

DELAYED PUBERTY AND VARIOUS DEVELOPMENTAL DISORDERS IN BOYS (TEENAGERS) IN THE SURKHANDARYA REGION

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Abstract. *In this article, the authors analyze the data of a study performed in Termez and 4 districts of the Surkhandarya region among 523 adolescents (boys) aged 11-17 years. In total, various disorders of sexual and general development were identified among 245 adolescents (48.6%), of which among 83 (33.8%) this pathology was combined with an iodine deficiency state of varying degrees. 11/6 examined adolescents suffered from one or another disorder of general development on the background of iodine deficiency and thyroid diseases. In the structure of malformations of the genital organs, the role of iodine deficiency was 13.43% - these are 8 p-s with DG out of 58 identified patients.*

Keywords: *delayed puberty, boys, adolescents, health screenings.*

Relevance. Today, there are more than 1.2 billion young people aged 10-19, or 17% of humanity (UNPO, Department of Economic and Social Affairs and Population Division, 2015, and Cummins, 2011). Their new abilities and health are the cornerstone of future economic and social prosperity, especially in an age of demographic aging (Sheehan et al., 2017).

In recent decades, theoretical and methodological advances have synergistically advanced the understanding of puberty far beyond the simplistic notions of "storm and stress" (Casey et al., 2010). Indeed, the very concept of puberty is being redefined (Herbison, 2016; Le Tissier et al., 2017). Emerging models and new ideas have moved away from viewing puberty as a primarily physical process driven by a hierarchical switch-initiated cascade of neuroendocrine and gonadal steroids (Sisk & Foster, 2004), to viewing it as a multi-dimensional interacting set of maturation processes in the body and brain, and social-emotional ability (Blakemore & Mills, 2014; Byrge, Sporns, & Smith, 2014; Dahl, 2016).

Adolescence, according to the WHO classification, is the period of life from ten to eighteen years, when the maturation of the body is completed. It is during this period that various disorders can appear that prevent normal puberty.

Among the many factors affecting the health of the younger generation, iodine deficiency occupies a special place. In recent years, in the regions of uncorrected iodine deficiency, there has been an increase in the intensity of goiter endemia and associated somatic, mental and reproductive health disorders.

Enough data has been accumulated on the negative impact of iodine deficiency diseases on the health of the younger generation, however, in-depth research and comparative analysis of the state of health, physical and sexual development in adolescent boys, depending on the severity of iodine deficiency, have practically not been carried out.

Often, parents (very rarely, the children themselves) turn to doctors - endocrinologists, pediatricians, urologists with complaints of a lag in the development of the genital organs relative to their peers. Some of these patients are referred for consultation with other specialists. In approximately 90% of cases, as a result of the examination, it turns out that there is no delay in puberty in a child (adolescent, young man). However, the vast majority of doctors, when solving these issues, are guided only by the subjective perception of the patient's somatic status and their practical experience, which is fraught with errors. Meanwhile, it is necessary to objectify the anamnesis, examination, and laboratory examination results in order to obtain reliable results, regardless of personal experience and subjective opinion of the doctor during preventive examinations in schools.

But more than half of the patients do not apply on time, and the true frequency of sexual development disorders remains inaccurate.

All this has been the reason for the present study.

The purpose of the research is to study the frequency of delayed puberty and various developmental disorders in adolescents (boys) in the Surkhandarya region.

Material and research methods. In September 2022, with the participation of employees of the Surkhandarya Regional Endocrinological Dispensary, we observed and examined 523 adolescents (boys) aged 11-17 years old (pupils of colleges, schools) in Termez and 4 districts of the Surkhandarya region.

All data were recorded in a questionnaire specially developed by us for each patient with all clinical anamnestic, objective and instrumental studies, which was subsequently entered into the database we had created (certificate of registration with the Agency for Intellectual Property of the Republic of Uzbekistan BGU No.00289 dated 02.03.2012 Tashkent, Ismailov S.I., Mavlonov U.Kh., Urmanova Yu.M., Ryaboshtan A.O.).

All 523 adolescents underwent anthropometric studies (target height, centile, growth rate, SDS of height and weight, etc.) based on the international Tanner-Whitehouse height-weight map, assessment of the stage of sexual development according to J. Tanner (using tables and an orchidometer), if necessary, patients were sent for pre-examination-X-ray (X-ray of the hand and Turkish saddle, ultrasound of the genital organs, karyotype, surgeon's consultation, genetics, and other studies).

The obtained data were processed using computer programs Microsoft Excel and STATISTICA_6. The reliability of differences in quantitative indicators ($n > 12$) was determined by the Wilcoxon method for unrelated ranges, to determine the reliability of small samples ($n < 12$),

a nonparametric Fisher component randomization test for independent samples was used, for qualitative values, the exact Fisher-Irwin test was used. Differences between groups were considered statistically reliable at $P < 0.05$. Mean values (M), standard deviations of means (m) were calculated.

The reliability of differences in the level between groups was assessed by the value of the confidence interval and Student's test (p). Differences were considered statistically reliable at $p < 0.05$.

Of the 523 examined boys, 143 patients (27.3%) with delayed puberty and various disorders of sexual development were selected and subsequently examined.

Comparison of anthropometric indicators was performed in comparison with literature data (3).

Research results and discussion. Examination of 523 boys contributed to the diagnosis of various forms of delay and disorders of sexual development. Table 1 shows the distribution of examined adolescents by age - stages of J. Tanner's puberty.

Table 1.

Distribution of patients by age (by 5 stages of J. Tanner's puberty).

Tanner's stages of puberty	Age (years)	Number of examined, n	n=523	Number of patients with DP *
I	prepubertal	49 (9,4%)	49	-
II	11,7 ± 1,3 years	126 (24,0%)	126	25
III	13,2 ± 0,8 years	83 (15,9%)	83	43
IV	14,7 ± 1,1 years	80 (15,3%)	80	38
V	15,5 ± 0,7 years	185 (35,3%)	185	37
Total: n = 523		523	523	143

Note: *DP – delayed puberty

As can be seen from Table 1, the patients aged 11.7 ± 1.3 years and 15.5 ± 0.7 years (24.0% and 35.3%) were the most common among the examined patients. During the examination, patients presented various complaints (Fig. 1).

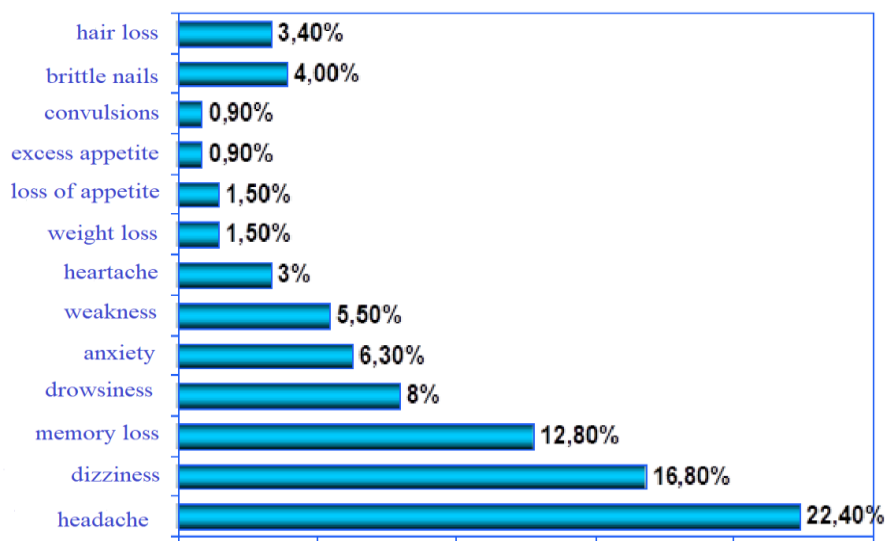


Fig.1. The frequency of complaints presented during the examination (%).

As can be seen from Figure 1, the most common complaints were headaches - among 117 p-s, dizziness - among 88 p-s, memory loss - among 67 p-s, drowsiness - among 42 p-s, general weakness - among 29 p-s, brittle nails - among 19 p-s, pain in the heart - among 18 p-s, dry skin - among 10 patients, that is, these complaints are most characteristic of iodine deficiency conditions and were dominant.

Figure 2 shows the frequency of various risk factors in anamnesis.

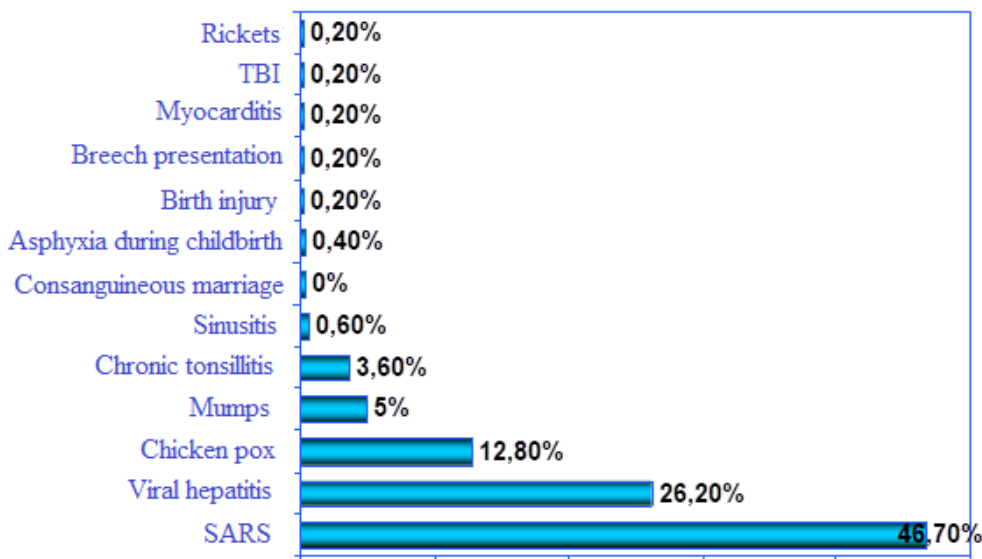


Fig. 2. Frequency of various risk factors in anamnesis (%).

As follows from Fig. 2, there are many different risk factors in the anamnesis of the examined adolescents, among which the leading place is occupied by neuroinfection - among 244 p-s (46.7%), then viral hepatitis - among 137 p-s (26.7%) and in third place in terms of frequency - chickenpox - among 67 p-s (12.8%).

Table 2 gives the frequency of thyroid diseases detected in adolescents.

Table 2.

Frequency of thyroid disease

№	Disease	n	% to the total number of patients
1	Diffuse goiter 1 degree	74	14,2
2	Diffuse goiter 2 degree	14	2,7
3	Diffuse goiter 1-2. Euthyroidism.	42	47,7
4	Diffuse goiter 1-2 . Hypothyroidism	46	52,3
5	Autoimmune thyroiditis.	1	0,2
	Total	89	17,01

As follows from Table 2, a total of 89 (17.01%) patients with iodine deficiency diseases of the thyroid gland were identified among 523 adolescents: diffuse goiter (DG) 1 degree - among 74 p-s (14.7%), diffuse goiter 2 degree - among 14 p-s (2.7%), autoimmune thyroiditis -1 (0.2%), among which DG, euthyroidism was observed among 42 p-s (47.7% of patients), and DG, hypothyroidism - among 46 (52.3%).

Table 3 gives the frequency of delay and various disorders of sexual development among 523 adolescents.

Table 3.

Frequency of delay and various developmental disorders in adolescents.

№	Type of developmental disorder	Total number of patients	% to the total number	Of these, combination with DG	% of the patients
1	Delayed puberty	97	18,5	36	37,1
2	Growth retardation	55	10,5	10	18,2
3	DPSD	81	15,5	36	44,4
4	MR	1	0,2	-	-
5	DSD	1	0,2	-	-
6	PP	1	0,2	-	-
7	Underweight	8	1,5	-	-
8	DPMD	1	0,2	1	0,2
	Total	245	48,6	83	33,8

Note: * GR – growth retardation, DP – delayed puberty, DPSD- delayed physical and sexual development, MR – mental retardation, DSD – delayed speech development, PP – precocious puberty, DNTG - diffuse non-toxic goiter, DPMD - delayed physical, sexual and mental development

As can be seen from Table 3, among the developmental disorders, the most common were DP (18.5%), as well as DPSD (15.5%). At the same time, the combination of pathology with DG was the highest in frequency among patients with DPSD - in 44.4% of cases among 81 patients. In total, various developmental disorders were identified among 245 adolescents (48.6%), of which among 83 (33.8%) this pathology was combined with an iodine deficiency state of varying degrees.

Thus, 1/6 of the examined adolescents suffered from one or another disorder of general development against the background of iodine deficiency and thyroid diseases.

Next, we studied the frequency of malformations of the genital organs in the examined adolescents (Table 4).

Table 4.

The frequency of malformations of the genital organs in examined adolescents

№	Type of developmental disorder	Total number of patients	% to the total number	Of these, combination with DG or DP	% of the patients
1	Varicocele	12	2, 3	+DP -5, +DG - 2	41,6 16,7
2	Cryptorchidism 1 and 2 sides.	7	1,4	+DP-3 +DPSD-1	42,8 14,3
3	False cryptorchidism	6	1,1	-	-
4	Anorchia - 1 sided	4	0,8	+DP-1 +DG-1	25 25

5	Anorchia 2 sided	2	0,4	+ Bladder stone removed -1	50
6	Micropenis	6	1,2	+DP-5 +DPSD-1 +DG-2	83 16,7 33,3
7	Inguinal hernia - 1 sided	6	1,2	+DP-2 +DPSD-1 + varicocele -1	33,3 16,7 16,7
8	Inguinal hernia - 2 sided	1	0,1	+DPSD-1	100
9	Gynecomastia	12	2,3	+DP-5 +DG-2 +DPSD-1	42 16,6 8,5
10	Umbilical hernia	2	0,4	+DG-1	50
	Total	58	11,08		

here DG – diffuse non-toxic goiter

According to the analysis, it follows that out of 523 adolescents, various disorders of sexual development were detected among 58 adolescents (11.08%). At the same time, the most common were such as varicocele and gynecomastia - 12 cases (2.3%), congenital anomalies of the genital organs were not uncommon: anorchia - 6 p-s (1.1%), etc. At the same time, many of them combined with DG - 8 p-s out of 58 (13.4%) - and DP - 26 p-s (44.8%).

Table 5 shows the results of the analysis of various operations that the adolescents examined by us have already been subjected to.

Table 5.

The frequency of operations performed for violations of sexual development in examined adolescents

№	Type of developmental disorder	Total number of patients	% to the total number of P-s	Of these, combination with DG or DP	% of the patients
1	Condition after removal of an inguinal hernia on 1 side	10	1,9	+3II-1	16,4
2	Condition after removal of an inguinal hernia on 2 sides	1	0,2	-	1,6
3	Condition after varicocele removal	3	0,6	-	4,9
4	Condition after the testicles are brought down	5	0,5	-	8,0
5	Condition after testicle removal	1	0,2	-	1,6
6	Condition after removal of a bladder stone	1	0,2	-	1,6

7	Appendectomy	36	6,8	-	59
8	Condition after kidney stone removal	1	0,2	-	1,6
9	Condition after removal of echinococcus lung on the right	1	0,2	+ DP-1	1,6
10	Condition after removal of liver echinococcus	1	0,2	-	1,6
11	Condition after removal of the umbilical hernia	1	0,2	-	1,6
	Total	61	11,7%		

* here DG – diffuse non-toxic goiter, DP – delayed puberty

In total, the patients underwent 61 different types of surgical interventions (11.7%), of which the most common were appendectomy - 36 p-s (59.0%), removal of an inguinal hernia - 11 p-s. (18%), as well as bringing down the testicles - 5 (8%). Thus, 1/8 of the adolescents examined had already undergone surgery for various diseases of both the urinary-genital systems and other internal organs.

Next, we analyzed the frequency of detected comorbidities (Fig. 3). From the data in the table it can be seen that adolescents most often had anemia (16.8%), less often - McCune-Albright syndrome (0.4%).

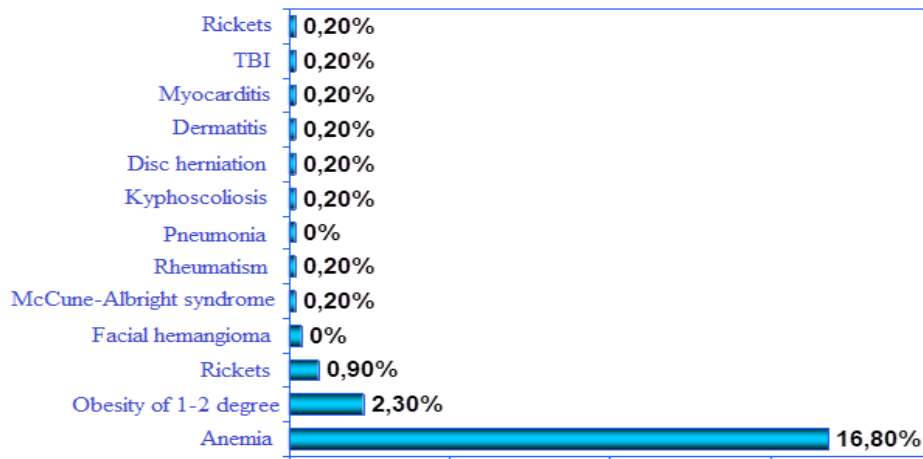


Fig. 3. The frequency of identified comorbidities (%)

The study of average anthropometric indicators revealed the following disorders among patients (table 6).

Table 6.

Average growth data for 523 adolescents by age (according to J. Tanner's 5 stages of puberty).

Age, years, by stages of puberty according to Tanner	Average Height, cm Healthy *	Average height, sm patients	P
I prepubertal	136,80 ± 6,24	125,5 ± 3,3	< 0,05
II 11,7 ± 1,3 years	145,74 ± 7,07	134,6 ± 4,5	< 0,05

III 13,2 ± 0,8 years	154,76 ± 7,94	141,52 ± 5,8	< 0,05
IV 14,7 ± 1,1 years	165,32 ± 8,18	149,1 ± 4,2	< 0,05
V 15,5 ± 0,7 years	170,10 ± 7,35	153,6 ± 6,4	< 0,05
Total: n = 523			

Note:* here, the average data for normal growth are taken according to I.I. Dedov (3),
P – reliability of differences compared to the norm.

As can be seen from the data in Table 6, in all age groups there was a reliable decrease in the average growth values ($p < 0.05$).

Thus, summarizing the above analysis, it can be noted that such studies should be carried out as both screening and monitoring of adolescents for the purpose of early diagnosis of various anomalies of the reproductive sphere in conditions of iodine deficiency.

Conclusions.

1) In total, various disorders of sexual and general development were identified among 245 adolescents (48.6%), of which among 83 (33.8%) this pathology was combined with an iodine deficiency state of varying degrees..

2) 1/6 of the examined adolescents suffered from one or another violation of general development against the background of iodine deficiency and thyroid diseases.

3) In the structure of malformations of the genital organs, the role of iodine deficiency was 13.43% - these are 8 p-s with DG out of 58 identified patients.

4) 1/8 of the adolescents examined had already been operated on for various diseases of both the urinary and reproductive systems and other internal organs, which indicates an increased risk of diseases of the internal organs in the study group.

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