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# Ecological and hygienic assessment of adolescent health in different climatic and geographic conditions of the Dagestan Republic

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**Objective**. Comparative assessment of morbidity and morphofunctional development level of adolescents of military age in various ecological zones of the Dagestan Republic.
**Materials and methods**. There was studied the anthropophysiometric indicators and the incidence of diseases of the digestive system, the musculoskeletal system, blood and blood-forming organs, the endocrine system and the respiratory system among adolescents of military age (age 17 years) over a 10-year period in all areas of lowland, foothill and mountain Dagestan.There were 3544 teenagers surveyed.
**Results**. A long-term steady trend of increasing prevalence of morphofunctional deviations and socially significant diseases amongadolescents of military age in the ecological zones of the republic was established.The incidence of adolescents of military age with various diseases is high on the background of morphofunctional abnormalities.
**Cunclusion**. The combined effect of factors with different biological effects (additivity, synergism, emergence and inversion of action) confirms the unfavorable prognosis of diseases among adolescents of military age and justifies the need for continuous monitoring of the environment.

**Keywords:** adolescents, anthropometry, incidence, diseases of the endocrine system, respiratory diseases, risk factors, correlation

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The growing territorial and population load of unfavorable environmental factors against the background of the deterioration of the socioeconomic situation of the population is the main cause of the steady in the near future, they will form the core of the country's military-economic potential [1, 4–10, 13, 16].

In this regard, the importance of protecting the health of conscripts goes beyond the scope of health care and acquires the status of one of the main problems of the country's military and economic security [14-16].

Suffice it to say that among today's high school graduates, less than 10% are healthy, 40–60% are diagnosed with chronic diseases, and 30–40% have morphofunctional abnormalities. Only in recent years, the prevalence of body mass deficiency has increased by 20%, over 40% of draftees in terms of their physical development cannot cope with the loads arising in the course of military service.

A comparative assessment of the incidence of major age groups of the population showed particularly unfavorable trends that were found among the teenage population. In the structure of the disease, there are diseases of the respiratory organs, the musculoskeletal system, the endocrine system, the digestive organs, the nervous system and the sensory organs [19]. From year to year the number of adolescents with adult pathology increases.

The above problems in the protection of adolescent age health are also characteristic of the lowland, foothill and mountainous Dagestan territories, where more than 60% of the population has an average per capita income below the subsistence minimum, and the problems of lagging communal amenities and social infrastructure of rural populated areas in many previous years points aggravate the state of health and the degree of manifestation of morphofunctional abnormalities [3, 11, 12]. In addition, the unfavorable ecological situation in the lowland and foothill Dagestan, caused by the intensive use of chemical plant protection products (more than 20 groups of chemical compounds of pesticides covering more than 130 preparative forms), against the background of a low level of life has significant impact on the immune status and somatic morbidity of the younger generation [3, 11, 12].Adolescents with intensive growth and development characteristic of their age, and the growing functional activity of the endocrine system react sensitively to rather low concentrations of toxic substances [3, 11, 12]. It is necessary to note the effect of emergence (mutual reinforcement of negative impact) [11] or “inversion of action” [11, 12] of the listed risk factors in order to present the degree of significance of this problem for agrarian regions, including all environmental zones of Dagestan Republic.

For data processing, normal and multiple correlation analysis, Spearman's rank correlation, regression analysis, and confidence interval were used.

**The purpose** of the study was a comparative assessment of the incidence and level of morphofunctional development of adolescent age in various environmental zones of RD.

**Material and methods**

To achieve the goal, the average annual and average long-term indicators of the listed nosological forms were calculated, and the degree of their combination in the same individuals was determined depending on the identified morphofunctional deviations in the adolescent age in all areas of lowland, foothill, and mountain Dagestan.

Diseases of digestive organs, the musculoskeletal system, blood and hematopoietic organs, and endocrine syphilis were studied as the “marker” most significant for the ecological zones of RD nosological forms. -stems and respiratory diseases for a 10-year period.The sources of information were the report data from the Ministry of Health of the Republic of Dagestan, the Committee on Dagestan Statistics, the Republican Center for Adolescent and Student Youth Health. Material was collected on the physical development of adolescent age in all cities and districts of the Republic of Dagestan for 10 years (age category 17 years).In the study of anthropophysiometric indicators, information sources were child development maps in district and city polyclinics, as well as developed questionnaires (medical control chart), which included, in addition to the parameters widely used in the assessment of physical development and developmental indices (weight, height, size of the subcutaneous fat layer, Catley index, spirometric coefficient, Erismann index, Brox index) [1, 2, 4, 8, 17-20], also physio-metric indicators (lung capacity, hand dynamometry, becoming dynamo etria, physiological reserve of the heart, Harvard step test, Martine test, Genchi).A total of 3544 adolescents of a business age and draft age were surveyed for all the ecological zones of the Republic of Dagestan. For data processing, the usual and multiple correlation analysis, Spearman's rank correlation, regression analysis, and confidence interval were used.

**Results and its discussion**

A comparative assessment of the most significant pathological conditions and the level of morphofunctional development was carried out over a 10-year observation period over five-year terms. The anthropometric parameter “weight deficit” was considered by us in the light of the dynamics of indicators of the digestive system diseases and diseases of the endocrine system.

It is interesting to note that in almost all the years of observation of the interdependence of the weight deficit with the diseases of the digestive system parameters in the equilibrium zone, a negative correlation coefficient of the average force with fluctuations from -0.487 to -

0.56 was revealed. The same picture was of the interdependence of the Territorial Planning Scheme and digestive system diseases%, but with a positive rxy value. A similar pattern was observed in the foothills of the Republic of Dagestan. The peculiarities of these indicators in the foothill zone include the direct dependence of diseases of the digestive system with weight deficit in adolescents of military age, it should be noted that% Pearson's correlation coefficient is characterized as a weak link (0.17).

**Table 1.** Frequency of compatibility of pathological states and deviations of the parameters of physical development of adolescents of military age in lowland Dagestan in 1998-2007 (at %)

| | Pulmonary capacity | Dynamometers below average | Respiratory diseases | Diseases of the digestive organs | Diseases of the endocrine system | Diseases of the blood and circulatory system | musculoskeletal system diseases |
|---|---|---|---|---|---|---|---|
| **Physical development below average** | 4,5 | 14,8 | | | | | |
| **Pulmonary capacity** | | | 29,8 | 32,2 | | 9,2 | 14,2 |
| **Dynamometers below average** | | | | | 13,3 | 23,3 | 25,8 |
| **Respiratory diseases** | | | | 58 | 25,9 | 6,3 | 23,3 |
| **Diseases of the digestive organs** | | | | | 19,8 | | 29 |
| **Diseases of the endocrine system** | | | | | | | 40,5 |
| **Diseases of the blood and circulatory system** | | | | | | | 24 |

And for a 10-year observation period, the relationship can be characterized as weak with the tendency of transition to the average (Pearson correlation coefficient = 0.287).The peculiarities of the studied indicators in the mountain zone include an inverse relationship, first, during the entire observation period and over five-year terms, and, secondly, the relationship between the average force (Pearson's correlation coefficient = 0.340) for a 10-year observation period is noted.In the cities of the republic for all the years of observation, the correlation was direct and, as a rule, of medium strength.

In the republic as a whole, the interdependence of the studied quantities, it can be said, was similar to the flatland zone (inverse relationship), and in the degree of interdependence more resembled the RD countryside, when all rxy values were significantly lower — 0.3 with variations Pearson's correlation coefficient -0.062 to Pearson's correlation coefficient = -0.188.

Thus, in the rural areas of the lowland zone of RD, the higher the weight deficit indicators, the less digestive diseases among adolescents occur, while in cities of the republic, the more often there is a weight deficit in the studied population, the more frequent the digestive system drseases. Regarding the diseases of the endocrine system: in the foothills of Dagestan, in five-year intervals, the correlation relation of endocrine system diseaseswith a weight deficit was established. In the lowland zone, the average correlation dependence was noted, and in the foothill zone, the correlation dependence was characterized as strong (Pearson's correlation coefficient = 0.732). According to the basic growth of indicators in the foothill and lowland Dagestan, the correlation dependence of the average force was revealed (Pearson's correlation coefficient = 0.563 and 0.644).

**Table 2.** Pearson's correlation coefficient of pathological states and parameters of physical development of adolescents of military age in the lowland Dagestan for 5 years

| | Pulmonary capacity | Dynamometers below average | Respiratory diseases | Diseases of the digestive organs | Endocrine system diseases | Blood and circulatory system diseases | musculoskeletal system diseases |
|---|---|---|---|---|---|---|---|
| **Physical development below average** | 0,162 | 0,341 | -0,255 | -0,144 | -0,22 | 0,001 | 0,068 |
| **Pulmonary capacity** | | -0,549 | 0,671 | 0,168 | 0,082 | 0,001 | 0,099 |
| **Dynamometers below average** | | | -0,179 | -0,059 | 0,296 | 0,171 | 0,459 |
| **Respiratory diseases** | | | | 0,458 | 0,066 | 0,11 | -0,357 |
| **Digestive organs diseases** | | | | | 0,094 | -0,219 | -0,302 |
| **Endocrine system diseases** | | | | | | -0,08 | 0,257 |
| **Blood and circulatory system diseases** | | | | | | | 0,207 |

In the cities of the republic for the entire term of the study (1998-2007), the endocrine system diseases also had a direct correlation dependence of the average force with a deficit of adolescents of military age weight (Pearson's correlation coefficient = 0.328). During the evaluation of the endocrine system diseases interaction with the parameters of physical development, the presence of a similar connection was also observed, in particular for lowland Dagestan in the first 5 years of observation, the endocrine system diseases incidence rate with a dynamometer below the average had a correlation dependence of the average force - (Pearson's correlation coefficient = 0,3). In the pre-mountain ecological zone, such a relationship, that is, a correlation of the average power, was found between the endocrine system diseases and the digestive system drseases (Pearson's correlation coefficient-0.599), as well as with indicators of manual dynamometry of the level below the average (Pearson's correlation coefficient = 0.42). For Dagestan, the direct correlation dependence of the average force is noted between the endocrine system diseases values and the physical level of development below the average during the 1 observation period with (Pearson's correlation coefficient = 0.396). It should be noted that a positive correlation relationship between the endocrine system diseases indices and the physical development level below the average for mountain Dagestan was observed during the 2 observation period with Pearson's correlation coefficient = 0.498 and for the entire 10-year observation period with Pearson's correlation coefficient = 0.6.

Thus, the mountain ecological zone has a steady unidirectional deterioration of health indicators in the endocrinous system and in terms of the morpho-functional development of adolescents of military age — physical development below average.

Of the three high-altitude zones, the foothill zo-on can be attributed to the risk areas of combining endocrine system diseases with other nosological forms and with abnormalities of morphofunctional development. So, for the second half of the observation period, the endocrine system diseases had a direct correlation dependence with physical development indices below the mean (Pearson's correlation coefficient = 0.388) and manual diameters of the level below the mean (Pearson's correlation coefficient = 0.672).

The same, that is, the correlation of the average force (Pearson correlation coefficient = 0.42), was observed during the 10-year observation period with rxy = 0.468 in the foothill ecological zone between dynamometers below the average and endocrine system diseases (Table 1).

Also, over the 5-year observation period in the foothill ecological zone, there was a multidirectional strong direct correlation between the CMR diseases and physical development below the average (Pearson's correlation coefficient = 0.708).

Thus, of all the studied territories, only the mountain and foothill ecological zones have a steady unidirectional deterioration of health indicators in the endocrine system and integral indicators of morphofunctional development of the SPW — physical development and dynamometry below the average level.

**Таблица 3.** The frequency of compatibility of pathological states and deviations of the parameters of the physical development of adolescents of military age in the foothill Dagestan in 1998-2007 (%)

| **Physical development below average** | **Pulmonary capacity** | **Dynamometers below average** | **Respiratory diseases** | **Digestive organs diseases** | **Endocrine system diseases** | **Blood and circulatory system diseases** | **musculoskeletal system disease** |
|---|---|---|---|---|---|---|---|
| **Physical development below average** | | 11,3 | | | 15,8 | | |
| **Pulmonary capacity** | % | 63,5 | 28,2 | 17,2 | 8,7 | 9,2 | 12,8 |
| **Dynamometers below average** | | % | 2,5 | | 46,8 | | |
| **Respiratory diseases** | | | % | 54,8 | | 24,2 | 46,9 |
| **Digestive organs diseases** | | | | % | | 61,6 | 70,3 |
| **Endocrine system diseases** | | | | | % | | |
| **Blood and circulatory system diseases** | | | | | | % | 43,9 |

**Table 4.** Pearson correlation coefficient of pathological states and parameters of physical development of adolescents of military age in pre-mountain Dagestan for 5 years

| Physical development below average | Pulmonary capacity | Dynamometers below average | Respiratory diseases | Digestive organs diseases | Endocrine system diseases | Blood and circulatory system | musculoskeletal system disease |
|---|---|---|---|---|---|---|---|
| **Physical development below average** | -0,583 | -0,023 | -0,493 | -0,475 | -0,073 | -0,375 | 0,708 |
| **Pulmonary capacity** | rxy | 0,603 | 0,259 | 0,23 | 0,103 | 0,203 | 0,384 |
| **Dynamometers below average** | | rxy | 0,063 | -0,171 | 0,42 | -0,536 | -0,11 |
| **Respiratory diseases** | | | rxy | 0,848 | -0,125 | -0,047 | 0,375 |
| **Digestive organs diseases** | | | | rxy | -0,599 | 0,212 | 0,599 |
| **Endocrine system diseases** | | | | | rxy | -0,202 | -0,299 |
| **Blood and circulatory system diseases** | | | | | | rxy | 0,71 |

At the same time, in the flat zone, the dynamics of these indicators change strictly in different directions. Moreover, this multidirectionality has a level of correlation dependence of the average force - Pearson's correlation coefficient = -0.562 (second half of observation) and Pearson's correlation coefficient = -0.404 (10-year observation period). The dynamics of these indicators in the cities of RD, in rural areas, as well as in the whole of RD for all the years of observation, had a weak correlation dependence (Pearson's correlation coefficient<0.3). Nevertheless, it should be noted that for all the years of observation in cities, the average growth rate of the endocrime system desease had a positive correlation dependence of the average power - (Pearson's correlation coefficient = 0.333) with a level of physical development below the average.

In the course of assessing the frequency of comorbid pathology with respiratory tract deseases and deviations of some parameters of the myofascial release, it was found that for low-lying areas of the RD over 5 years strong) (tab. 2).

In the same years, in the foothill the most significant nosological form occurring in adolescents of military age as a “marker” pathology is respiratory diseases. In addition, this group can be used as a prognostic criterion of such anthropophysiological indicators as pulmonary capacity, chest circumference, Erie-Sman index, spirometric coefficient, etc. areas, this indicator had a weak connection with the tendency of transition to the average strength indicator (Pearson's correlation coefficient = 0.26). It should be noted that in the same years, in the mountain EZ and in the RD as a whole, pathology associated with the AML, as well as the integral index of the IFR - the physical development of the level below the average was rare - with a frequency of 8% to 20%.

Of the most studied “marker” diseases in precursors of the respiratory disease, it is most often correlated with diseases of the digestive organs.

**Table 5.** Pearson's correlation coefficient of pathological states and parameters of physical development of adolescents of military agein mountain Dagestan

| | Pulmonary capacity | Dynamometers below average | Respiratory diseases | Digestive organs diseases | Endocrine system diseases | Blood and circulatory system diseases | musculoskeletal system disease |
|---|---|---|---|---|---|---|---|
| **Physical development below average** | -0,725 | 0,162 | -0,009 | -0,132 | 0,396 | 0,133 | -0,056 |
| **Pulmonary capacity** | | -0,035 | -0,049 | 0,279 | -0,31 | -0,11 | 0,196 |
| **Dynamometers below average** | | | 0,153 | -0,181 | 0,159 | 0,396 | -0,199 |
| **Respiratory diseases** | | | | 0,158 | -0,22 | 0,014 | -0,251 |
| **Digestive organs diseases** | | | | | 0,135 | -0,144 | -0,292 |
| **Endocrine system diseases** | | | | | | 0,033 | -0,254 |
| **Blood and circulatory system diseases** | | | | | | | 0,329 |

Practically in all the studied territories, with the exception of cities of RD, AML have a direct correlation dependence with the digestive orgarns desease during the entire observation period, including over five-year intervals of observation

It should be noted that only in two cases - for the 1st time in the first 5-year observation period in the mountain ecological zone with rxy = 0.158 and for the second time in the plain ecological zone during the second 5-year observation period with rxy = 0.149 - the correlation link was lower than the average force. Also, over the entire 10-year observation period in the foothill ecological zone, a direct strong correlation was found between the indices of respiratory and digestive diseases with a coefficient rxy = 0.848 and rxy = 0.731, and in 79% of respiratory diseases and Diseases of the digestive organs were observed in combination with diseases of the musculoskeletal system.

In the mountainous ecological zone, the frequency of the respipatory orgarns diseases with the digestive system drseases over the entire observation period was 61.8%, and on the taxiway in general — 49.4%.In the course of the evaluation of the mutual influence of respiratory diseases with the anthrophysiometric indices and with the integral indicator of physical development at the level below the average, the different directions of mutual influences were established.

So, if with a dynamometry at a level below the average, communication with respiratory diseases is usually direct and in some years reaches average values depending on the territories, then with an integral indicator myofascial release (with physical development at a level below the average, as a rule, the reverse and achieves significant indicators.So, in the foothill EZ - rxy = -0.493.

The relationship of respiratory organs deseases with the integral indicator of physical development at the level below the average in the lowland ecological zone was -0.427, and in the foothill ecological zone -0.382 during the same time period.

That is, in terms of the respipatory orgarns diseases indicator, if we can predict the state of certain parameters of the myofascial release, then it is hardly possible to predict the physical development in general for the myofascial release. First of all, due to the multi-directionality of the dynamics of the studied indices.

**Table 6.** Frequency of compatibility of pathological states and deviations of the parameters of physical development of the adolescents of military age in mountainous Dagestan in 1998-2007 (at %)

| | Pulmonary capacity | Dynamometers below | Respiratory diseases | Digestive organs | Endocrine system | Blood and circulatory | musculoskeletal system |
|---|---|---|---|---|---|---|---|
| **Physical development below average** | | 37,1 | | 13,4 | 61 | 30,9 | |
| **Pulmonary capacity** | % | | | 6,6 | | | 9 |
| **Dynamometers below average** | | % | 20,4 | 23,2 | 22,6 | | |
| **Respiratory diseases** | | | % | 61,8 | 0,5 | 9,8 | 1,7 |
| **Digestive organs diseases** | | | | % | 34,6 | 2,6 | -9 |
| **Endocrine system diseases** | | | | | % | 23,1 | |
| **Blood and circulatory system diseases** | | | | | | % | 45,2 |

This applies more to the mountain EZ and to the data on taxiways in general, and in the lowland and foothill eZ, the correlation is almost the average power and inverse, with the only reservation that in the first observation period the relationship is inverse and weak (rxy = -0.255).During the remaining periods of observation, the value of the correlation connection ranged from -0.382 to -0.585. During the first 5 years, in addition to the positive correlation of the average power with the digestive system drseases (rxy = 0.458), the low-level zone in the low-level ecological zone had a reverse correlation dependence with the musculoskeletal system diseases (rxy = -0.357).

And in the foothill ecological zone, in the absence of any connection in the interval in the first 5 years between the respiratory organs deseases and musculoskeletal system in the second 5-year period, a positive and strong correlation was revealed with rxy = 0.791.

In the same ecological zone, among the nozological forms that have a narrowly directed nature of the dynamics with respiratory organs deseases, there is a disease of the musculoskeletal system. Thus, over a five-year study period and for the entire observation period, a correlation dependence of the average force was found (rxy = 0.375 and rxy = 0.469, respectively).

Of the territories studied, in terms of the extent and combination of diseases of the Osteomuscular system with other “marker” diseases, the foothill areas of the RD can be reasonably attributed to the most disadvantaged during the entire study period.

**Table 7.** Frequency of compatibility of pathological states and deviations of physical development parameters of adolescents of military age in the Republic of Dagestan for 10 years (in %)

| | Pulmonary capacity | Dynamometers below | Respiratory diseases | Digestive organs | Endocrine system | Blood and circulatory | musculoskeletal system |
|---|---|---|---|---|---|---|---|
| **Physical development below average** | | 57,9 | | 1,2 | | 17,2 | 13,7 |
| **Pulmonary capacity** | % | 14,9 | 10 | 14,4 | | | 11,6 |
| **Dynamometers below average** | | % | 49,4 | | 8,8 | 2,2 | 58,1 |
| **Respiratory diseases** | | | % | 49,4 | 6,7 | 16,4 | 14,4 |
| **Digestive organs** | | | | % | 13,1 | 11,2 | 14,9 |
| **Endocrine system diseases** | | | | | % | 6,1 | 2,4 |
| **Blood and circulatory system diseases** | | | | | | % | 29,2 |

At the same time, the average growth rate in rural areas of RD can be attributed to the highest - 0.6. The basic indicator of growth in lowland Dagestan rural areas is only as good as in cities of the Republic of Dagestan - 5.5% versus 5.7% in cities.

The chest circumference indicators in the foothill region of Dagestan exceed those in the rural areas of the lowland ecological zone by 0.7-1.0. Thus, for the first observation period, the International Union of Radioecology in the foothill Dagestan was 83.9, against 82.9 in the lowland Dagestan, for the second 5-year period it grew substantially and reached 86.1 against 85.4 in the low Dagestan and, finally, for the entire 10-year observation period, the indicator was 85.0 versus 84.1 in the lowland zone.

At the same time, the average growth rate in rural areas of RD can be attributed to the highest - 0.6. The base rate of growth in lowland Dagestan's rural areas is only lower than that for cities RD - 5.5% versus 5.7% for cities.

In the mountainous regions, the indicator under study slightly lagged behind the identical indicators of the foothill zone, but to the same extent outperformed the rural areas of the lowland Dagestan.

The condition of the blood and hematopoietic organs is an integral part of the health indicators of adolescents of military age. Functional abilities not only of the body systems, but of the organism as a whole, depend largely on the morphofunctional state of organs and circulatory systems and blood formation.

There is not a single system in the human body that would not depend directly and indirectly on the performance and functional capabilities of the hematopoietic system.

From our point of view, natural climatic and geographic factors in the form of high physiological erythrocytosis and socio-economic factors can have a significant impact on the state of the blood-circulating and circulatory system.

Anthropogenic eco-factors of a chemical and physical nature (Resistance Index, microwave fields, pressure drops, etc.) may in some cases be an etiological factor of acquired anemia, leukopenia, etc. And socio-economic factors depending on the economic situation of, city, district, village and, finally, families where teenagers live, can play both a positive and a negative role in the morphofunctional state of the blood and blood-forming organs [3, 11, 12].

**Table 8**. Rxy of pathological states and parameters of physical development of adolescents of military age on Dagestan Republic in the first 5-year period

| | Pulmonary capacity | Dynamometers below average | Respiratory diseases | Digestive organs diseases | Endocrine system diseases | Blood and circulatory system diseases | musculoskeletal system disease |
|---|---|---|---|---|---|---|---|
| **Physical development below average** | -0,069 | 0,295 | -0,105 | 0,083 | 0,11 | 0,198 | 0,059 |
| **Pulmonary capacity** | rxy | 0,013 | 0,218 | 0,19 | -0,015 | -0,019 | 0,16 |
| **Dynamometers below average** | | rxy | 0,087 | -0,131 | 0,183 | -0,142 | 0,378 |
| **Respiratory diseases** | | | rxy | 0,461 | -0,016 | 0,124 | 0,225 |
| **Digestive organs diseases** | | | | rxy | 0,106 | 0,224 | 0,18 |
| **Endocrine system diseases** | | | | | rxy | 0,139 | 0,066 |
| **Blood and circulatory system diseases** | | | | | | rxy | 0,229 |

As a rule, the pathology of the blood and circulatory system is accompanied by various abnormalities from other organs and systems, the degree of manifestation of which depends

on the degree of regional risk of myofascial release deviations and the spread of “marker” diseases of adolescents of military age.

So, according to the degree of compatibility of Blood and circulatory system diseases with Endocrine system diseases, the most unfavorable of the territories of RD are cities, since for the entire observation period these pathologies met together in more than 50%, and in the first 5-year period almost 70% of cases.

It should be noted that among the 10 cities of the Republic of Dagestan 40-50% have indicators that exceed the International Union of Radioecology in cities from 1.5 to 2.0. With single-level indices, the average growth rate with other EZs of the city of RDs has the highest level of disease of the digestive system%, which must be taken into account when conducting various sports and recreational activities.

When ranking the studied territories according to the degree of decrease of the International Union of Radioecology values for a 10-year period, indicators of the cities of taxiways (85.9) occupy the first place, followed by foothill Dagestan with a chest circumference index of adolescents of military age - 85.0 and third place - Mountain Dagestan (84.6). Further, also in terms of the degree of decrease, are occupied by s / m RD, RD as a whole, flat zone s / m RD.

It should be noted that almost all of the studied anthropophysiometric indicators and incidence rates are fairly large and almost identical factor loads and are closely interrelated. Thus, the problem of protecting the health of students requires close interdepartmental cooperation between the health authorities, education, Rosporodnadzor, social protection services, committees on physical culture and sports, culture, youth affairs, military enlistment offices, etc.

**Findings**

1. A long-term steady growth trend inthe prevalence of morphofunctional deviations and “marker” diseases among adolescents of military age in the ecological zones of the republic has been established.

2. The ranking of territories according to the frequency of morphofunctional deviations and the intensity of "marker" diseases in adolescents of military age is the basis for planning and conducting targeted measures for their early prevention.

3. The high frequency of simultaneous damage of adolescents of military age with different “marker” diseases against the background of morphofunctional deviations confirms the versatility of the adverse effects of the combined effect of factors with different manifestations of biological effects (additivity, synergism, emergence and inversion of effect), which makes it possible to substantiate the need for continuous environmental monitoring.

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