

Self-Rating of Mental Status and Depression; Autonomic Nervous System Disbalance in Young Women with Low Blood Pressure

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Abstract: The study objective was to identify the specific characteristics of the mental status in the young women with low BP and assess its possible association with ANS disbalance. Out of 1264 young women (age: 17–35), the study group of 69 persons with low SBP (61–99 mm Hg) and the control group of 35 persons with normal SBP (120–129 mm Hg) were formed. SBP and DBP as well as heart rate were measured; Kerdo index was calculated. We used Eysenck Personality Questionnaire (EPQ) and Zung Self-Rating Depression Scale. For statistical analysis, the Spearman's rank correlation coefficient, Mann–Whitney U-test and chi-square test were used. The young women with low or normal BP showed no difference in the levels of anxiety, frustration, aggressiveness, rigidity, or depression states. The young women with low BP demonstrated AMS disbalance with sympathetic predominance. However, no correlation between Kerdo index and the mental status or depression level was revealed in hypotension.

Abbreviations:

ANS- autonomic nervous system;	BP- blood pressure
SBP- systolic blood pressure;	DBP- diastolic blood pressure
LD- level of depression;	EPQ- Eysenck Personality Questionnaire

Key words: Young women • Low blood pressure • Mental status • Depression • Autonomic nervous system disbalance

INTRODUCTION

The problem of low blood pressure (BP) is still poorly studied, although its prevalence in general population reaches 56% (according to Holter monitoring) [1]. A single-step outpatient examination of the female students showed low SBP (61–99 mm Hg) in 7.2% [2]. Low BP is associated with vertigo, cognitive impairment, physical discomfort, fatigue and lack of energy [2-8]. Analysis of the mental aspect of life in persons with low BP is also interesting for clinical practice [9, 10].

In fact, the problem of hypotension lies in treatment which is still not established and is rather empiric and palliative, than etiologic or pathogenetic. However, administration of vasopressors for chronic hypotension resulted in improved cognitive functions and enhanced cerebral bloodflow [11]. It is thought that ANS

dysfunction is one of the pathogenetic mechanisms in both postural and chronic hypotension (constitutional chronic low BP) [12-16]. Research in this field will be promising if the influence of ANS disbalance on the mental aspect of life in hypotensive persons can be proved.

Study objective: To identify specific characteristics of the mental status in the young women with low BP and assess its possible association with ANS disbalance.

MATERIAL AND METHODS

The field of research is arterial hypotension. Objects of interest include mental status, depression and the autonomic nervous system in arterial hypotension.

The study type is single-step. The study was performed at the time of examination of the university

students to evaluate their fitness for sports. Location of the examination: outpatient clinic; the timeframe — from 15.00 to 19.00 p.m.

We studied 1264 women at the age of 18 to 35 and two groups were formed out of them: the study group (with low SBP) and control (with normal SBP).

The inclusion criterion for enrollment into the study group was low BP. The exclusion criteria were as follows: connective tissue dysplasia, drug addiction, malignancies, diabetes mellitus, hypothyroidism, adrenal insufficiency, connective tissue disorders, congenital heart defects or abnormal vessels, heart surgery in the history, acute respiratory viral infection and pregnancy. Exclusions were based on the review of medical documents and interviews. The inclusion criterion for the control group was normal BP. The exclusion criteria were the same as for the study group.

The study group consisted of 69 women. The median age was 19 (25%-18; 75%-20). The control group included 35 women at the median age of 19 (25%-18; 75%-20). Both groups were similar with respect to the age ($p=0.5$). The low BP group was divided into 2 sub-groups by sympathetic or parasympathetic predominance. The study protocol was in accordance with the Declaration of Helsinki (1975), including its revised version (1983). The design, study protocol and informed consent form for participation in the study were approved by the Ethics Committee of the E.A. Vagner Perm State Medical Academy, RF Ministry of Health. The persons enrolled into the study signed the consent form for participation in the study.

Systolic blood pressure (SBP) in the range of 120–129 mm Hg was defined as normal [17]. SBP in the range of 61–99 mm Hg was categorized as low [18]. SBP, diastolic BP (DBP) and heart rate were assessed by the mean value for two measurements on the right shoulder in the sitting position (with a forearm resting on a table) using A&D UA-777 sphygmomanometer (AGD Company Ltd., Japan, 2012).

The mental status was assessed using the Eysenck Personality Questionnaire (EPQ) [19]. The final score was evaluated and interpreted according the following groups of questions:

- Anxiety (predilection of an individual for experiencing anxiety that is characterized by a low threshold for initiation of an anxiety reaction): 0–7 points-no anxiety; 8–14 points-moderate anxiety, of acceptable level; 15–20 points-intense anxiety.
- Frustration (mental status that develops due to the real or imagined obstruction which prevents the goal

achievement): 0–7 points-resistant to failures, no fear of difficulties; 8–14 points-moderate level, frustration present; 15–20 points-low self-esteem, avoidance of difficulties, fear of failures.

- Aggressiveness (elevated mental activity, striving for leadership using violence against other people): 0–7 points-calm, self-possession: 8–14 points-moderate aggressiveness; 15–20 points-aggressiveness, no self-possession, difficulties in communication and work with people.
- Rigidity (difficulties in changing a set activity under circumstances which objectively demand its adjustment): 0–7 points-no rigidity, easy switch: 8–14 points-moderate level; 15–20 points-pronounced rigidity, steadiness of behavior, belief, or opinions even when they disagree with the real situation or life. The change of occupation or family changes are contraindicated.

Presence of depression was assessed using Zung Self-Rating Depression Scale [20]. A level of depression (LD) was calculated using the formula:

$$LD = \Sigma_{sr} + \Sigma_{opp}$$

where Σ_{sr} -a sum of crossed-out numbers for “straight” propositions #1, 3, 4, 7, 8, 9, 10, 13, 15 and 19; Σ_{opp} -a sum of numbers, “opposite” to crossed-out ones for propositions #2, 5, 6, 11, 12, 14, 16, 17, 18 and 20. LD <50 indicated no depression.

LD between 50 and 59 was interpreted as mild depression of a situative or neurotic origin. For LD between 60 and 69, a subdepressive state or masked depression was assigned. LD >70 corresponded to major depression.

ANS status was determined by Kerdo index at rest (V.I.):

$$V.I. = (1 - d/hr) * 100$$

where d-DBP, hr-heart rate.

Positive and negative index values were interpreted as the shift of ANS tone towards sympathetic or parasympathetic predominance, respectively [21].

Statistical analysis was performed using non-parametric statistics, since SBP showed non-normal distribution (the Kolmogorov–Smirnov test and Lilliefors test; $p < 0.05$). For descriptive data characterization, median values, 25th and 75th percentiles were used. Possible correlation was evaluated using the Spearman rank correlation coefficient; the quantitative data in two

Table 1: Comparison of women in the study and control groups according to levels of anxiety, frustration, aggressiveness, rigidity and depressive states

Parameters	Level of parameter	Study group (n=69)	Control group (n=35)	P
		N (%)		
Anxiety	No anxiety	25 (36%)	14 (40%)	0.87
	Moderate anxiety	40 (58%)	18 (51%)	0.67
	Intense anxiety	5 (7%)	3 (9%)	0.88
Frustration	Resistant to failures	35 (51%)	17 (49%)	1.0
	Moderate	29 (42%)	16 (46%)	0.88
	Low self-esteem	6 (9%)	2 (6%)	0.88
Aggressiveness	Calm, self-possession	27 (39%)	15 (43%)	0.98
	Moderate aggressiveness	38 (55%)	15 (43%)	0.33
	Aggressiveness	5 (7%)	5 (14%)	0.42
Rigidity	No rigidity	22 (32%)	10 (29%)	0.90
	Moderate	43 (62%)	21 (60%)	0.98
	Pronounced rigidity	5 (7%)	4 (11%)	0.28
Depression	No depression	60 (87%)	32 (91%)	0.72
	Mild depression	8 (12%)	3 (9%)	0.89
	Sub-depression state	1 (1%)	0 (0%)	0.72
	Major depression	1 (1%)	0 (0%)	0.72

independent groups were compared using the Mann–Whitney U-test; the fractions in two independent groups were compared using chi-square test [22]. Statistica 6.1 (Stat Soft, USA; N^o AXXR912E53722FA) software was used.

RESULTS

As Table 1 shows, the study group was similar to the control group with respect to the levels of anxiety, frustration, aggressiveness, rigidity, or depressive states.

Characterization of distribution of Kerdo index, EPQ score and Zung Self-Rating Depression Scale score in the study group is presented in Table 2. As it can be seen, the study group shows ANS disbalance with sympathetic predominance. Kerdo index within the control group is distributed as follows: the median value, 25th and 75th percentile are +1, -6 and +15, respectively. The difference from the study group is found ($p=0.001$).

In the study group, no correlation between Kerdo index and the mental status or level of depression was found (Table 3).

DISCUSSION

Our data obtained differ from the other study results. Perhaps, this difference is due to the characteristics of the selected cohort: the young women with low BP. For example, E. Barrett-Connor and L. Palinkas studied association between BP and depression in the cohort of older men at the age of 60 to 89, who received no drug therapy for hypertension [23]. As the Beck depression

Table 2: Kerdo index, EPQ score and Zung Self-Rating Depression Scale score in the study group (median value, 25th and 75th percentiles)

Parameters	M (25%-75%)
Kerdo index	13 (5-21)
EPQ score	
- Anxiety	9 (6-11)
- Frustration	7 (4-10)
- Aggressiveness	9 (6-11)
- Rigidity	9 (7-12)
Zung Self-Rating Depression Scale, score	41 (34-48)

Table 3: Association between Kerdo index and EPQ score, Zung Self-Rating Depression Scale score in the study group (n=69)

Parameter	Rank correlation coefficient, r	p
EPQ, score		
- Anxiety	-0.06	>0.05
- Frustration	0.04	>0.05
- Aggressiveness	0.05	>0.05
- Rigidity	0.06	>0.05
Zung Self-Rating Depression Scale, score	0.01	>0.05

Inventory showed, the men with DBP <75 mm Hg had higher depression score than the men with normal BP (range: 75-85 mm Hg). In this study, the highest rate of depression was detected among men with SBP <75 mm Hg. A. Rosengren *et al.* published the data of a study which design included two inclusion criteria: sex (male) and age (50). It was found that low SBP was associated with lower level of well-being in social aspects (occupation, family, financial status, housing). Low DBP was associated with a low level of well-being in mental and somatic aspects [24].

We found no difference between hypotensive and normotensive female students with respect to the self-rated mental status, including anxiety and depression symptoms. However, M. Costa *et al.* revealed the difference in cognitive functions and attention grade between 25 hypotensive (SBP <100 mm Hg, DBP <60 mm Hg) and 22 normotensive female students. It was established that the hypotensive persons could recall less words from the list and showed slower mental work (counting) and lower attention levels [25].

However, we don't exclude the possibility that the information in German textbooks on affective disorders and depression in hypotensive persons is nothing but the labels assigned by doctors of the late 19th – early 20th century. At that time, the doctors thought that a neurotic patient always had lower BP than other patients [4]. Our work limitation is the use of the self-rating technique for mental health. But objective tests for assessment of depression and anxiety are mostly used by other specialists (neurologists and psychiatrists).

CONCLUSION

- No difference in levels of anxiety, frustration, aggressiveness, rigidity, or depression were found between the young women with low or normal SBP.
- The young women with low SBP show ANS disbalance in a form of sympathetic predominance.
- The young women with low SBP lack the influence of ANS disbalance on the levels of anxiety, frustration, aggressiveness, rigidity, or depression.

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