

# **PREDICTING RISK OF DETERIORATING HEALTH OF THE POPULATION BASED ON THE PRINCIPLES OF MEDICINE OF BORDERLINE CONDITIONS**

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It's generally known that the persistent health deterioration of wide population groups in Ukraine that has been observed during the last few decades is immediately connected with ineffectiveness of the current primary disease prevention system. According to the opinion of the leading scientists-hygienists, representatives of Kiev, Kharkiv, Vinnitsa and Lugansk scientific schools [1, 2, 3], the solving of this urgent scientific problem consists in the introduction of hygienical prenosological diagnostics methodology into the Sanitary Epidemiological Service practice, well tested in the full-scale scientific experiments in relation to children with different social adaptation levels, students and workers of different industries.

The study of prenosological prevention issues abroad is done in several different directions. First of all, it's the use of physical activity for the prevention of both somatic and neurogenic pathology [4, 5, 6, 7]. A considerable number of researches both in the European countries and in the USA is dedicated to the study of nutrition character as a risk factor for the development of prenosological conditions [8, 9, 10]. A wide spread of neurosis-like conditions among different population groups, especially among adolescents and youth, sets conditions for absolute relevance of the study of mental health disorder prodromes and timely mental disorder prevention [11, 12]. A great number of scientists around the world have dedicated their research to this problem [13, 14, 15, 16, 17].

Besides, a lot of attention is currently dedicated to the study of bad habits proliferation and healthy lifestyle propaganda as an effective way of early disease prevention [18, 19]. An important role in the professional pathology prevention is also

given to early diagnostics of premorbid conditions, stipulated by the influence of harmful working environment factors [20, 21].

According to our own experience of result generalization in theoretical and experimental research in the area of child and adolescent hygiene, industrial medicine and psychohygiene, prenosological diagnostics is an important compound of a wider branch of modern medicine – medicine of borderline conditions.

Medicine of borderline conditions is an area of medical science that studies general patterns of prenosological state formations and transitional processes of their transformations. The goal of medicine of borderline conditions is prevention of somatic and mental diseases of different genesis by the way of early determination of prodromes and of occurrence risks followed up by the body functional state correction. In the foundation of medicine of borderline conditions there is the working hypothesis that the development of clinical disease forms is preceded by certain bodily dysfunctions that have prenosological character. Timely identification of unhealthy prenosological conditions, risk detection and elimination and medical correction are directed at health maintaining and strengthening for different population groups, regardless of age, social, professional and other attachment.

The reason for separating medicine of borderline conditions into an independent branch of medical science is the new scientific concept built on the generally acknowledged patterns of accommodation process that trace to earlier undefined physiological phenomena, generalized in the adaptive transition law: “the organism transition to adapted condition happens at the cost of energy and plastic resources , accumulated during the previous adaptation experience, through the breakup of previous useful connections in the leading biological system, that used to provide stable organism state by the way of a new dominant system formation with three main types of reactions: protection mechanisms determined by evolution, individual adaptation experience reactions, and non-specific fast reactions to the new influence”.

This law determines the connection between the temporary space characteristics of the functional life support system of an individual at a certain stage of his physical, mental and social being, exposes the mechanisms of organism existence and

transformation under the influence of changing environmental factors. The principles of medicine of borderline conditions are built on the general adaptation patterns and have solely universal character.

Experimental data, got in the course of the complex study have confirmed the theoretical borderline conditions medicine principles. It was proved that the prenosological conditions occur as the result of dysfunctions of those adaptive systems, that are currently responsible for stable body functioning.

### **Psychodiagnostics of prenosological mental states in senior pupils**

According to the results of their own research, prenosological mental states of senior pupils presented by neurotic disorders situations and periods of risk against the background of certain accentuations of personality. Features of the formation of the rising individual mental properties are separate direction of psychodiagnostic study.

We investigated the communicative and emotionally-volitional personality traits using a teenage version of the questionnaire by R. Cattell [22]. Senior pupils who are learning by innovative method of preserving and forming health in School of health promotion (study group – SHP) and senior pupils from usual comprehensive school (control group - CG) were compared (Fig. 1, 2).

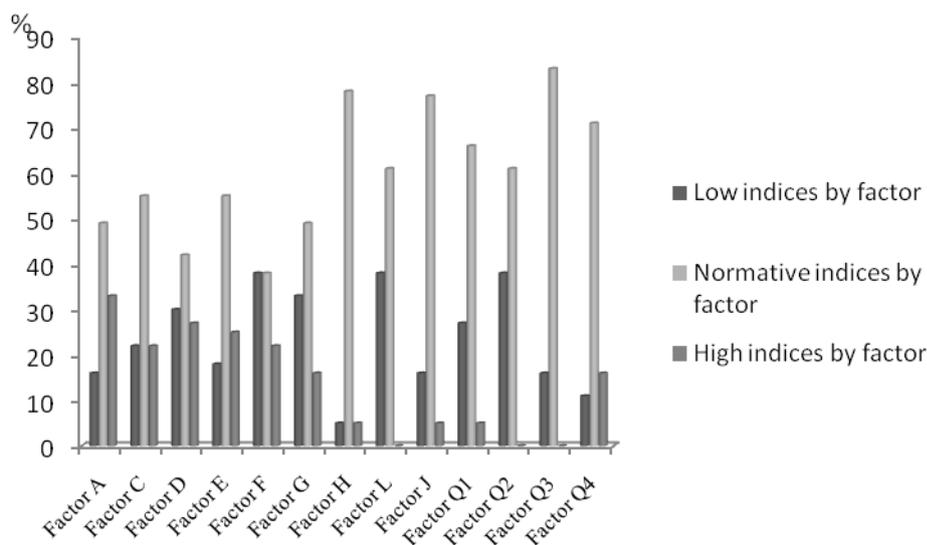


Fig.1. Emotionally-volitional communicative and personality traits of senior pupils in control group

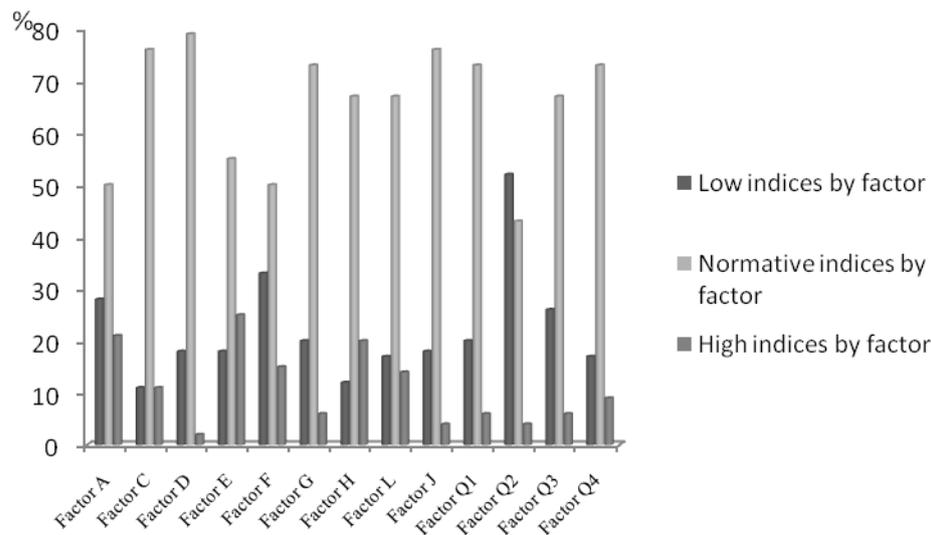


Fig. 2. Emotionally-volitional communicative and personality traits of senior pupils in SHP

Regulatory emotionally-volitional traits of senior pupils were established, namely: emotional stability and restraint, normative behavior, sensitivity to others, the standard level of anxiety, operating tension. These properties belong to the typical character traits constituting psychological portrait of representatives SHP. Caution is typical communicative property of school pupil from SHP, it defines the features of interpersonal interaction.

In contrast to the study group, such emotional-volitional feature as self-regulatory is the most common personality trait in the control group. Such communicative properties as courage, conformity, self-sufficiency are more common in the control group pupils in contrast to the study group. Personality traits "closure - communicative" and "submission - domination" manifest regardless of the life conditions.

Further analysis of prevalence of specific personality accentuation in the study and control groups was performed. Comparative psychodiagnostic experiment found typical personality traits, which should be subject to psychohygienic correction.

Psychological portrait of senior pupil from SHP presented by such personality traits: the individual is self-mastering, efficient, reasonable, developed emotionally and volitionally, sure of his abilities, understands the requirements of his social group, has a

typical mood stability and resistance to nervous exhaustion; cautious in interpersonal relations.

Such character accentuation as unsociability and its opposite - excessive sociability, and also increased (unmotivated) caution are inherent in a particular persons of group SHP. They have such features of psychological portrait as excessive seriousness, reasonableness, taciturnity and a tendency to complications. These features are implemented on the background of the two opposing options interpersonal interaction: 1) unsociability, reticence, rigidity and increased rigor to the estimation of people, which leads to a skeptical attitude towards others, loneliness and lack of close friends; 2) inconsistency of activities, the propensity to sociable disposition.

The data show significantly less prevalence of accentuations among of senior pupils from SHP. This can be viewed as a result of the favorable effect of social and psychological learning environment for teenagers of SHP, as well as a consequence of directional selection of students to study by the innovative pedagogical system. But, based on the potential dangers of a possible transformation of character accentuation into psychopathy, the complex of psychohygienic aid for pupils must include compulsory psychodiagnostics and psychohygienic correction of defective personality traits.

"Psycho-diagnostic questionnaire for school pupils" (own product of KhNMU department of hygiene and ecology number 1 [22]) was used to study the state of mental health by index of prenosological mental states prevalence among pupils SHP. Its questions are designed to identify abnormalities in certain cognitive function, and the cumulative diagnostic effect allows establishing signs that precede mental disorders (prenosological mental states).

Investigation of the prevalence of certain forms of prenosological states among senior pupils of SHP showed that the borderline conditions, which precede depression, are the most common ( $13,4 \pm 3,5\%$ ), asthenia has fewer cases ( $11,3 \pm 3,2\%$ ), hypochondria is the least common ( $5,2 \pm 2,2\%$ ). A similar trend was observed in the control group, there were more surveyed teenagers with deviations of prenosological

type: with signs of asthenia ( $15,6 \pm 3,2\%$ ), with symptoms of depression ( $18,8 \pm 4,0\%$ ) (Fig. 3).

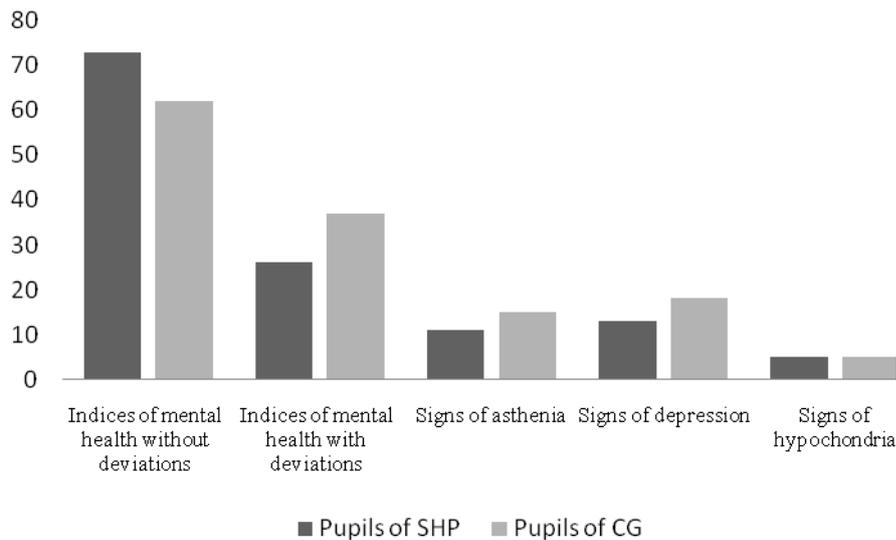


Fig. 3. Comparative characteristics of mental health of senior pupils of SHP and CG

Typical features of a psychological portrait of senior pupils with the specified complex of prenosological manifestations are: orientation of the individual to self-isolation against a background of lower self-esteem and a negative attitude to their own "I", which manifests itself as boredom, depressed mood and increased anxiety (symptoms of a depressive state), exhaustion against a background of deterioration of general and intellectual efficiency with typical daytime and sleep rhythms (signs of asthenia), excessive attention to their own health with the revaluation of the negative effects of their state and its biased judgement (typical symptoms of hypochondria).

### **Prenosological diagnosis of vibration disease risk among workers**

The prodromes of professional dust pathology among workers in hazardous industries manifested in violation of the pro-and antioxidant systems, and primary characteristics of the vibration pathology are evident in disturbances of body thermoregulation, which are the result of the relevant professional predefined risk factors (occupational dust and vibration).

Complex of unfavorable factors of combined action acts on the body of representatives of researched professions. These factors may increase the effects of local vibration under certain conditions, namely: industrial noise (exceeding the maximum

permissible level on 12 dBA), significant physical activity (transferring cargo weighing 10 to 40 kg and forced working posture for 20-80% of the time), general vibration (boilermaker, shipbuilder, molder), unfavorable meteorological conditions (fettler, molder, fitter of machine assembly work (FMAW), insufficient lighting on work surface (boilermaker, shipbuilder, molder), occupational dust and fumes in the air (fettler, molder, FMAW).

The general regularity has been found in a elektrotermometrical study of workers with jeopardize vibration profession. It manifests itself in the dropping of skin temperature of both hands at 4° C compared to the physiological norm (27-31° C) ( $p < 0.001$ ). This indicates a persistent deterioration in thermoregulatory function of the distal parts of the upper extremities. This deterioration is the result of a long-term action of high-level local vibration. Therefore, it can be argued that the decrease in skin temperature of hand up on 4° C can be considered as one of the primary symptoms of vibration disease. These signs are objective criteria of health state for workers with jeopardize vibration profession. The presence of such symptoms, even in the absence of other symptoms, can be regarded as a preozological sign of vibration disease.

The characteristic temperature dynamics of the hand surface was found in representatives of jeopardize vibration profession in the time of the cold test. In response to cold stress temperature was varied as follows: the left hand had surface temperature before cold load  $(26,80 \pm 0,27)^\circ \text{C}$  and after cold load -  $(25,20 \pm 1,75)^\circ \text{C}$  ( $p < 0,05$ ) (Fig. 4); the temperature of the right hand before the cold load was  $(25,13 \pm 0,31)^\circ \text{C}$  and after cold load -  $(22,64 \pm 0,27)^\circ \text{C}$  ( $p > 0.05$ ) (Fig. 5). This shows the insufficiency of the vasomotor apparatus predominantly in left hand. However it would be necessary to pay attention to the lack of statistically significant differences between the obtained data ( $p > 0.05$ ).

Within five minutes of monitoring the temperature of the left hand was significantly different from the start and was in the first age group -  $(25,61 \pm 1,24)^\circ \text{C}$ , and the second -  $(24,76 \pm 0,44)^\circ \text{C}$  ( $p < 0.01$ ). This increase of termoasymmetry with age shows typical age-related changes that occur in employees of jeopardize vibration profession.

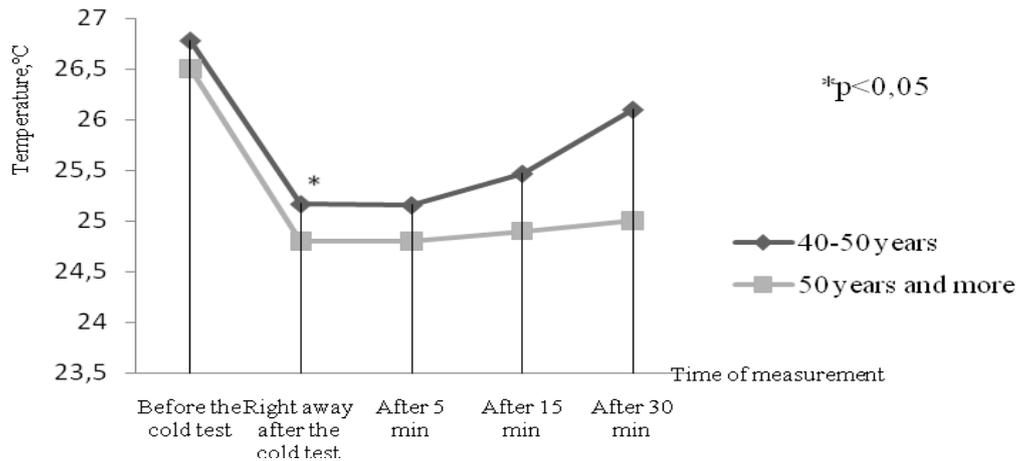


Fig. 4. Restitution of skin temperature of the left hand of employees, depending on the age

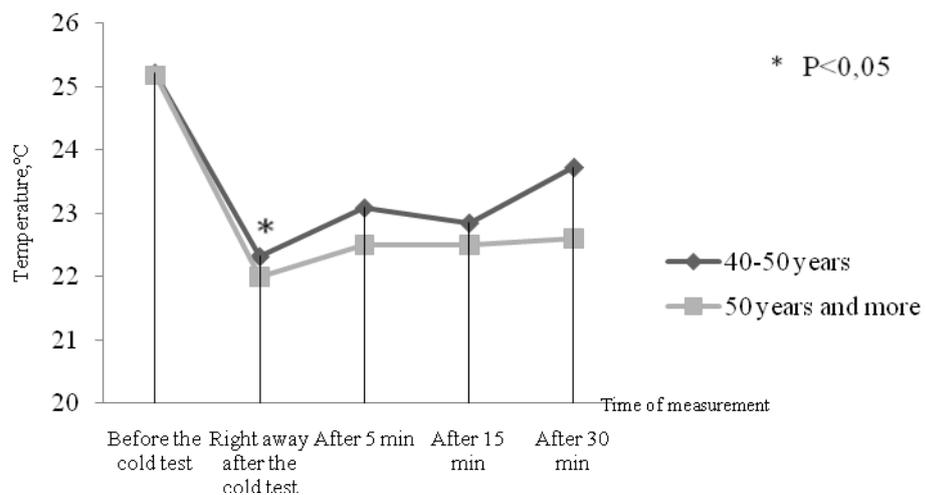


Fig. 5. Restitution of skin temperature of the right hand of employees, depending on the age

Next, we studied the dynamics of hand temperature change after cold test, depending on the length of experience in jeopardize vibration profession.

Thus study of the dynamics of hand surface temperature using contactless thermography allowed to establish that the worker is older and more experience in his jeopardize vibration profession, so he has a lower density of infrared radiation.

In addition, by the results of cold test it was found that more negative state of the thermoregulatory system is observed in the profession "boilermaker", "FMAW" and "fettler" that is a clear example of action of unfavorable working conditions (primarily local vibration).

Thus, the marked affection of the distal parts of the upper extremities was noted at all test frequencies in all groups under observation. The results of observation revealed the following regularities of pathogenesis: the age of the worker and his work experience in the jeopardize vibration profession are not defining features of vibration sensitivity lowering ( $p > 0.05$ ); however, the degree of deterioration is related to the severity of vibration disease ( $p < 0.05$  -  $< 0.001$ ), and differences in professional activities (the most pronounced loss of vibration sensitivity observed in shipbuilders and FMAW,  $p < 0.05$ ).

### **Conclusions**

Thereby our own observations have proved that prenosological mental conditions of students are represented by neurotic disorders of situations and risk periods against the background of certain personality accentuations.

The harmful industry workers show the prodromes of professional dust dysfunction, manifested in the disorder of pro-antioxidant system, and the prodromes of vibration pathology are the thermoregulatory system disorders as the consequence of certain occupationally predetermined risk factors (occupational dust and vibrations).

Among different age groups of children, the prodromes of organism sensibilization are some specific disorders of immune system that manifest in the increase of immunoglobulin G in the blood serum and disorders in the clinical presentation of blood at the expense of increase in eosinophil number against the background of such risk factors as hereditary disposition to allergies. The children's risk factors for allergic disease include: the pathology of pregnancy and delivery, the infant excess weight, presence of obligatory allergens in the nutrition, irrational immunoprophylaxis.

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### **Abstract**

Prenosological diagnostics is an important compound of a wider branch of modern medicine – medicine of borderline conditions. In the foundation of medicine of borderline conditions there is the working hypothesis that the development of clinical disease forms is preceded by certain bodily dysfunctions that have prenosologic character.

Timely identification of unhealthy prenosological conditions, risk detection and elimination and medical correction are directed at health maintaining and strengthening for different population groups, regardless of age, social, professional and other attachment.

Experimental data, got in the course of the complex study, was proved that the prenosological conditions occur as the result of dysfunctions of those adaptive systems, that are currently responsible for stable body functioning.

Thereby our own observations have proved that prenosological mental conditions of students are represented by neurotic disorders of situations and risk periods against the background of certain personality accentuations.

The harmful industry workers show the prodromes of professional dust dysfunction, manifested in the disorder of pro-antioxidant system, and the prodromes of vibration pathology are the heat system disorder as the consequence of certain occupationally predetermined risk factors (occupational dust and vibrations).

### **Summary**

Results of own theoretical and experimental research show that prenosological diagnostics has a wide application in medicine of borderline conditions. Experimental data, got in the course of the complex study, was proved that the prenosological conditions occur as the result of dysfunctions of those adaptive systems, that are currently responsible for stable body functioning, for example neurotic disorders and personality accentuations for senior pupils, disorders in thermoregulatory function for jeopardize vibration workers.

**Key words:** medicine of borderline conditions, prenozological diagnostics, psychodiagnostics, correction of the functional state, risk management, occupational diseases, mental health.

### **Резюме**

Результати власних теоретичних і експериментальних досліджень підтверджують, що донозологічна діагностика отримує широке використання в медицині пограничних станів. Отримані в ході комплексного дослідження експериментальні дані показують, що в результаті дисфункції адаптаційних систем, які в даний момент повинні забезпечувати стійке функціонування організму, виникають донозологічні стани, наприклад, невротичні розлади і акцентуації особистості у молоді, що навчається, порушення системи терморегуляції організму в робочих вібронебезпечних професій.

**Ключові слова:** медицина граничних станів, донозологічна діагностика, психодіагностика, корекція функціонального стану, керування ризиками, професійні хвороби, психичне здоров'я

## **Резюме**

Результаты собственных теоретических и экспериментальных исследований подтверждают, что донозологическая диагностика получает широкое применение в медицине пограничных состояний. Полученные в ходе комплексного исследования экспериментальные данные показывают, что в результате дисфункции адаптационных систем, которые в данный момент должны обеспечивать стойкое функционирование организма, возникают донозологические состояния, например, невротические расстройства и акцентуации личности у учащейся молодежи, нарушения системы терморегуляции организма у рабочих виброопасных профессий.

**Ключевые слова:** медицина пограничных состояний, донозологическая диагностика, психодиагностика, коррекция функционального состояния, управление рисками, профессиональные заболевания, психическое здоровье

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