0
6	Nail changes: thinning, striation, brittleness, sunken, spoon-shaped nails (koilonychia)	-	-	1	2.22*	9	16.1	8	32.0
7	Foot cracks	-	-	8	17.8	11	19.6	7	28.0
	Frequency, f	-	6.54	-	12.0*	-	18.6	-	30.9
	Sensitivity	-	-	-	62.5	-	76.9	-	72.7
	Specificity	-	-	-	54.5	-	51.1	-	73.8

As can be seen from the data of Exhibit 14, the symptoms of epithelial syndrome are not expressed in girls with LID ($p>0.05$), except for the symptom of "cracked foot" ($p<0.001$). With the transition to I-degree IDA (18.6%, $p<0.026$), especially with its severity II (30.9%, $p<0.003$), the frequency of this syndrome increases in adolescent girls. At the same time, symptoms such as pallor, dryness of the skin, changes in hair, nails were quite sensitive (84.2% - 90.6%) already with IDA degree, moreover, these symptoms with II-degree IDA severity in adolescent girls become highly specific (70.0-88.9%). The symptom "cracked foot" did not have high sensitivity (56.0-57.9%) and specificity (45.1-57.9%), and therefore this symptom cannot be considered pathognomonic for IDA in adolescent girls.

Thus, judging by the syndromic analysis, the IDA clinic in girls aged 12-14 years, it becomes obvious that there are no clinical symptoms in the presence of which it is possible to establish LID without resorting to laboratory research methods.

The clinical symptoms of I-degree IDA have sufficient sensitivity, i.e., they recognize diseases when they are present. However, these symptoms in the I-degree IDA do not have specificity (selectivity), i.e., they give a negative result in the absence of anemia. The above IDA symptomatology becomes specific only with its severity II, i.e., when all the IDA symptoms are already present. This leads to an important conclusion that, based on the IDA clinical symptoms in school-age children, one can't recognize this pathology early and, moreover, to perform preventive measures.

One should note that the level and structure of the IDA incidence in schoolchildren in the CIS regions varies widely. Therefore, there is a need to create a prognostic map of the IDA severity in girls, adapted to our conditions.

In this regard, we studied the degree of IDA symptoms informativeness in girls. For this purpose, we used the method of normalized intensive indicators, NII, which was based on the data of the IDA syndromic assessment in the examined patients. After selecting the most significant factors with a correlation coefficient ($\geq r=\pm 0{,}30$) with indicators of peripheral blood (Hb, number of erythrocytes, MHC, HGB/HCT, ROE) and iron metabolism (serum iron, transferrin), we determined the weight index (K) for every sign. For this purpose, having multiplied the NII of each feature by the value of the weight coefficient (K), we obtained the prognostic coefficient (R) of the studied factor. So, for example, with frequent pathology in a subject with viral infections more than 4 times a year, it is 1.6 x 3.7 = 5.4; and in their absence 0.4 x 3.7 = 1.5; i.e., the probability of developing IDA in girls with this feature exceeds 4 times those of children who did not have this factor.

As can be seen from the data in Table 7, the sums of the weight index (K) differ depending on the studied syndrome, and the latter depends on the number of symptoms within the syndrome.

Table 7. Prognostic map of the risk of developing IDA in girls aged 12-14 years.

No	Risk factors (symptoms, syndromes)	Survey group. Ogr (II) Kgr (I)	Intensive indicator %	NIP (%)	Factor weight index (K)	Feature predictive ratio (R)
1	2	3	4	5	6	7
1	I. Immunological syndrome Frequent (more than 4 times a year) colds (SARS, influenza, catarrhal tonsillitis, pharyngitis, otitis media)	II	286.0	1.6	3.7	5.9
		I	78.4	0.4		1.5
2	Isolated chronic foci of infection	II	500.0	1.3	2.0	2.6
		I	255.0	0.7		1.4
3	Combined chronic foci of infection	II	179.0	1.3	1.8	2.3

		I	98.0	0.7		1.3
		EK = 7.5 (0.6–1.43)				
1	II. Gastrointestinal syndrome: Cheilosis (angular stomatitis, “zaeda”)	II	161.0	1.6	4.1	6.6
		I	39.2	0.4		1.6
2	Sideropenic glossitis	II	214.0	1.5	2.7	4.1
		I	78.4	0.5		1.4
3	Sideropenic dysphagia	II	179.0	1.6	4.1	6.6
		I	44.4	0.4		1.6
4	perversion of taste	II	196.0	1.4	2.5	3.5
		I	78.4	0.6		1.5
5	perversion of appetite	II	375.0	1.4	2.1	2.9
		I	176.0	0.64		1.3
6	Perversion of smell	II	375.0	1.6	3.8	6.1
		I	98.0	0.4		1.5
7	Nausea, vomiting	II	446.0	1.7	5,7	9.7
		I	78.4	0.5		1.7
8	Decreased appetite	II	376.0	1.5	3.2	4.8
		I	118.0	0.5		1.6
9	Chronic gastritis, gastroduodenitis	II	161.0	1.5	2.7	4.1
		I	59.0	0.5		1.4
10	Chronic colitis, enteritis, intestinal dysfunction)	II	125.0	1.5	3.2	4.8
		I	39.2	0.5		1.6
11	Chronic diseases of the liver and biliary tract	II	107.0	1.7	5.5	9.4
		I	19.6	0.3		1.7
12	Worm infestation	II	411.0	1.3	1.9	2.5
		I	216.0	0.7		1.3
		IK = 41.5 (0.44–1.57)				
1	III. Cardiovascular Syndrome: Muscle weakness in the upper and lower limbs	II	429.0	1.7	5.5	9.4
		I	78.4	0.3		1.7
2	Fatigue when doing housework	II	500.0	1.6	4.2	6.7
		I	118.0	0.4		1.7
3	Feeling of pain and heaviness in the region of the heart	II	71.4	1.6	3.6	5.8
		I	19.6	0.4		1.4
4	Heartbeat (tachycardia), "interruptions" and "fading" of the heart.	II	250.0	1.9	12.8	24.3
		I	19.6	0.2		2.6

5	Weakening, splitting of the 1st heart sound at the apex, systolic murmur at the apex and large vessels (pulmonary artery)	II	143.0	1.6	3.6	5.8
		I	39.2	0.4		1.4
6	Arterial hypotension (diastolic)	II	125.0	1.5	3.2	4.8
		I	39.2	0.5		1.6
7	ECG (ST-T) changes		89.3	1.6	4.6	7.4
			19.6	0.4		1.8
						EK = 37.5 (0.33–1.71)
1	IV. Astheno-vegetative syndrome: Irritability, tearfulness	II	375.0	1.6	4.8	7.7
		I	78.4	0.4		1.7
2	Unreasonable anxiety, feeling of anxiety	II	196.0	1.5	3.3	5.1
		I	59.0	0.5		1.5
3	Lethargy, low mood, depression	II	286.0	1.8	7.3	12.8
		I	39.2	0.2		1.8
4	Sleep disturbance (restless sleep, night terrors, startle)	II	125.0	1.4	2.1	2.9
		I	59.0	0.6		1.3
5	Sweating of palms, soles	II	250.0	1.7	6.4	11.1
		I	39.2	0.3		1.7
6	Coldness of the extremities, paresthesias on the extremities	II	286.0	1.5	2.9	4.3
		I	98.0	0.5		1.5
7	Feeling of heat on the face, torso	II	214.0	1.6	3.6	5.7
		I	59.0	0.4		1.6
8	Intolerance to stuffy rooms, transport	II	250.0	1.6	4.2	6.8
		I	59.0	0.4		1.6
9	Noise in ears, head	II	196.0	1.7	5.0	8.4
		I	39.2	0.3		1.7
10	Headaches, dizziness	II	339.0	1.5	2.9	4.3
		I	118.0	0.5		1.5
11	"Goosebumps" before the eyes (when standing up)	II	250.0	1.6	4.2	6.8
		I	59.0	0.4		1.6
12	Weakening of memory and attention	II	232.0	1.7	5.9	10.1
		I	39.2	0.3		1.7
13	Impaired vision and hearing	II	125.0	1.7	6.4	11.1
		I	19.6	0.3		1.7
14	Feeling short of breath, "sighs"	II	179.0	1.8	9.1	16.4
		I	19.6	0.2		1.8
15	Biting hair and nails	II	89.0	1.2	1.5	1.8

		I	59.0	0.8		1.2
16	Imperative urge to urinate (with excitement, mental stress)	II	161.0	1.6	4.1	6.6
		I	39.2	0.4		1.6
17	Subfebrile condition (iron deficiency fever)	II	36.0	1.2	1.6	2.0
		I	22.0	0.8		1.2
						EK = 75.3 (0.4 – 1.7)
1	V. Epithelial syndrome: Paleness of the skin and sclera with a bluish tint	II	281.0	1.7	4.8	8.2
		I	59.0	0.4		1.7
2	Paleness of the skin with a yellowish tinge around the mouth.	II	120.0	1.3	1.7	2.2
		I	71.4	0.8		1.2
3	Pale skin with a greenish tint (chlorosis)	II	80.0	1.2	1.5	1.8
		I	54.0	0.9		1.4
4	Dryness, roughness, peeling of the skin.	II	232.0	1.5	3.0	4.5
		I	78.4	0.5		0.9
5	Hair changes (dullness, brittleness, hair loss)	II	304.0	1.7	5.2	8.8
		I	59.0	0.3		1.7
6	Nail changes: (thinning, striation, brittleness, hollowness)	II	161.0	1.8	7.3	13.1
		I	22.2	0.2		1.8
7	Foot cracks	II	196.0	1.1	1.1	1.2
		I	178.0	0.9		1.0
						EK = 24.6 (04–1.62)
	Total					EK = 186.4 (0.38–1.63)

In our studies, those with the highest K scores had asthenic-vegetative (75.3 units), gastrointestinal (41.5 units) and cardiovascular syndromes (37.5 units) rather than epithelial (24.6 conventional units) and immunological syndromes (7.5 conventional units). One gets the impression that with IDA in children, all organs and systems are affected, i.e., the more severe the IDA degree, the more organs and systems are involved in the pathological process. We identified the highest weight indices for the symptoms of "palpitations" (12.8), feelings of lack of air (9.1), lethargy, adynamia, depression, changes in the nails (7.3), impaired vision and hearing, increased sweating of the palms and soles (6.4), weakening of memory and attention (5.9), nausea, vomiting (5.7), muscle weakness, chronic diseases of the liver and biliary tract (5.5), hair changes (5.2).

Factors with an average weight index for the development of IDA (5.0 - 4.0) we attributed noise in the ears, head, irritability, tearfulness, pale skin and blue sclera, ECG (ST-T) changes, fatigue, intolerance to stuffy rooms, "goosebumps" before the eyes when standing up, imperative urge to urinate, sideropenic dysphagia and cheilosis. Perversion of smell, frequent acute respiratory viral infections, weakening of heart sounds, a feeling of pain and heaviness in the chest, a feeling of heat on the face, torso, anxiety, tearfulness, arterial hypotension, chronic colitis, enteritis and decreased appetite had K gradations from 3.0 to 4.0 conventional units. .un., other symptoms had <5.0 c.u. predictive coefficient.

The practical significance of this prognostic map of the IDA severity in girls is that, based on the summation of the prognostic coefficient of each IDA clinical sign in the examined, it is possible to determine not only the prevailing syndrome in the IDA clinic, but also to assess the severity of the IDA clinical symptoms in children. To do this, all ranges of clinical IDA severity according to the prognostic coefficient (r = 0.38-1.63) are divided into three intervals, which allows to identify children with mild (0.58 - 0.8 c.u.), with moderate severity (0.81 - 1.22) and severe IDA degree (≥1.23 c.u.), we conditionally designated them according to type A, B, C severity [5]. By way of discussion, we note that until now, when separating the severity of anemia (mild, moderate, severe) in children and adults, researchers are based on the Hb content in the blood, which reflects only the degree of decrease in the level of the latter, which does not correspond to the IDA severity. As a result, when managing sick children, doctors are more focused on replenishing the Hb level (rather than iron stores in the body, especially maintaining them), do not look for the IDA causes from other organs and systems, and this, apparently, often leads to the discrediting of therapeutic and preventive measures to eliminate ID. We consider that the division of each IDA severity (I, II and III) into the similarity of weak, moderate and severe activity of the inflammatory process (as in rheumatism) or A and B (as in assessing the stage of circulatory failure), would allow doctors to clarify the clinical severity IDA in children of different ages, making up a range of preventive and therapeutic measures depending on the involvement of organs and systems in the overall pathological process. Therefore, the clinical and laboratory diagnosis of anemia can be formulated as I-degree IDA (A severity) with a predominance of epithelial syndrome or II-degree IDA (C severity), i.e., a combined immunological, gastrointestinal and cardiovascular syndrome.

We do not pretend to the widespread use of such a formulation of the IDA diagnosis, and we are aware that the solution of such issues is not the lot of one scientific team. We only want to emphasize some unresolved issues of terminology in assessing the IDA severity.

3 Conclusion

From the data of our material, it follows that the clinical picture of IDA in schoolgirls was somewhat transformed and among them the syndrome of a decrease in the immunological resistance of the body and gastrointestinal syndrome began to prevail, their frequency increased by more than 2–5 times compared to the above authors.

Thus, the clinical picture of iron deficiency anemia in adolescent girls is characterized by the polymorphism of symptoms and syndromes, which indicates the involvement of many organs and systems in the pathological process. We concluded that it is necessary to update data on the ID clinical symptoms in adolescent girls, depending on age, gender and regions of residence.

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