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Complex Estimation of the Nutritional Status of Servicemen

Trying to estimate the state of health of servicemen in the context of the character of nutrition it is reasonable to look not on individual criteria characterizing a particular system of the body alone, but rather to conduct a complex study of the indices of the body structure, functional and adaptive capabilities of the organism, as well as its psychological state. The most informative values of these criteria are the fat component of the body, the index of functional changes of the blood circulatory system as well as the combined index of physical fitness, Shtange’s test involving voluntary breath-holding and personal anxiety.

Introduction

Despite all the advances in modern medical science, the development of new methods of diagnosis and treatment and higher living standards, the total number of human diseases is not reduced. In this regard, greater urgency in preserving and reinforcing the health of a population require primary prevention measures aimed at preventing diseases, injuries, poisoning and other pathological conditions.

With the purpose of timely diagnosis, treatment and prevention of diseases the system of dynamic health surveillance of population has been developed and is widely used now. However, it is based on identification of initial signs of disease; but for the purpose of health assessment rates of morbidity, hospitalization, work contribution losses, disability etc. are being used to illustrate clinically-revealed derangement. This results in the fact that the complete set of processes of health decline tends to evade the scrutiny of medical personnel thus impairing the effectiveness of preventive measures – mainly due to their late start.

One of the main environmental factors affecting the formation of human health is adequate and balanced nutrition. It provides normal growth and development, adaptation to the environment, immunity, physical and mental performance, while the study of the nutritional status allows its timely correction and influences the formation of human health, especially in organized groups of people.

One of the perspective directions of such research is the methodology of studying the nutritional status, characterizing the state of health that exists under the influence of consumable amount and composition of food as well as the conditions of food consumption and genetically determined features of nutrients’ metabolism.

A large number of studies is currently published on the nutritional status of different groups of population and in these studies a large number of indices selectively characterizing the structure of the body, functional and adaptive capabilities of the organism are being used for its assessment. At the same time, criteria of full assessment of health status formed under the influence of nutrition have not been elaborated so far, the psychological constituent of health is not taken into account.

Based on the foregoing, we conducted a study to select the most reliable, simple and understandable criteria in order to elaborate on their basis a combined index for nutritional status assessment.

In the developmental stage of the study, we proceeded from the following provisions:

- Indices in use must characterize the state of the structure, function, adaptive capacity and the psychological state of the subjects;
- Estimation of indices must be simple in realization, should not require significant investment of time and material resource;
- Body structure acts as the basic criterion for the nutritional status assessment;
- Indices describing other constituents of health must be relative to the body structure characteristics and they must have statistically reliable differences among the subjects with different indices of body structure.

Nutritional status	Insufficient	Decreased	Optimal	Heightened	Excessive
Gastro-intestinal tract, %	less than 9,0	9,0–11,9	12,0–17,9	18,0–20,9	21 and more
Points	3	4	5	4	3
Index of functional changes of blood circulatory system, conditional units	less than 1,85	1,85–1,99	2,00–2,30	2,31–2,45	more than 2,45
Points	3	4	5	4	3
Physical fitness index, points	less than 150	150–269	270 and more	150–269	less than 150
Points	3	4	5	4	3
Shtange’s breath-holding by inhalation test, seconds	less than 43	43–49	50 and more	43–49	less than 43
Points	3	4	5	4	3
Personal anxiety index, points	more than 41	39–41	30–38	27–29	less than 27
Points	3	4	5	4	3
Total amount of points	15–17	18–22	23–25	18–22	15–17

Tab. 1: The scale of the combined assessment of the nutritional status (License BY 17900 C1 2014.02.28)

As subjects of the study, 2,000 conscripts and cadets, 18-25 years old, were engaged.

Methods

Among the indices of the body structure we selected the most frequently used in screening studies of body mass index – a ratio of actual body weight to its ideal value calculated by the method of the European Association of Nutritionists - index Pinye, value of the body fat component.

To determine the functional state of the organism, we estimated the physical fitness; hemodynamic and physiological body reserves were studied.

Physical fitness was estimated based on the results of pull-ups on the bar, running for 100 and 1000 meters, with subsequent calculation of the composite index of physical fitness. To appraise each of the exercises a 100-point scale was designed.

Among the indices characterizing the state of the cardiovascular system, we used heart rate, systolic and diastolic blood pressure, pulse and the average dynamic pressure, stroke and minute blood volume calculated by Starr method, peripheral vascular resistance, index of the functional state of the organism, the Robinson index, Kerdo vegetative index and Quaas coefficient of endurance.

For the estimation of physiological reserves of the body, we conducted Ruffe and Ruffe-Dickson tests with dosed physical activity, as well as breath-holding tests of Shtange, Genchi and Bogomazov.

Adaptation abilities estimation was performed on the ground of the index of the functional changes of the blood circulatory system and heart rate variability: according to the index of tension of the regulatory systems, mode amplitude and variation range.

In the study of the psychological state, the methodology of subjective evaluation of situational and personal anxiety according to Spilberger-Hanin "self-esteem Scale" was used; in order to identify depressive symptoms we used the Beck's scale, and for evaluation of adaptive abilities of the person the multilevel questionnaire "Adaptability" (IPC-AM), established by A.G. Maklakov and S.V. Chermyanin.

Quality of life (QOL) indices were scrutinized with the use of nonspecific questionnaire «SF-36 Health Status Survey». Subjective assessment of somatic state was performed with the use of "Giessen questionnaire on somatic complaints".

Results

The results of the studies revealed that the most informative indices to assess the health of young people based on the value of nutritional status are fat component of the body

(FCB), combined index of physical fitness (PFI), the execution time of Shtange's breath-holding by inhalation test (BHIT), index of functional changes in the blood circulatory system (IFC) and the intensity of personal anxiety (PA). The hemodynamics index has little informative effect in the assessment of the nutritional status during mass screening studies due to lack of significant differences in the examined groups of individuals having different body structure.

Based on the findings, the combined index for the assessment of the nutritional status of young people aged 18–25 years was elaborated, which is calculated by the sum of the points obtained in the evaluation of the values of the five indices listed above (Table 1). The total amount of points was calculated, with 15–17 points indicating insufficient or excessive nutritional status, 18–22 points revealing decreased or heightened nutritional status, 23–25 points showing optimal nutritional status.

Differentiation of insufficient and excessive, decreased and heightened statuses of nourishment was carried out with reference to the value of the fat component of the body (higher or lower compared to the optimum values, according to the amount of the collected points). Relative to the optimum values of this index, the nutritional status of the examined individuals with fat component of the body below or equal to 15% was estimated as decreased or insufficient – depending on the total number of the collected points, and more than 15% as a heightened or excessive.

Conclusion

The proposed indices and criteria of their estimation can be widely used during screening examinations of servicemen in military units. They serve the purpose to identify the development of prenosological situations with the aim of starting meaningful preventive measures for the correction of the state of health. ■

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