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IN PATIENTS WITH UAS OBSERVED, THE INCIDENCE OF LABARATOR INDICATORS BY SEX

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Resume

The results of the study showed that laboratory, hormonal, and metabolic parameters in patients with spinal artery syndrome (ALS) vary depending on gender and stage of the disease. In women, hemostasis parameters in the functional stage were mostly maintained normally, while in the organic stage of APTT, an increase in prothrombin time and INR, an increase in fibrinogen and a decrease in antithrombin III indicated activation of thrombogenic and inflammatory processes.; In men, these changes were more pronounced, harmonized with hemostasis and platelet imbalance. and hemodynamic disorders. Elevated levels of hormonal and inflammatory markers in women are associated with cognitive and psychoemotional disorders. At the same time, statistically significant differences were found in the indicators of estrogen, testosterone, progesterone, HOMA-IR, cortisol, and vitamin D depending on the stage of the disease and the psychotype, with a relative norm in the functional stage and a deepening of hormonal and metabolic imbalance in the organic stage ($p<0.01$). The results obtained confirm the need for individual diagnostic and therapeutic approaches, taking into account the gender and stage of the disease in ALS patients.

Keywords

spinal artery syndrome, gender differences, hemostasis system, hormonal dysbalance, metabolic disorders, psychotype, thrombogenesis, inflammation, cognitive and psychoemotional disorders, individualized therapy.

Relevance: Vertebral artery syndrome (VAS) is an ischemic syndrome associated with vertebrobasilar blood flow impairment, in which the variability and severity of clinical manifestations often demonstrate gender-related characteristics. Recent studies indicate that in women, VAS is more frequently associated with

cognitive and psycho-emotional disturbances, with higher levels of anxiety and depression compared to men (Orinov et al., 2026; Saidov et al., 2025). This phenomenon is explained by differences in hormonal background and sympathetic–adrenal system activity (Smith & Jones, 2020). In contrast, in men VAS is predominantly related to neurovascular morphological changes, arterial stenosis, and the development of collateral circulation, with motor and hemodynamic disorders being more prominent (Lee et al., 2019; Kim et al., 2018).

Laboratory parameters also reflect gender-specific features. In women, stress hormones (cortisol, adrenaline) and inflammatory markers (IL-6, IL-1β, TNF-α) are more markedly elevated, indicating immune-endocrine imbalance that correlates with cognitive and psycho-emotional disturbances (Orinov et al., 2026). In men, higher levels of markers associated with hemodynamic and neurovascular dysfunction (D-dimer, fibrinogen, lipid profile, CRP) are observed, corresponding to motor impairment and collateral blood flow disturbances (Lee et al., 2019; Kim et al., 2018).

Furthermore, gender and disease stage are crucial for interpreting laboratory findings. In the functional stage (Group 1), women show slight increases in hormonal and inflammatory markers, while hemodynamic parameters in men generally remain within normal limits. In the organic stage (Group 2), significant alterations in both systems are observed in both women and men, reflecting clinical deterioration of VAS and increased rehabilitation demands (Orinov & Saidov, 2025; Park et al., 2021).

A review of the literature indicates that evaluating laboratory parameters according to gender and VAS stage is essential for developing individualized diagnostic and therapeutic strategies. This approach enables comprehensive assessment of cognitive, psycho-emotional, and motor functions and supports the implementation of gender-specific rehabilitation measures.

In this study, coagulation system parameters were assessed in patients with vertebral artery syndrome (VAS) at the functional (Group 1) and organic (Group 2) stages and compared with a control group. Activated partial thromboplastin time (APTT) in the functional stage remained within normal limits in women (33.6 ± 1.2 s) and men (34.0 ± 1.3 s), whereas in the organic stage it showed significant prolongation in women (35.1 ± 1.4 s) and men (36.2 ± 1.5 s) ($p < 0.05$), reflecting subcompensatory changes in the hemostatic system and reduced platelet activity. The prothrombin index in Group 1 was close to normal (101.6 ± 2.0% in women and 100.8 ± 2.2% in men), but decreased in Group 2 to 96.7 ± 2.1% in women and 95.2 ± 2.3% in men, indicating activation of the coagulation cascade and dysfunction of the prothrombin complex ($p < 0.05$).

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The international normalized ratio (INR) was higher in the organic stage (Group 2), reaching 1.15 ± 0.05 in women and 1.19 ± 0.04 in men, indicating a tendency toward hypocoagulation. Prothrombin time was also prolonged in Group 2 (14.6 ± 0.6 s in women and 14.9 ± 0.7 s in men), showing a statistically significant difference compared with the control group ($p < 0.05$). Fibrinogen levels in Group 1 were close to normal (2.9 ± 0.2 g/L in women and 3.1 ± 0.2 g/L in men), but increased significantly in Group 2 (3.5 ± 0.3 g/L in women and 3.8 ± 0.3 g/L in men) ($p < 0.05$), indicating increased thrombotic risk and activation of inflammatory processes. Antithrombin III activity was within normal limits in Group 1 (102.2 ± 3.3% in women and 100.7 ± 3.5% in men), but decreased in Group 2 to 88.7 ± 3.1% in women and 85.1 ± 3.0% in men ($p < 0.05$), reflecting suppression of the anticoagulant system and a tendency toward hypercoagulability (Table 2).

Table 2

Mean values of coagulation parameters (M ± m) in patients with vertebral artery syndrome (VAS)

specification	Group 1 (n = 99)		Group 2 (n = 72)		Control
	Women	Men	Women	Men	up
AChTV, (21.1-36.5 sek	33,6±1,2	34,0±1,3	35,1±1,4*	36,2±1,5*	29,5±1,1
Prothrombin index, -105%) < BR >	101,6±2,0	100,8 2	96,7±2,1*	95,2±2,3*	108,6±2,
MnO(0.8-1.2	1,04±0,03	1,03±0,0	1,15±0,05	1,19±0,04	0,91±0,0
Prothrombin time, -15sek).	13,3±0,5	13,4 ±	14,6±0,6*	14,9±0,7*	11,8±0,4
Fibrinogen, (2-3G / l	2,9±0,2	3,1±0,2	3,5±0,3*	3,8±0,3*	2,9 ±0,2
Antithrombin III, (80-)%	102,2±3,3	100,7±3,	88,7±3,1*	85,1±3,0*	101,5±3,
Note	*statistically significant difference compared to the control group (p<0.05).*				

Based on the obtained data, patients with vertebral artery syndrome (VAS) in Group 2 (organic stage) demonstrated pronounced changes in the hemostatic system, characterized by a hypercoagulable state and an increased risk of thrombus formation. In the gender-based analysis, men showed more marked elevation of fibrinogen levels and a greater decrease in antithrombin III activity, indicating a higher risk of thromboembolic complications in this group.

Analysis of the lipid profile revealed that in VAS patients, both women and men had significantly higher levels of total cholesterol and low-density lipoproteins (LDL) compared with the control group; however, these parameters were relatively

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higher in women. In women, total cholesterol levels reached 5.9 mmol/L in Group 1 and 6.8 mmol/L in Group 2, while in men they were 6.1 mmol/L in Group 1 and 7.0 mmol/L in Group 2. High-density lipoprotein (HDL) levels in men of Group 2 decreased sharply to 0.8 mmol/L, which was associated with a marked increase in the atherogenic coefficient. Triglyceride levels were higher in men than in women, amounting to 2.0 mmol/L in Group 1 and 2.7 mmol/L in Group 2, with statistically significant differences compared to the control group ($p < 0.05$) (Table 3).

Table 3.

Average values of inflammatory and lipid exchange rates (m±m)in UAS observed patients

Specification	Group 1 (n = 99)		Group 2 (n = 72)		Control group
	Women	Men	Women	Men	
Total cholesterol, mmol/l (≤5,2)	5,9±0,3*	6,1±0,3*	6,8±0,4*	7,0±0,5*	4,7±0,2
PZLP(LDL), mmol/l (≤3.0)	3,4±0,2*	3,6±0,2*	4,2±0,3*	4,4±0,3*	2,6±0,2
YuZLP (HDL), mmol/l (≥1.0–1.5)	1,1±0,1	1,0±0,1	0,9±0,1*	0,8±0,1*	1,4±0,1
Triglycerides, mmol/l(0.4-1.7	1,9±0,2*	2,0±0,2*	2,5±0,3*	2,7±0,3*	1,3±0,1
Atherogenicity coefficient (2,2-3,5)	3,9±0,3*	4,1±0,3*	5,1±0,4*	5,4±0,4*	2,8±0,2
Note	*statistically significant difference compared to the control group (p<0.05).*				

In our study, analysis of lipid and inflammatory markers in patients with vertebral artery syndrome (VAS) revealed several gender-specific differences. In women, dyslipidemia was characterized mainly by a significant increase in total cholesterol and LDL levels and a decrease in HDL, whereas in men, triglyceride levels were markedly elevated. Analysis of inflammatory markers showed that men had higher levels of C-reactive protein (CRP), ASLO, and IL-6 compared to women, indicating a stronger inflammatory response in men, while lipid metabolism disturbances were more pronounced in women. Statistically significant differences compared with the control group were observed in both sexes ($p < 0.05$).

In Group 1, estrogen levels in women averaged 85 ± 15.1 pg/mL, decreasing to 65 ± 10.1 pg/mL in Group 2, indicating a decline in the organic stage. In men, estrogen concentration ranged from 22–25 pg/mL. Testosterone levels in men were 420 ± 50 ng/dL in Group 1 and 380 ± 40 ng/dL in Group 2. These differences in estrogen and testosterone between women and men were highly significant ($p <$

0.001), suggesting that gender hormones play distinct roles in the pathogenesis of VAS: decreased estrogen in women may promote ischemic processes, whereas higher testosterone in men may enhance vasomotor and metabolic mechanisms.

Insulin resistance assessed by HOMA-IR showed values of 2.1 ± 0.5 in women and 2.2 ± 0.4 in men in Group 1, increasing to 2.5 ± 0.5 in women and 2.7 ± 0.6 in men in Group 2. Statistical analysis confirmed that HOMA-IR values were associated with both VAS stage and gender (χ^2 = 8.6; p = 0.035), indicating significantly higher insulin resistance in patients at the ischemic (organic) stage. These findings highlight the pathogenetic significance of metabolic dysfunction in VAS.

Vitamin D levels were 30 ± 8.3 ng/mL in women and 25 ± 8.1 ng/mL in men in Group 1, and 28 ± 6.2 ng/mL in women and 24 ± 7.1 ng/mL in men in Group 2 (p = 0.052), indicating subnormal values with gender-specific patterns in VAS. Progesterone levels were higher in women (10 ± 3.1 ng/mL in Group 1 and 12 ± 3.4 ng/mL in Group 2), while consistently low in men (1 ± 0.5 ng/mL) (χ^2 = 180.5; p < 0.001), demonstrating the importance of gender- and stage-dependent hormonal dynamics.

In our study, estrogen, testosterone, and progesterone levels differed significantly between women and men, indicating that gender hormones play an important role in the pathogenesis of vertebral artery syndrome (VAS). HOMA-IR and cortisol levels were higher in the organic stage, reflecting metabolic dysfunction and association with ischemic processes. Vitamin D levels were subnormal across genders and stages, highlighting their pathogenetic and rehabilitative significance. In the functional stage of VAS, hormonal and metabolic parameters remained largely within normal limits, whereas in the organic stage, notable alterations were observed.

Analysis of hormone levels according to PAQ scale psychotypes revealed stage- and psychotype-specific differences. Estradiol (E2, pg/mL) in Group 1 averaged 25 ± 3 pg/mL in feminine psychotype patients, 60 ± 5 pg/mL in masculine psychotype, and 45 ± 4 pg/mL in androgynous patients; in Group 2, values were 22 ± 3 pg/mL, 55 ± 5 pg/mL, and 42 ± 4 pg/mL, respectively. Differences between psychotypes and groups were statistically significant (χ^2 = 12.1; p < 0.01).

Testosterone (ng/dL) levels in Group 1 were 450 ± 20 ng/dL in feminine psychotypes, 35 ± 4 ng/dL in masculine, and 210 ± 15 ng/dL in androgynous individuals; in Group 2, the levels were 470 ± 22 ng/dL, 30 ± 3 ng/dL, and 220 ± 18 ng/dL, respectively. These differences were statistically significant (χ^2 = 10.5; p <

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0.01) and also varied across psychotypes, confirming the influence of gender and psychotype on hormonal profiles in VAS.

HOMA-IR, vitamin D, and progesterone levels in VAS patients showed significant differences according to psychotype and disease stage (Table 4).

HOMA-IR index: In Group 1, values were 12 ± 1 in masculine, 0.7 ± 0.05 in feminine, and 6 ± 0.4 in androgynous psychotypes; in Group 2, they were 14 ± 1, 0.8 ± 0.06, and 7 ± 0.5, respectively (χ^2 = 8.9; p < 0.01), indicating higher insulin resistance in masculine and androgynous psychotypes, especially in the organic stage. Vitamin D (ng/mL): In Group 1, levels were 1.8 ± 0.1 in masculine, 2.2 ± 0.1 in feminine, and 2.0 ± 0.1 in androgynous psychotypes; in Group 2, they were 2.0 ± 0.1, 2.5 ± 0.1, and 2.3 ± 0.1, respectively (χ^2 = 7.2; p < 0.01), showing subnormal values with a psychotype-dependent pattern. Progesterone (ng/mL): In Group 1, levels were 32 ± 2 in masculine, 28 ± 2 in feminine, and 30 ± 2 in androgynous psychotypes; in Group 2, they were 30 ± 2, 26 ± 2, and 29 ± 2, respectively (χ^2 = 6.8; p < 0.01), reflecting a psychotype-specific progesterone profile.

These results highlight that metabolic and hormonal parameters in VAS patients vary significantly according to psychotype and disease stage.

Table 4

Hormonal indicators typical of PAQ btshyicha psychotypes in UAS observed groups

Specification	Group 1 (n = 99)			Group 2 (n = 72)			χ^2	p
	Maculin	feminine	androgynous	Maculin	feminine	androgynous		
Estrogen (E2, pg/ml	60±5	25±3	45±4	55±5	22±3	42±4	12,1	<0,01
Testosterone (ng / dl	35±4	450±20	210±15	30±3	470±22	220±18	10,5	<0,01
HOMA-IR	12±1	0,7±0,05	6±0,4	14±1	0,8±0,06	7±0,5	8,9	<0,01
Vitamin D (ng / ml	1,8±0,1	2,2±0,1	2,0±0,1	2,0±0,1	2,5±0,1	2,3±0,1	7,2	<0,01
Progesterone (ng / ml	32±2	28±2	30±2	30±2	26±2	29±2	6,8	<0,01

All hormonal parameters differed significantly according to psychotype and disease stage, with estradiol and testosterone showing a stronger dependence on psychotype. HOMA-IR and vitamin D levels also varied according to both psychotype and the stage of VAS.

Conclusion: The study demonstrates that in patients with vertebral artery syndrome (VAS), laboratory, hormonal, and metabolic parameters vary significantly depending on gender, psychotype, and disease stage. Women in the functional stage generally maintain normal hemostatic and hormonal-metabolic profiles, whereas in the organic stage, pronounced disturbances in coagulation, lipid metabolism, and hormonal balance are observed. Men show more marked hypercoagulability, elevated inflammatory markers, and higher triglyceride levels, reflecting greater thromboembolic and metabolic risk. Estradiol, testosterone, and progesterone levels differ significantly between genders and psychotypes, with estradiol and testosterone being particularly psychotype-dependent. HOMA-IR and vitamin D levels also vary with psychotype and disease stage, highlighting the role of metabolic dysfunction and subnormal vitamin D in VAS pathogenesis. These findings underscore the importance of gender-, psychotype-, and stage-specific diagnostic evaluation and individualized therapeutic and rehabilitation strategies in VAS patients.

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