

Peculiarities of Functional Activity of the Pituitary-Thyroid System in Adolescents of the North

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Abstract

The article presents a pilot study on the assessment of functional activity of pituitary-thyroid system (PTS) in adolescents as a factor of long-term adaptation to life in the North. The study included 864 adolescents of different ethnic groups (the Russians, the Yakuts, the Evenks, the Evens, the Dolgans, the Chukchi, the Yukagir) and found that PTS functional activity varies according to ethnicity. (**International Journal of Biomedicine. 2018;8(2):147-149.**)

Key Words: adolescents • pituitary-thyroid system • Yakutia • ethnicity

Abbreviations

FT4, free thyroxine; **FT3**, free triiodothyronine; **PTS**, pituitary-thyroid system; **SIPN**, small indigenous people of the North; **TSH**, thyroid-stimulating hormone; **T3**, total triiodothyronine.

Introduction

In the regions of Siberia, the North and the Far East of Russia, the pathology of the thyroid gland is one of the most common. In general, the prevalence of endocrine pathology among adolescents in these regions is 5 times higher than among the population of Russia as a whole.⁽¹⁻⁵⁾ Yakutia belongs to the regions with endemic iodine deficiency. In a number of districts of Yakutia, the level of ioduria is about 26µg/l vs. 100-200µg/l in the norm.

The endocrine system indirectly affects the processes of adaptation to various endo- and exogenetic factors, especially during the period of physical and sexual maturation.^(6,7) Hormonal changes are of great importance in the development of various deviations in the state of children's health.⁽⁸⁾ The

complex interrelations of neuro-humoral mechanisms and their dynamic functional restructuring in response to the influence of the internal and external environment require a comprehensive study and objective evaluation of the hormonal profile of children.^(2,7,9)

Materials and Methods

This research was carried out within the framework of the project "Monitoring the state of children's health" (registration number 0120-128-07-99). The study was approved by the Ethics Committee of the Yakut Science Center of Complex Medical Problems. Written informed consent was obtained from the parents /legal guardians.

We examined the health status of 864 adolescents of different ethnic groups living in 5 settlements in the Far North of Yakutia (Table 1). Hormones of PTS—TSH, T3, FT4, and FT3—have been determined by enzyme immunoassay ("Victor-2" analyzer) in adolescents of health group I-II using appropriate test systems: Monobind (USA), Xema (Russia).

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Table 1.**Prevalence of endocrine pathology in adolescents of Yakutia**

Settlement	Identified endocrine pathology	Prevalence of endemic goiter
Berezovka (Srednekolimsky)	39 (27.5%)	8 (5.6%)
Olenegorsk (Alaihovskiy)	23 (29.5%)	16 (20.5%)
Andryushkino (Nizhnekolimsky)	126 (44.2%)	22 (8.0%)
Saylyk (Ust-Yansky)	82 (36.8%)	36 (16.1%)
Total	270 (37.6%)	82 (11.4%)

Statistical analysis was performed using StatSoft Statistica v6.0. Baseline characteristics were summarized as frequencies and percentages for categorical variables and as mean±SEM for continuous variables. Multiple comparisons were performed with one-way ANOVA and Tukey's HSD test. A probability value of $P < 0.05$ was considered statistically significant.

Results

In adolescents older than 15 years, the prevalence of endocrine pathology was higher than in those 10-14 years of age. The prevalence of endemic goiter depended on the place of residence. In the Saylyk and Olenegorsk settlements, in adolescent over the age of 15, endemic goiter was registered in 16.1% and 20.5% of cases, respectively.

These data are higher than in the children of the Far Eastern District, previously described by V.Kozlov.⁽¹⁰⁾

Table 2.**The levels of PTS hormones in general groups of teenagers in Yakutia**

Population	TSH μU/mL	T3 nmol/L	FT4 pmol/L	FT ₃ pmol/L
All teenagers	(n=864) 1.76±0.04	(n=390) 3.04±0.04	(n=401) 14.6±0.15	(n=403) 2.26±0.04
All girls	(n=385) 1.73±0.06	(n=175) 2.88±0.07	(n=166) 14.7±0.25	(n=166) 2.07±0.05
All boys	(n=479) 1.78±0.06	(n=215) 3.16±0.06	(n=235) 14.5±0.19	(n=237) 2.39±0.07
All Caucasoids	(n=126) 1.47±0.08	(n=85) 3.14±0.07	(n=39) 15.1±0.56	(n=39) 2.52±0.13
All indigenous	(n=818) 1.65±0.04	(n=352) 3.19±0.07	(n=395) 14.6±0.15	(n=397) 2.26±0.05

* $P < 0.05$ between the indigenous and non-indigenous groups of adolescents

The levels of PTS hormones in general groups of teenagers in Yakutia are presented in Table 2. The data obtained indicate that TSH secretion was significantly different between the indigenous and non-indigenous groups of adolescents.

The analysis of the hormone levels by ethnicity showed no gender differences, except for Dolgan teenagers (Table 3).

Taking into account the age of the examined adolescents, significant differences in TSH levels were found in the Evens;

Table 3.**The levels of PTS hormones in adolescents of different ethnic groups of Yakutia**

Variable	Caucasoids (1)	the Yakuts (2)	Small Indigenous people of the North					Statistics
			the Evens (3)	the Evenks (4)	theYukagirs (5)	the Dolgans (6)	the Chukchis (7)	
Girls								
TSH, μU/mL	(n=45) 1.46±0.16	(n=125) 2.1±0.13	(n=115) 1.53±0.12	(n=34) 1.61±0.17	(n=32) 1.18±0.19	(n=19) 0.79±0.12	(n=20) 1.65±0.20	F=5.3862 P=0.0000 P ₁₋₂ =0.0495 P ₂₋₃ =0.0076 P ₂₋₅ =0.0039 P ₂₋₆ =0.0004
T3, nmol/L	(n=36) 3.08±0.11	(n=29) 3.21±0.19	(n=50) 2.75±0.08	(n=30) 3.29±0.14	(n=15) 3.0±0.25	(n=18) 2.41±0.17		F=4.5942 P=0.0006 P ₁₋₆ =0.0307 P ₂₋₆ =0.0074 P ₃₋₄ =0.0288 P ₄₋₆ =0.0020
FT4, pmol/L	(n=15) 14.8±2.0	(n=86) 15.1±0.33	(n=57) 14.3±0.34	(n=4) 17.6±1.93	(n=13) 12.65±1.41			F=2.0041 P=0.0961
FT3, pmol/L	(n=13) 1.8±0.18	(n=86) 1.99±0.08	(n=57) 2.19±0.11	(n=4) 2.3±0.33	(n=13) 2.39±0.17			F=4806.0021 P=0.0000 P ₁₋₃ =0.0000 P ₂₋₃ =0.0000 P ₃₋₅ =0.0000
Boys								
TSH, μU/mL	(n=82) 1.46±0.12	(n=174) 2.1±0.11	(n=109) 1.7±0.14	(n=31) 1.43±0.15	(n=38) 1.18±0.16	(n=26) 1.38±0.17	(n=22) 1.3±0.17	F=5.2024 P=0.0000 P ₂₋₅ =0.0013
T3, nmol/L	(n=49) 3.2±0.1	(n=39) 3.62±0.16	(n=53) 2.92±0.09	(n=22) 3.64±0.15	(n=21) 3.52±0.20	(n=23) 3.55±0.73		F=1.7953 P=0.1153
FT4, pmol/L	(n=35) 15.2±0.53	(n=127) 14.5±0.28	(n=49) 14.8±0.30	(n=6) 14.5±0.78	(n=18) 13.02±0.85			F=1.7002 P=0.1508
FT3, pmol/L	(n=36) 2.63±0.14	(n=129) 2.16±0.06	(n=49) 2.47±0.19	(n=6) 2.48±0.28	(n=14) 3.79±0.56			F=9.1863 P=0.0000 P ₁₋₅ =0.0026 P ₂₋₅ =0.0000 P ₃₋₅ =0.0002

and in the pubertal period, in comparison with the prepubertal period, these levels increased in girls and decreased in boys. Gender differences for T3, as well as for TSH, were obtained only for the Dolgans. Statistically significant age-related differences were found in Yakut girls.

There were gender differences in the FT3 level in Caucasoids and Yukagirs ($P < 0.05$), but age-related differences for this hormone were not noted. There were no gender differences in the FT4 level in the general groups of the examined adolescents, and age-related differences were obtained only in Caucasians. In the general groups of Caucasians, in comparison with the indigenous adolescents (the Yakuts and SIPN), we revealed statistically significant differences only for TSH. There were no statistically significant differences in all studied hormones in adolescents of both sexes between indigenous and non-indigenous adolescents. Gender differences were obtained only for FT3 in Caucasoids.

In adolescents of the indigenous population, depending on ethnicity, comparative analysis showed that the thyrotropic function of the pituitary gland in SIPN adolescents was statistically lower ($P < 0.05$) than in the Yakuts, but the blood content of the most active fraction of thyroid hormones (FT3) in Yakut adolescents showed a statistically significant decrease ($P < 0.05$). The gender differences in the content of PTS hormones in adolescents of Caucasoids, Yakuts and SIPN showed that the Yakut girls had the highest thyroid-stimulating function of the pituitary gland in comparison with the girls of Caucasoids and SIPN ($P < 0.05$). In Yakut girls, the T3 level was also statistically higher than in SIPN girls, but the FT3 level was lower in comparison with this group ($P < 0.05$). The same tendency was observed in boys.

In conclusion, the results obtained are consistent with the high level of endemic thyroid disease in Yakutia. The study found that the functional activity of the endocrine system in adolescents in Yakutia varies according to their ethnicity.

Competing interests

The authors declare that they have no competing interests.

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