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Review

LIFESTYLE FACTORS IN RISKS OF CHRONIC NON-COMMUNICABLE DISEASES IN YOUNG PEOPLE (LITERATURE META-ANALYSIS)

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Healthy lifestyle formation and protection of people's health is a complex multifactorial process directly associated with the prevention component in the healthcare system. To protect health of future generations, it is necessary to consider and control lifestyle-related factors in young people.

The aim of this study was to determine lifestyle-related factors and associated functional changes in the body as risk indicators of chronic non-communicable diseases in young people.

The review relied on meta-analysis of data obtained from various research databases over the period between 2013 and 2023. Analyzed studies employed variable research methods inducing questioning, anthropometric measurements, functional tests and biochemical analyses. The obtained data were statistically analyzed by using cluster analysis in Statistica 10.

The results of the accomplished meta-analysis have shown two major locuses that can be identified among risk factors influencing young people's health. The first one is hypodynamia and associated unhealthy diets and essential hypertension. The second one is bad habits, smoking holding the absolutely first rank place among them.

We have identified basic lifestyle-related health risk factors of chronic non-communicable diseases (CNCDs) for young people, namely, hypodynamia and smoking. It seems necessary to develop statistical report forms in order to control the health risk factors highlighted in this review within the social-hygienic monitoring.

Keywords: *young age, hypodynamia, smoking, unhealthy diet, health risk factors, meta-analysis, cluster analysis, chronic non-communicable diseases.*

Supporting and protecting health of an individual or a nation as a whole is a complex multifactorial process managed within not only healthcare but also economy, social policy, ecology, etc. The World Health Organization (WHO) believes physical inactivity, smoking, alcohol misuse and unhealthy diet to be four major behavioral risk factors creating elevated

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likelihood of chronic non-communicable diseases (chronic NCDs) [1]. Over the last decade, the conventional paradigm of the Russian healthcare, which emphasizes priority assigned to prevention, has been upgraded by issuing several legislative documents[1].

Several priority prevention tasks have been formulated in healthcare: to identify risk factors able to cause chronic NCDs and to perform their pre-nosologic diagnostics; to promote commitment to healthy lifestyles.

Risk-based technologies for health assessment are an up-to-date methodology for healthcare operations. This methodology has been developed in Russia since 2000. The contemporary situation (as of 2024) as regards risk examination and assessment is outlined in the monograph [2]. It emphasizes that a model for health risk assessment should be based on formation of a relevant information platform, namely, selecting sources of information, possibility to quantify them, and creation of databases harmonized with available resources in the sphere.

Assessment of environmental health risks, which considers physical, chemical, microbiological, and radiation factors, is the subject of social and hygienic monitoring functioning. However, environmental factors create an important but far from comprehensive health paradigm. Fifty percent (or even more) of health are known to be associated with a lifestyle. This is emphasized regularly in State Reports 'On Sanitary-Epidemiological Welfare of the Population in the Russian Federation'. Thus, for example, the State Report 'On Sanitary-Epidemiological Welfare of the Population in the Russian Federation in 2023'[2] provides the following data: 53.1 % of the country population (approximately 77.7 million people) are exposed to adverse lifestyle-related factors. At the same time, managerial decisions aimed at creating healthy lifestyles accounted for only 13.63 % in 2023. There are objective reasons for that since social and hygienic monitoring does not operate adequately with pre-nosologic assessment criteria and, consequently, with managing health risks associated with lifestyle factors. Data about lifestyle factors, which are included in social and hygienic monitoring, are limited to alcohol sales dynamics in the Russian Federation, dy-

[1] O natsional'nykh tselyakh i strategicheskikh zadachakh razvitiya Rossiiskoi Federatsii na period do 2024 goda: Ukaz Prezidenta RF ot 7 maya 2018 g. № 204 (s izmeneniyami na 21 iyulya 2020 goda) [On national goals and strategic tasks of the Russian Federation development for the period up to 2024: the RF President Order dated May 07, 2018 No. 204 (last amended as of July 21, 2020)]. *KODEKS: electronic fund for legal and reference documentation*. Available at: https://docs.cntd.ru/document/557309575 (September 22, 2024) (in Russian); O strategii razvitiya zdravookhraneniya v Rossiiskoi Federatsii na period do 2025 goda: Ukaz Prezidenta RF (s izmeneniyami na 27 marta 2023 goda) [On the strategy for development of the healthcare in the Russian Federation for the period up to 2025: the RF President Order (as of March 27, 2023)]. *KODEKS: electronic fund for legal and reference documentation*. Available at: https://docs.cntd.ru/document/554815875 (September 22, 2024) (in Russian); Ob osnovakh okhrany zdorov'ya grazhdan v Rossiiskoi Federatsii: Federal'nyi zakon ot 21 noyabrya 2011 g. № 323-FZ (s izmeneniyami na 26 sentyabrya 2024 goda) [On the fundamentals of citizens' health protection in the Russian Federation: the Federal Law issued on November 21, 2011 No. 323-FZ (as of September 26, 2024)]. *KODEKS: electronic fund for legal and reference documentation*. Available at: https://docs.cntd.ru/document/902312609 (September 22, 2024) (in Russian); Ob utverzhdenii Poryadka organizatsii i osushchestvleniya profilaktiki neinfektsionnykh zabolevanii i provedeniya meropriyatii po formirovaniyu zdorovogo obraza zhizni v meditsinskikh organizatsiyakh: Prikaz Ministerstva zdravookhraneniya RF ot 29 oktyabrya 2020 g. № 1177n [On Approval of the procedure for organizing and implementing prevention of non-communicable diseases and activities aimed at creating healthy lifestyles in healthcare institutions: the Order by the RF Ministry of Health dated October 29, 2020 No. 1177n]. *KODEKS: electronic fund for legal and reference documentation*. Available at: https://docs.cntd.ru/document/566406903 (September 22, 2024) (in Russian); Ob utverzhdenii poryadka provedeniya profilakticheskogo meditsinskogo osmotra i dispanserizatsii opredelennykh grupp vzroslogo naseleniya: Prikaz Ministerstva zdravookhraneniya RF ot 27 aprelya 2021 g. № 404n (s izmeneniyami na 19 iyulya 2024 goda) [On Approval of the procedure for conducting preventive medical check-ups and mass health examination for certain groups of adult population: the Order by the RF Ministry of Health dated April 27, 2021 No. 404n (last amended as of July 19, 2024)]. *KODEKS: electronic fund for legal and reference documentation*. Available at: https://docs.cntd.ru/document/607124051 (September 22, 2024) (in Russian).

[2] O sostoyanii sanitarno-epidemiologicheskogo blagopoluchiya naseleniya v Rossiiskoi Federatsii v 2023 godu: Gosudarstvennyi doklad [On Sanitary-Epidemiological Welfare of the Population in the Russian Federation in 2023: the State Report]. Moscow, the Federal Service for Surveillance over Consumer Rights Protection and Human Wellbeing, 2024, 364 p. (in Russian).

namics of acute poisonings caused by alcohol-containing products, and poisonings caused by smoking blends among the country population. Up to 2020, reports contained data on dynamics of consumer expenditure on tobacco products and age-specific prevalence of tobacco use among people older than 15 years; the 2022 and 2023 reports do not contain such information.

Meanwhile, the country has a functioning system for mass health examination provided for the population. In accordance with the valid Order No. 404n dated April 27, 2021 'On Approval of the procedure for conducting preventive medical check-ups and mass health examination for certain groups of adult population', a mass health examination has a goal, which is to identify risk factors causing certain diseases (as stipulated by the foregoing Order) including essential hypertension, hypercholesterolemia, high fasting blood glucose, tobacco smoking, alcohol misuse, unhealthy diets, low physical activity, overweight, as well as risks of using drugs and psychoactive substances.

The results of the 2023 mass health examination[3] showed that only 22 % of more than 77 million examined people could be considered healthy; risk factors of chronic NCDs were established in 46 % of them. High blood pressure (29.6 %) and overweight (29.8 %) were considered the most significant. Moreover, the foregoing risk factors can be viewed as prepathology typical for mature age.

In accordance with the Concept for the development of social and hygienic monitoring[4], the following tasks are to be solved:

– developing criteria and methods for substantiating and selecting priorities and optimal managerial decisions aimed at providing sanitary-epidemiological wellbeing of the population and consumer rights protection considering sanitary-hygienic, economic, social, and lifestyle factors, which determine the living environment for the country population;

– creating databases that describe lifestyle factors and developing methods for their assessment within the system for social and hygienic monitoring.

Within primary prevention of chronic NCDs, young people are the most eligible model for identifying health risk factors. The literature has a huge data array about health of children, adolescents, young males and females, dynamics of changes in their health over a certain period including those consistent with changes in socioeconomic conditions. Some publications, both domestic and foreign, focus on lifestyle factors and combine from dozens to several hundreds of observations of various health risk factors able to cause chronic NCDs in young people. In this respect, it seems relevant to create an actual database on adverse lifestyle factors young people are exposed to and to justly consider them predictors of chronic NCDs being guided by prenosologic changes in the body in the process. This determined the aim of the present study.

The aim of this study was to identify lifestyle factors and associated functional changes in the body as risk indicators of chronic non-communicable diseases in young people.

The aim was to be achieved by solving the following tasks:

1. Substantiation of relevant criteria for searching literature data in up-to-date available databases.

2. Substantiation of major lifestyle factors for possible inclusion into the system for social and hygienic monitoring.

Materials and methods. The study involved searching in the following databases: CyberLeninka research library, MEDLINE (PubMed platform), eLIBRARY electronic

[3] Itogi dispanserizatsii 2023 goda priznali neuteshitel'nymi [The results of the 2023 mass health examination are considered unsatisfactory]. *ZDRAV.RU: the information support for medical and prevention experts.* Available at: https://www.zdrav.ru/news/1100926-itogi-dispanserizatsii-2023-goda-priznali-neuteshitelnymi (October 25, 2024) (in Russian).

[4] Kontseptsiya razvitiya sistemy sotsial'no-gigienicheskogo monitoringa v Rossiiskoi Federatsii na period do 2030 goda (proekt) [The Concept for the development of social and hygienic monitoring in the Russian Federation for the period up to 2030 (a draft)]. *Regional'naya sistema upravleniya riskom dlya zdorov'ya naseleniya [The Regional System for Health Risk Management]: collection of organizational, information, and methodical materials*, vol. 1, Ekaterinburg, 2019 (in Russian).

research library, Cochrane Library, Wiley Online Library, and ScienceDirect over the period from 2013 to 2023 using the following keywords: health, cardiovascular risk, mass health examination, youth's health, risk factors of diseases, health assessment. Publications were partly collected by hand and partly using Screening software package. The authors looked through articles, which seemed eligible for inclusion, established what data were missing, and got acquainted with original publications. Discrepancies and missing data were adjusted by group discussions, providing links to an original publication and an additional independent decision made by all authors.

Thirty-seven percent of literature sources were taken from eLIBRARY; 35 %, Cyberleninka; 14 %, MEDLINE (PubMed platform); 6 %, Wiley Online Library (clinical literature database); 5%, ScienceDirect; 3 %, Cochrane Library (clinical literature database).

Literature sources were selected for analysis relying on the following criteria: actuality, relevance (conformity with the research subject), availability (a source should be published in open access or be accessible through libraries or databases), time of publication (between 2013 and 2023).

As a result, 2406 publications were identified in databases. Seven hundred and nighty-one articles were excluded from the analysis due to the following reasons: a full text was not available (n = 143); articles were not protocols or did not report results obtained by systemic reviews (n = 248); publications were not relevant to the study subject (n = 400). Therefore, 1615 literature sources were selected for further analysis; they were represented by experimental research and other meta-analysis; literature reviews made by students were not included. The foregoing literature sources describe health of more than 200 thousand people, 57 % females and 43 % males. Countries were represented in the sources per different proportions: Russia (82.2 %), Belarus (3 %), Kazakhstan (1.3 %), India (0.6 %), USA (6.3 %), Great Britain (0.3 %), China (2.7 %), Brazil (1.3 %), Germany (0.6 %), Jordan, Ghana, Côte d'Ivoire, Italy, Afghanistan, Finland, Iran, Slovakia and Armenia (0.3 % each).

Accomplished quantitative synthesis of primary data made it possible to establish three age categories eligible for obtaining aggregated statistical indicators: 14–17 years, 18–25 years, and 26–30 years.

Authors of the selected literature sources used variable research methods including surveys (78.6 %), anthropometry, and functional diagnostics: HR and BP measurements; stress and simple ECG; BMI calculation; TIBC and TVC measurements (16 %), biochemical blood tests: cholesterol, glucose, LDL and HDL (2.6 %), functional tests: Stange Test, Martine Test, Ruffier Squat Test, Genchi Test, oorthostatic test, Robinson's index (2.8 %).

References were created basing on the literature review data and placed in Calameo online-service for Internet publications, where all literature sources used in this review can be found[5].

Statistical data analysis was performed using cluster analysis that involved estimating the Euclidian distance for establishing direct correlations between risk factors based on the shortest straight-line distance between variables. The analysis was performed in STATISTICA 10. The number of examined people per all ages and per the identified age periods of 14–17 years, 18–25 years, and 26–30 years was used as grouping variables for clusters. This made it possible to establish distribution of lifestyle health risk factors in different age groups among young people. Clusters of lifestyle factors were formed with respect to examined people's age following the principle of the greatest correlation with each other.

The first idea was to apply either correlation or regression statistical data analysis. Cluster analysis was selected due to certain difficulties in performing regression analysis

[5] Rasprostranennost' faktorov riska obraza zhizni sredi lits molodogo vozrasta 2000–2024 gody: bibliograficheskii ukazatel' publikatsii [Prevalence of lifestyle health risk factor among young people, years 2000–2024: references]. Rostov-on-Don, Rostov State Medical University, 2024, 154 p. Available at: https://www.calameo.com/read/00776773137499a304bf1 (October 20, 2024) (in Russian).

since it was impossible to identify a common dependable variable (based on actual data). At the same time, the selected method made it possible to identify strength of correlations between all examined variables.

Results and discussion. The study [3] analyzed correlations between work and social and demographic factors, lifestyle and cardiovascular risks among Brazilian adolescents aged 12–17 years, who had to work morning shifts due to their social status and simultaneously consumed rather low amounts of fruit and vegetables. The analysis showed that these two risk factors were the most common ones causing cardiovascular diseases. A protector effect related to body mass was observed among adolescents who worked less than 20 hours per week; working adolescents were noted to be prone to shorter sleep against those who did not have to work. This factor had adverse consequences for adolescents who studied in the morning and had to get up early such as chronic lack of sleep during the week and cumulative fatigue, which disrupted their normal sleep-wake cycle. This might result in many organic disorders including cardiovascular diseases, immunodeficiency, cognitive and affective impairments and risk of obesity. This can also be a precursor of such bad habits as tobacco smoking and alcohol use. Statistical analysis did not establish any correlations between investigated health variables (essential hypertension, metabolic syndrome and biochemical changes) and work. This might be due to maintaining a healthy body mass as a result of physical activity [3]. Studies of cardiovascular risks in adolescents aged between 12 and 17 years, regardless of their sex, who had to study in the morning, revealed higher ideal CVH measures in adolescents older than 15 years against those younger than this age. A different result was obtained for European adolescents where younger ones (< 15 years) tended to have a higher ideal Cardiovascular Health (CVH) measure than older adolescents (15 years), 4.69 against 4.29 accordingly [4]. This difference can be explained by parents' tendency to ease off their control over older teenagers, which promotes risky behavior associated with unhealthy lifestyles. This trait has greater influence when a person is closer to a start of their adult life [5]. This effect can be non-obvious since 17 years was the oldest age of adolescents covered in this study and this may result in non-ideal CVH. Moreover, higher ideal CVH measures were established in schoolchildren in private schools together with higher proportions of ideal blood pressure and a borderline proportion of ideal fasting plasma glucose against those in state schools. This means that adolescents from families with higher incomes are likely to have better cardiovascular health measures [6]. Impacts exerted by sports and physical activity on health-related life quality were examined among sportsmen students (n = 842) and ordinary students (n = 1322). As a result, significant differences in mental component scores (MCS) were noted between levels of sport and physical activity; however such differences were not detected in physical component scores (PCS). After controlling for sex, a positive relationship was found between increased sport and physical activity level and greater MCS; that is, higher levels of sport and physical activity were associated with more positive mental health in these populations [7]. As reported in the study [8], prevalence of risk factors causing chronic NCDs was higher among medical students who did not have any physical activity beyond sport classes at university. Students who did sports actively tended to have psychoemotional stress less frequently; tobacco smoking, alcohol use as well as unhealthy diets were less prevalent among them against their counterparts who did not do any sports. This may indicate a likely positive effect produced on prevalence of chronic CNDs risk factors among future healthcare workers by additional sport activities apart from usual sport classes scheduled at university [8]. In addition to interviews, anthropometric data were collected (body mass, body size and body mass index (BMI)), blood pressure, as well as laboratory test data (blood glucose, cholesterol and triglycerides). These data were collected as clinical evidence of analytical values obtained for cardiovascular risk factors. Risk factors of impaired cardiovascular function in Brazilian students included family history of

CVD (93.2 %), sedentarism (56.8 %), pharmacological agents (40.0 %), dyslipidemia (35.3 %) and lack of knowledge of modifiable risk factors (25.3 %). Other risk factors for this nursing diagnosis had rather low scores: individual history of CVD (12.7 %), obesity (9.5 %), essential hypertension (4.7 %) and diabetes mellitus (0.5 %) [9]. In regression analysis, age showed a significant association with general obesity, whereas age and female sex were significantly associated with abdominal obesity. The analysis also identified the male sex and high BMI as the increased risk factors for hypertension [10]. Multifactorial regression analysis showed that sedentary lifestyle (odds ratio OR = 2.517, p = 003), diabetes mellitus (DM) (OR = 1.902, p = 006), high body mass index (BMI ≥ 30 kg/m^2) (OR = 1.776, p = 005), good socioeconomic status (OR = 1.724, p = 021) and essential hypertension (OR = 1.664, p < 0.001) were independent cardiovascular risk factors in an Afghani population [11]. In the study [12], anthropometric measurements, blood pressure and capillary blood glucose were measured. A logistic regression model made it possible to establish hypertension-associated factors as well as cardiovascular risk factors: 148 people (7.3 %) were overweight or obese; 44.0 % males and 36.6 % females reported alcohol use. Eating speed (slow vs. fast) and physical activity (active vs. inactive) were assessed with a standardized questionnaire. All three exposures (eating mode, physical activity and oxygen consumption) were positively associated with abdominal obesity, high blood pressure, high fasting blood glucose (FBG), high triglycerides (TG), and decreased high density lipoprotein cholesterol (HDLC) [13]. The authors obtained results confirming that many bachelor students suffered from eating behavior disorders or had diagnosed eating disorders but did not have access to effective prevention, precise diagnostics or available treatment. It is especially important to develop more reliable methods for identifying students with severe eating disorders so that they could be offered original or culturally acceptable and effective prevention or early treatment [11]. Risks caused by smoking, e-cigarettes included: higher moderate or vigorous physical activity was inversely associated with cigarette and e-cigarette use cross-sectionally. Data on physical activity provided by the respondents themselves, as well as data on smoking cigarettes or e-cigarettes obtained by surveying showed that only higher moderate physical activity was statistically significantly associated with reduced cigarette smoking 6 months later, after adjusting for baseline cigarette smoking, sensation seeking, BMI, and demographic variables [14]. High BMI was revealed to be associated with subsequent depression. Based on meta-analysis of eight studies, comprising 30,539 participants, smoking was associated with subsequent depression. Low, but not high, SBP was associated with an increased risk of depression. Targeting childhood/adolescent smoking and obesity may be important for the prevention of both CVD and depression across the lifespan [15]. Assessment of influence exerted by lifetime cardiovascular risk factors (body mass index (BMI), high-density lipoprotein, low-density lipoprotein, triglycerides, systolic blood pressure, blood glucose) and lifestyle factors (vegetable consumption, fruit consumption, smoking and physical activity) on the systemic vascular resistance index (SVRI) and cardiac index (CI) assessed in adulthood revealed that childhood BMI, blood glucose, vegetable consumption, smoking and physical activity independently predict systemic vascular resistance in adulthood. A favorable change in the number of risk factors or BMI from childhood to adulthood was associated with lower vascular resistance in adulthood [16].

Examination of physical activity among schoolchildren and medical students in Ufa established that a considerable proportion of the examined people (43.16 % of the total number) did not have enough physical activity and limited it to sport classes at school. Only 39.78 % of the examined schoolchildren and medical students visited sports clubs regularly. Those schoolchildren and students who did not do any sports were established to have unhealthy work and leisure regimes. They spent authentically more free time playing on PC or watching TV. The proportion of children and

adolescents with normal physical development is authentically higher among those who do sports actively in all age groups. Higher functional levels estimated per total vital capacity of the lungs, hand force and adaptation were revealed in schoolchildren and students who did sports or had regular physical activity. Sex- and age-dependent differences were established in schoolchildren and students as per the character of physical activity and sports they were involved in. Thus, duration of trainings and sport skills were higher in young males against females. The number and duration of trainings as well as sport skills were noted to grow with age [4]. Analysis of behavioral health risk factors in high school students (the 10^{th} – 11^{th} grade) established that most of them (76.2 ± 0.9 %) tended to have positive attitudes towards school and a positive atmosphere in class. Growing educational loads (90.5 ± 0.6 %) and excessive use of electronic gadgets (92.0 ± 0.6 %) are the leading and most prevalent health risk factors for contemporary high school students. They increase daily visual loads considerably and promote eyesight deterioration (49.9 ± 1.1 % of the respondents), induce frequent headaches (56.2 ± 1.1 %) and spine aches (43.5 ± 1.0 %). Most respondents mentioned being moody (71.8 ± 0.9 %) and suffering from weakness after classes (69.6 ± 1.0 %). Almost half of the high school students (45.3 ± 1.1 %) estimated their health as unsatisfactory or poor. Irrational use of electronic gadgets by most high school students both in studies and in leisure activities considerably decreased an amount of time they spent outdoors (55.7 ± 1.1 % of the respondents), duration of night sleep (76.8 ± 0.9 %) and physical activity (87.4 ± 0.7 %). Most high school students had such an adverse factor as an unhealthy diet, typically imbalanced or involving irregular meals. Adolescents' health was also affected by behavioral risk factors, which were established by the conducted analysis [5]. The study revealed that only 40 % of the interviewed adolescents had additional physical activity in sport clubs: 53 % of young males and 28 % of young females. Tobacco smoking was the next per prevalence as it was mentioned by 24 % of young males and 11 % of young females ($p < 0.001$). Combination of several modifiable health risk factors was the most unfavorable with respect to an early outbreak of persistent essential hypertension in adolescents aged 15–17 years. Thus, a risk of essential hypertension was 8 times as high in males (OR = 8.1, 95 % CI: 1.1–61.4) and 18 times as high in females (OR = 18.4, 95 % CI: 1.0–326.4) in case of overweight / obesity combined with smoking and low physical activity. Abdominal obesity was shown to be a significant factor in early subclinical damage to target organs in adolescents with essential hypertension [17].

Biological cardiovascular risk factors such as essential hypertension or overweight were established in each sixth-seventh student among first-year students of the Stavropol State Medical University; a chronic focal infection was diagnosed practically in each fourth. Burdened heredity was established in one third of the cases. Such behavioral risk factors as unhealthy diets, hypodynamia and poor resistance to stress were established in each fourth-fifth first-year student. Smoking was identified 10 times less frequently. Only one fourth of the examined first-year students had practically no health risk factors. Sex-related differences were established among first-year students as regards identified health risk factors. Biological factors, such as high blood pressure or overweight, were four and two times respectively more frequently detected in young males. Behavioral risk factors including unhealthy diets, hypodynamia and poor resistance to stress were twice as frequent in young females. In contrast, smoking was three times more frequently detected among young males. Despite young age and a short history of affecting factors, students had preclinical but quite obvious lesions of the arterial wall as one of the most prognostic-significant target organs [18]. Several factors affecting students' health and high prevalence of endocrine diseases were considered the most significant per survey data obtained in 2007–2009. They include poor initial health; high prevalence of active (42.9 %) and passive (47.2 %)

tobacco smoking and diseases of the musculoskeletal system (45.9 %); poor living conditions (22.8 %); unhealthy diets. Fifty-six percent of the examined male students and 25 % of the examined female students used to smoke prior to new developed organization forms and approaches to smoking prevention were tested. Most smokers were younger than 20 years. Alcohol was consumed by 71.1 % of the interview students; in general, beer was preferred (31.0 %) [19]. A survey was conducted among 1912 first-year students (both males and females, the average age was 17.7 years) in two Moscow higher education institutions (HEI) with its aim to establish levels of physical activity, smoking status, alcohol misuse and food addictions. Almost one third of the respondents (mostly girls) were established to have sedentary lifestyles. An average age of starting to smoke was 14.8 years. At the moment the survey was being conducted, 22 % of the respondents were smokers (28 % of young males and 18 % of young females). Twelve point two percent of the respondents had either moderate or strong nicotine addiction. Most smokers had very low motivation to quit. An average age of starting to use alcohol was 15.8 years. Sixty percent of the respondents drank alcohol without any considerable sex-related differences in its consumption. Eighteen percent of the participating students had irregular meals. Almost 50 % of the students added more salt to cooked food; 17 % consumed too much sugar; more than 50 % consumed foods rich with sugar and fats. Fifty-four percent of the respondents did not consume enough vegetables or fruit [20]. The study [21] focused on analyzing health of medical students attending various years of the Izhevsk State Medical Academy and on generalizing data about their lifestyles, health and incidence obtained by surveying. The analysis revealed that young people tended to have rather poor health due to high incidence rates, presence of one or more chronic diseases, low interest in protecting one's health, unhealthy work and rest regimes and sleep and wake cycle, unhealthy diets, low physical activity etc. Analysis of the survey data revealed that the examined students tended to have poor health; 35 % of the respondents reported having acute respiratory virus infections (ARVI) more than thrice a year and 38.0 % of the respondents had at least one chronic disease. Among chronic pathologies, respiratory diseases held the first rank place with 19 %; the second place belonged to diseases of the musculoskeletal system (16,4 %); third; diseases of the eye and adnexa (15.1 %); fourth, diseases of the digestive system (14.5 %); fifth, diseases of the nervous system (11.2 %); sixth, endocrine diseases (10.3 %); seventh, diseases of the genitourinary system (9.8 %); the last place belonged to diseases of the blood and blood-forming organs (3.7 %). Each fifth student had disorders of the musculoskeletal system, which were associated with sedentary lifestyles and low physical activity. Bad posture, scoliotic changes in spine and flat feet were the most frequent [21].

Analysis of adherence to a healthy lifestyle in high school students showed that two third of the respondents estimated their health as good and fell sick very rarely. One third of the respondents suffered from some malaise from time to time. Bad mood, high fatigue at the end of the day, irritability and headaches were the most frequent negative psychoemotional states mentioned by high school students as those, which they suffered from time to time. Girls had more frequent complaints about periodical malaise than boys. Year after year, high school students have considered sports, healthy diets, refusal from bad habits and healthy sleep the major components of a healthy lifestyle; it is noteworthy that significance assigned by adolescents to a healthy diet has grown considerably over the last two years. Overwhelming majority of the interviewed high school students (79 %) tried to keep a healthy lifestyle. To strengthen their health, high school students tried to spend a lot of time outdoors, did sports on their own, with friends or visited a sport club and stayed away from bad habits [22]. The authors detected authentic direct weak correlations between physical activity and doing sports and various age-related hemodynamic indicators [23].

Surveying and instrumental screening including assessment of the cardio-ankle vascular index were applied in a study with its focus on young people living in the North Caucasian Federal District (NCFD). The authors established frequency of overweight and obesity, elevated BP, smoking, hypodynamia as well as characteristics of diets among young people attending several higher educational institutions in the NCFD. The CAVI as an integrated index of the overall stiffness of the artery turned out to be a bit higher on both sides in Slavs against their counterparts from Caucasian ethnic groups [24]. When blood pressure, BMI and pulse pressure were estimated in a regression model with adaptation potential as a dependent variable, a trend was revealed that as BMI and body sizes grew up, prevalence of cardiovascular diseases increased as well [25].

A study with its focus on a relationship between subjective health self-esteem and working conditions in young people aged 18–25 years established the following dependence: the worse were working conditions the worse esteem was given to their health by the respondents. A relationship was also detected for objective health deterioration since employers tended to make greater demands of their workers under harder working conditions. As a result, workers did not ask for a sick leave even in cases when it was necessary; this led to occurrence of occupational diseases. The authors also noted that workers tended to feel better in case their working conditions involved more physical activity; chronic diseases and obesity were also less prevalent in such cases [26]. Results obtained by anonymous surveying were employed to investigate lifestyles adopted by students of the Pacific State Medical University. Physical development was estimated using the results of a medical check-up including somatometry data (body height and weight) together with the index method (body mass index or BMI), bioimpedance analysis (estimation of body composition) and functional indexes (spirometry). The study established risk factors of chronic non-communicable diseases in 1165 students of the first to third year per seven parameters: overweight, underweight, hypercholesterolemia, hyperglycemia, hypertension, hypotension and smoking. Assessment of students' lifestyle revealed that half of the respondents had bad habits. The most prevalent risk factors of chronic non-communicable diseases were established in students depending on a year and sex. The first year students: boys tended to have hypercholesterolemia, hypertension and overweight; girls, underweight, hyperglycemia, hypercholesterolemia. The second year students: boys tended to have hypertension, hyperglycemia, and overweight; girls, underweight, hyperglycemia, and hypercholesterolemia. The third year students: boys tended to have hypertension, smoking and overweight; girls, underweight, hypercholesterolemia and hyperglycemia [27]. Mental workers are better aware of variable components that make up a healthy lifestyle and this has an impact on their everyday life. They are more often involved in various types of physical activity including organized training sessions. Among them, more people tend to keep a healthy diet and eating regime and, on the contrary, less people have bad habits (smoking or alcohol use). Physical workers have much more negative results as regards adhering to healthy lifestyle principles. In general, their lifestyles are more considerably associated with risks for life and health. Obviously, other socio-demographic factors can interfere with the relationship between workers' health behaviors and their work type, which was established by using surveys. Such factors can include sex, age, education or material welfare [28–34]. A comparative study of young people aged 18–25 years prior to and after the coronavirus pandemic was perfumed to assess trends in adherence to healthy lifestyle among them. The study findings showed that young people tended to worry about their health more after the pandemic and adherence to a healthy lifestyle grew among them [35].

The dendrogram shows how the analyzed literature sources are distributed per the essence of the established risk factors (Figure 1). The risk factors established by literature data analysis are located along the X axis; a correlation measure (the combination distance) between clusters is located along the Y axis. It is

defined as frequency of each risk factor among the examined people according to literature data. In this study, we relied on an assumption that each risk factor initially represented a separate cluster and they would combine in groups later depending on a correlation (distance) between analyzed variables.

As a result, two locuses related to unfavorable lifestyle factors can be identified among 215,858 examined young people. The first one is hypodynamia and obviously associated unhealthy diets and essential hypertension. The second one is bad habits, smoking holding the absolutely first rank place among them.

Health-affecting factors are distributed differently depending on examined people's age (Figures 2 and 3). Among those aged 14–17 years (Figure 2), hypodynamia was more prevalent and naturally a specific weight of all non-functional outcomes including high blood pressure, hyperglycemia and disrupted lipid metabolism also grew. A relation between these variables grows as shown in Figure 2: the Euclidean distance between them decreases and the number of the examined people who have the foregoing risk factors grows up to 17,000 thus forming a massive cluster; hypodynamia and disrupted lipid metabolism take the leading place among the analyzed risk factors. Smoking is less prevalent in this age group since it was detected only in 4000 people in contrast to the age group of 18–25 years (Figure 3).

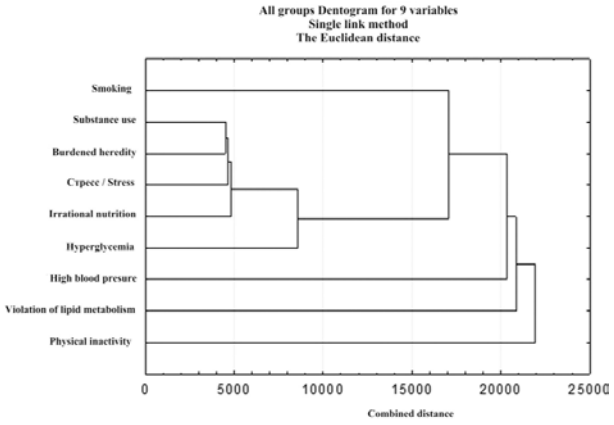

Figure 1. The dendrogram showing distribution of risk factors in all age groups

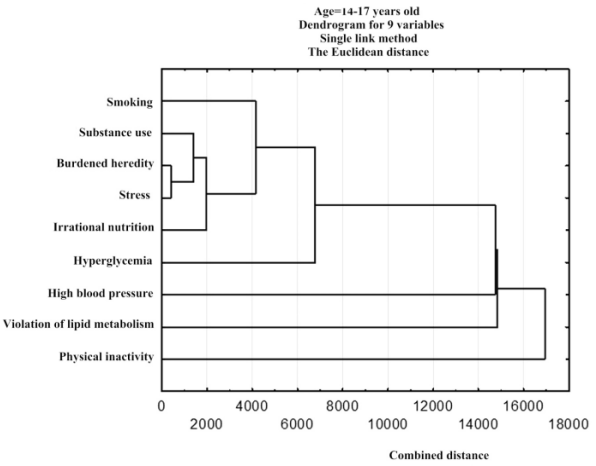

Figure 2. The dendrogram showing distribution of risk factors in the age group of 14–17 years

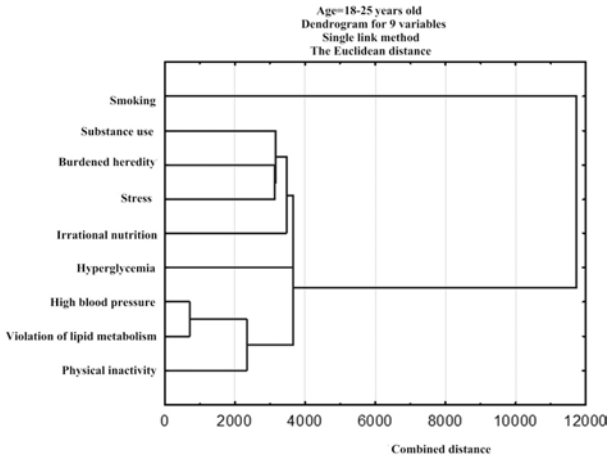

Figure 3. The dendrogram showing distribution of risk factors in the age group of 18–25 years

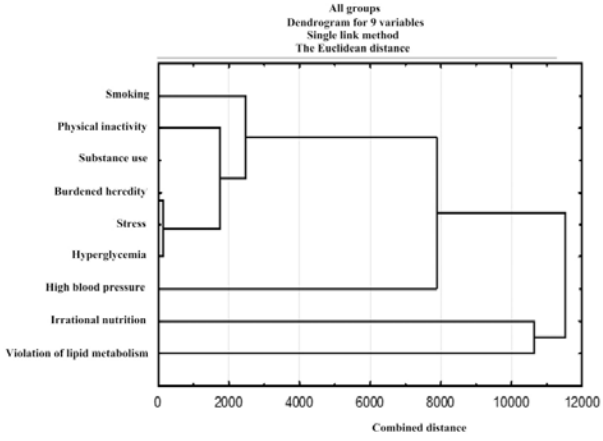

Figure 4. The dendrogram showing distribution of risk factors in all age groups in Asian countries

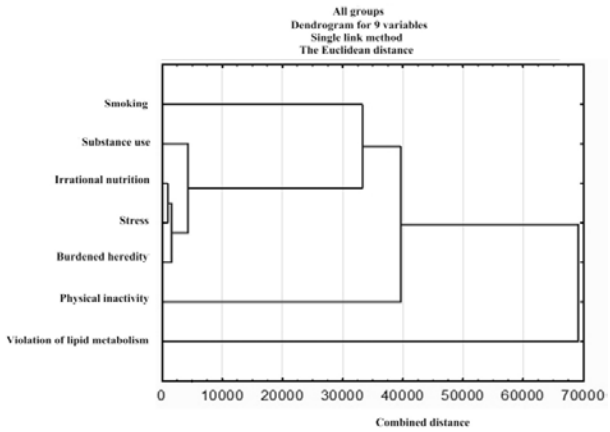

Figure 5. The dendrogram showing distribution of risk factors in all age groups in European countries

Among people aged 18–25 years (Figure 3), practically all unfavorable factors and corresponding outcomes of an unhealthy lifestyle are associated with smoking that is, smoking as a risk factor was identified in most examined people in this age group whereas other risk factors were less prevalent. Major cluster-forming risk factors include smoking, hypodynamia, use of psychoactive substances and unhealthy diets. These risk factors influence development of chronic CNDs among young people and are closely interrelated as shown in Figure 3:2000 examined people had established hypodynamia and 12,000 were smokers. We can conclude that as young people grow older and control performed by family and school is eased off, some factors related to absent persistent interest in having a healthy lifestyle start to manifest. This naturally results in elevated risks of chronic NCDs. The same trends in lifestyle-related factors persist in the age group of 26–30 years similar to that of 18–25 years; namely, impacts of smoking and hypodynamia grow.

There were considerably less respondents in the age group of 26–30 years (approximately 5 thousand); however, the trends in ratios of risk factors were similar to those identified in the age group of 18–25 years, that is, smoking was the most prevalent.

The analyzed issue also has inter-national differences; lifestyle risk factors are distributed in a different way in Asian countries, European countries and Russia as shown in Figures 4 and 5. The most significant factors in Asia include unhealthy diets (12,000 people were established to have this factor) and associated hypodynamia (up to 2000 thousand people) with such manifested outcomes as high blood pressure and disrupted lipid metabolism. Smoking is much less frequent and its prevalence tends to decrease (Figure 4). Hypodynamia prevails in European countries (70,000 people); the second place belongs to unhealthy diets (up to 2000 people) but this factor is less manifested than in Asian countries. Smoking takes the third place (32,000 people); however, this factor has greater influence than in Asian countries (Figure 5).

Conclusion. Cardiovascular diseases (CVD) cause 17.7 million deaths annually, which accounts for 31 % of all deaths worldwide. Four out of five CVD-caused deaths are due to infarctions and strokes and more than 75 % of these deaths occur in low- and middle-income countries[6]. At the macroeconomic level, CVD have become a grave economic burden for these countries[7]; Brazil, African countries and East Timor are good examples here. These countries do not have integrated programs of primary healthcare for early identification and treatment provided for people with CVD-causing risk factors and this is one of the reasons for high CVD prevalence in them. This makes access to effective healthcare able to meet patients' demand more difficult. Therefore, primary healthcare, prevention by learning, identifying and managing cardiovascular health risks play an important role in preventing or mitigating them and, moreover, in preventing CVD complications in an effective and least harmful way [36–39].

Given all the foregoing, the NANDA-I (North American Nursing Diagnosis Associa-

[6] Cardiovascular Diseases. *WHO*. Available at: https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1 (October 10, 2024).

[7] Health and Environment. Tools for Effective Decision-Making. The WHO-UNEP Health and Environment Linkages Initiative (HELI): Review of Initial Findings. *WHO*. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/32527/HE.pdf?sequence=1&isAllowed=y (October 10, 2024).

tion) taxonomy [37] determines the nursing diagnosis 'the risk of impaired cardiovascular function' as susceptibility to internal or external causes, which can affect one or several vital organs or the circulatory system. Risk factors for this nursing diagnosis include pharmacological agents, lack of knowledge of modifiable risk factors, diabetes mellitus, sedentary lifestyle, high blood pressure, individual history of cardiovascular diseases, family history of cardiovascular diseases, age of 65 years and older, obesity and smoking [38]. Early detection of risk factors in people susceptible to cardiovascular risk helps develop intervention measures, which can eliminate and / or mitigate these risks and, consequently, prevent CVD progression. Therefore, implementation of relevant prevention activities among young people can decrease cardiovascular incidence by up to 80 % [39].

When analyzing young people's lifestyles, the following issues should be emphasized: social stereotypes of a healthy lifestyle have not been molded enough; bad habits are commonly spread in these age groups; young people tend to be poorly informed of their own health and are incapable to critically perceive negative symptoms and health risk situations; creative, developing and collective leisure activities are not used as actively as they should be; perception of health as a value has been weakened [21].

Analysis of medical students' health revealed that young people tended to have rather poor health due to high incidence rates, occurrence of one or several chronic diseases, low interest in one's health, unhealthy diets, irrational work, rest and sleep regimes, low physical activity etc. Since certain hemodynamic disorders are usually correlated with basic risk factors, it is necessary to wider implement targeted BP assessment methods in operations of students' health centers and students' polyclinics. These methods should be implemented as an integral component in the second stage of students' mass health examination and used for early detection of vascular remodeling during mass preventive examinations so that any preventive measures would be taken in due time. Prevention activities among students should be organized through creating students' health centers, either in one HEI or one center per several ones. These centers should cooperate with dean's offices, experts in educational and social work, student activists, information support workers, various departments and other HEI structures. This activity should be catalyzed by experts employed at clinical departments of various profiles, who combine their posts with working as physicians at students' health centers. Early prevention of cardiovascular and metabolic health risks among students is a significant factor of their further occupational realization as future health experts. Alcohol misuse and unhealthy diets are the most frequent modifiable cardiovascular health risks among students. Smoking and low physical activity are also urgent challenges; however, their prevalence is lower among students in Moscow in comparison with other RF regions. Established regularities require special attention from HEI administrative staff. Preventive activities aimed at RF correction have been proven to make much greater contributions to a decline in cardiovascular mortality in comparison with treatment procedures applied to treat coronary heart disease, essential hypertension and their complications [3, 6]. This approach should be implemented through creating a system for mass RF diagnostics and detection of pre-clinical disorders among population, especially employable groups [31, 32]. Encouraging students to take part in regular mass health examinations is even more effective. Examinations provided for youth at health centers or students' polyclinics [18, 33] seem quite promising in this respect [19, 20]. The first experience in creating students' health schools for students who are exposed to cardiovascular risk factors creates certain preconditions for further development in this direction [21]. Development of such an approach requires creation of well-grounded screening aimed at effectively assessing profiles of significant RF and latent changes in target organs [7, 9]. It is established that successful screening should consider age of examined patients [22], their social [20],

psychophysiological [12, 13] and constitutional-anthropometric [11] status. Prevention, which starts at an early age, seems the most effective even if it brings any results only in a long-term outlook since such an age corresponds to the earliest stages in the cardiovascular continuum [14]. But the diagnostic stage in prevention provided for young people as an initial element of mass health examination is obviously underdeveloped [18].

Our findings make it possible to determine priority activities aimed at preventing negative effects produced by these factors and to develop strategies able to support health protection in young people.

Therefore, the accomplished meta-analysis of available literature sources that focus on lifestyle-related risk factors and their role in health risks among young people made it possible to establish basic risk factors of chronic CNDs and age groups where lifestyle-related factors, hypodynamia and smoking, have the greatest effects. In addition, the issue was established to be global in its essence.

It is necessary to perform quantify prevalence of such factors and their outcomes in order to check effectiveness of implemented preventive activities. In Russia, this goal may be easier to achieve due to the system for social and hygienic monitoring, which operates within the Sanitary Service's activities. Consequently, it is necessary to develop statistical report forms that cover negative lifestyle-related factors as well as their possible effects on the body. These forms should be harmonized with the system for social and hygienic monitoring.

Naturally, the question here is where relevant data should be taken from. It is a well-known fact that full-time students are provided with annual screening of risk factors able to cause chronic NCDs at their higher educational institutions in conformity with the Order No. 404n dated April 27, 2021 'On Approval of the procedure for conducting preventive medical check-ups and mass health examination for certain groups of adult population' (last edited by the Orders issued by the RF Ministry of Health on February 01, 2022 No. 44n, July 07, 2023 No. 352n, September 28, 2023 No. 515n). In the beginning, when pilot projects are implemented, relevant data on risk factors can be obtained by these activities and this will help get some insight into their prevalence in RF regions. Additional data can be provided by medical prevention departments in students' polyclinics (health centers), who are also responsible for identifying risk factors able to cause chronic NCDs.

Therefore, according to available literature data, hypodynamia and smoking are two major lifestyle-related health risk factors of chronic non-communicable diseases for young people.

Quantitative data on lifestyle-related risk factors can be obtained through mass health examinations in primary healthcare organizations such as polyclinics or health centers, which should be considered within development of the system for social and hygienic monitoring.

It is advisable to develop and implement statistical report forms that cover lifestyle-related risk factors in the system for social and hygienic monitoring. This may promote more comprehensive and science-intense analysis of cause-effect relations within the Lifestyle Indicators – Population Health system, development of scenario modeling and prediction of risks of medical and demographic losses in the country.

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