SPECIFICS OF THE DYNAMICS OF OVERWEIGHT AND CONCOMITANT CHRONIC DISEASES IN VORONEZH OBLAST

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Overweight and obesity are some of the global problems faced by the civilization characterized by the growing prevalence and the development of concomitant diseases. This study aimed to assess the mid- and long-term incidence and dynamics of these disorders in various age groups of the population of Voronezh Oblast, including the mentioned concomitant chronic diseases, and to compare the learned data to the mean figures registered in the Central Federal District (CFD) of the Russian Federation and the country in general. From 2016 to 2020, in Voronezh Oblast, the values of the indicators reflecting the prevalence of overweight were profoundly influenced by the regional specifics; in all the age groups, these values were significantly higher than the mean figures recorded in the Central Federal District and Russia on the whole ($p < 0.05$). As for the concomitant diseases, the incidence of the disorders of endocrine system, mental and behavioral disorders, urolithiasis was high, showing an upward trend, whereas in the country in general and CFD in particular, the respective indicators tend to decrease. The results of this study indicate the need for further exploration of this subject, including investigation of the potential risk factors defining the specifics of the prevalence in the region in question, some of which are the features of the nutritional patterns, the content of vitamins and minerals in the general diet in particular, and factors not connected to nutrition, such as chemical composition of water and features of the soil.

Keywords: obesity, overweight, general morbidity, risk factors

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ОСОБЕННОСТИ ДИНАМИКИ ЗАБОЛЕВАЕМОСТИ ОЖИРЕНИЕМ И СОПУТСТВУЮЩИМИ ХРОНИЧЕСКИМИ ЗАБОЛЕВАНИЯМИ СРЕДИ НАСЕЛЕНИЯ ВОРОНЕЖСКОЙ ОБЛАСТИ

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Проблема избыточной массы тела и ожирения — одна из глобальных проблем цивилизации, которая характеризуется как прогрессирующим ростом этой формы патологии, так и развитием хронических заболеваний, сопутствующих ожирению. Целью исследования было оценить среднемноголетние уровни и динамику показателей заболеваемости в различных возрастных группах населения Воронежской области, в том числе заболеваемости ожирением и обусловленными им хроническими заболеваниями в сравнении со средними показателями по Центральному федеральному округу (ЦФО) и Российской Федерации (РФ) в целом. В Воронежской области регистрируемые показатели распространенности ожирения в период с 2016 по 2020 г. имели ярко выраженные региональные особенности и были существенно выше по сравнению со средними показателями по РФ и ЦФО ($p < 0,05$) во всех возрастных группах. Зарегистрированы более высокие показатели заболеваемости для заболеваний эндокринной системы, психических расстройств и расстройств поведения, мочекаменной болезни, демонстрирующие направленность к росту при общей тенденции к снижению в целом по РФ и ЦФО. Полученные результаты свидетельствуют о необходимости продолжить исследование и детально изучить потенциальные факторы риска, определяющие специфику заболеваемости на этой территории, к которым относятся характер питания, в частности особенности витаминно-минерального состава пищевых продуктов основной группы потребления, а также факторы, не связанные с особенностями питания, такие как химический состав воды, особенности состава почвы.

Ключевые слова: ожирение, избыточная масса тела, общая заболеваемость, факторы риска

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The problem of overweight and obesity is one of the global problems of civilization [1]. Its prevalence on the scale of entire populations stems primarily from unhealthy eating behavior, characterized by increased consumption of high-calorie foods and dishes with excessive sugar content [2, 3]. Insufficient physical activity also aggravates the risk of overweight, as well as type 2 diabetes mellitus, cardiovascular disease, and other conditions caused by obesity [4]. The list of general significant risk factors includes eating disorders (overeating and night eating syndrome), sleep deficiency, and hypodynamia [5]. Thus,

those who sleep for less than 8 hours are 3.1 times more likely to be overweight than those who sleep for at least 10 hours [6]. There are also specific risk factors, which basically determine regional features of overweight; being primarily of chemical nature, they slow down metabolic processes [7].

Adipose tissue, as a metabolically active endocrine organ, influences immunity, glucose levels, lipid metabolism, angiogenesis, and metabolic rate. Against the backdrop of obesity and overweight, the body increases the production of pro-inflammatory and atherogenic cytokines, experiences oxidative stress, and faces heightened risks of insulin resistance, dyslipidemia, hypertension, and orthopedic issues [8].

Recent studies indicate that overweight and obesity are risk factors for cardiovascular diseases, with their prevalence continuing to rise [9–13] not only among adults but also among children [14]. The pattern of distribution of adipose tissue in the body is considered one of the key drivers behind cardiovascular pathologies in obese individuals; it particular, the respective conditions are associated with the predominance of visceral fat [15, 16]. There are about 230 complications that obesity contributes to. In addition to the mentioned cardiovascular system disorders, the list includes type 2 diabetes mellitus, diseases such as dyslipidemia, obstructive sleep apnea syndrome, chronic kidney disease, non-alcoholic fatty liver disease, and some cancers [17, 18]. There is evidence that obesity promotes the development of polycystic ovary syndrome [19], and reports describing cases of otorhinolaryngological diseases [20] and inflammatory bowel conditions [21] in obese individuals. Many patients with obesity are more prone to developing respiratory diseases [22]. Studies point to a link between obesity and certain cognitive impairments due to the development of cerebrovascular pathology, which is one of the most common disorder of the nervous system. Thus, published research positions obesity as a global problem, describing it as both a progressing pathology and a risk factor for concomitant diseases that significantly reduce the quality and duration of life. The urgency of this problem substantiated conducting a study within the framework of the Demography national project [23].

This study aimed to assess the mid- and long-term incidence and dynamics of obesity and the diseases associated therewith in various age groups of the population of Voronezh Oblast, and to compare the collected data to the mean figures registered in the Central Federal District (CFD) of the Russian Federation (RF) and the country in general.

METHODS

We analyzed the official statistical data of the Ministry of Health of the Russian Federation (report form #12 "Information on the number of diseases reported in patients living in the service area of the medical organization" and the national statistical books on the general morbidity of children (0–14 years old), adolescents (15–17 years old) and adults (18 years and older)). The analysis covered different age groups; the data described years 2011 through 2020.

We used parametric and nonparametric statistical methods to process the results in MyOffice Standard 3 package (New Cloud Technologies; Russia). The tests employed to check the normality of the distribution and the equality of variances were the Shapiro-Wilk test and Levene's test, respectively. Since the parameters studied exhibited normal distribution, we used parametric methods. The Student's *t*-test enabled the comparison of numerical data between two independent groups. The differences were considered significant for $p < 0.05$.

RESULTS

The analysis of obesity prevalence in the Voronezh region during the past decade has revealed an upward trend across all considered age groups, including children (0–14 years old), adolescents (15–17 years old), and adults (18 years and older). From 2016 to 2020, the incidence rates recorded there exhibited pronounced specific features characteristic of the region, and were significantly higher than the average for the RF and the CFD ($p < 0.05$) (Fig. 1).

From 2011 to 2020, the incidence of obesity among children (0–14 years old) in the Voronezh Region was significantly higher than in the RF, with the mean being 35.8% (from 23.7 to 48.7%) ($p < 0.05$). Compared to the CFD, the figures for the Voronezh Region were higher by 35.0% on average (from 8.1 to 61.5%), which is significant ($p < 0.05$) (Fig. 1A). Compared to the RF, the incidence of obesity was significantly higher ($p < 0.05$) than the country mean among adolescents (15–17 years old) and adults (18 years old and older), too. Specifically, the figures for adolescents were, on average, 54.4% (from 31.2 to 80.8%) greater than country means, and 51.7% (from 12.3 to 71.3%) greater than the means registered in the CFD (Fig. 1B). As for adults, the average values were higher than in the RF by 26.1%, and significant differences were recorded from 2016 on, ranging from 34.3 to 61.9%. Compared to the CFD, with the prevalence dynamics stable, the considered indicator within the studied period was 90.5% higher in the Voronezh Region, and since 2016, the incidence rates there have been more than twice as high as in the CFD (Fig. 1C).

Thus, during the period in question, the rates of obesity in all age groups were significantly higher in the Voronezh Region than in the RF ($p < 0.05$). A similar trend was observed for mental disorders, behavioral disorders, and urolithiasis (Tables 1, 2).

The analysis of morbidity among adults (18 years and older) revealed a significantly higher incidence of digestive system diseases, including gastric and duodenal ulcers, as well as a significant prevalence of diseases with long latency periods, including diseases of the circulatory system, hypertension in particular [9–13]. According to available literature, they may be etiologically linked to obesity (Table 2).

In the Voronezh Region, diseases of the endocrine system (type 2 diabetes mellitus), digestive disorders, and urolithiasis are in the rise among children and adolescents, whereas in the RF and the CFD, the direction of the trend for these ailments is opposite (Fig. 2).

Against the backdrop of a general upward trend in the incidence of diabetes among adolescents, in the Voronezh Region (Fig. 2B), the prevalence of this disease was dropping from 2013 to 2016, followed by a significant spike in the period from 2019 to 2020. The situation is similar for the digestive diseases: in 2011, the incidence thereof in the Voronezh District was lower than in the RF in general, but from 2014 on, the trend for such diseases in the said region is upward and stable (Fig. 2C). As for urolithiasis, in child population (0–14 years old), a significant increase in the incidence thereof was revealed during the observed period, with the prevalence significantly higher than in the CFD and nationwide (Fig. 2A). In adolescents, while the general incidence of urolithiasis was on the rise, in the Voronezh Region, this disease was diagnosed less often that in the RF and the CFD, but from 2017 to 2019, the situation changed to the opposite.

DISCUSSION

Along with the increased incidence of obesity in various age groups of the Voronezh Region population (compared to those

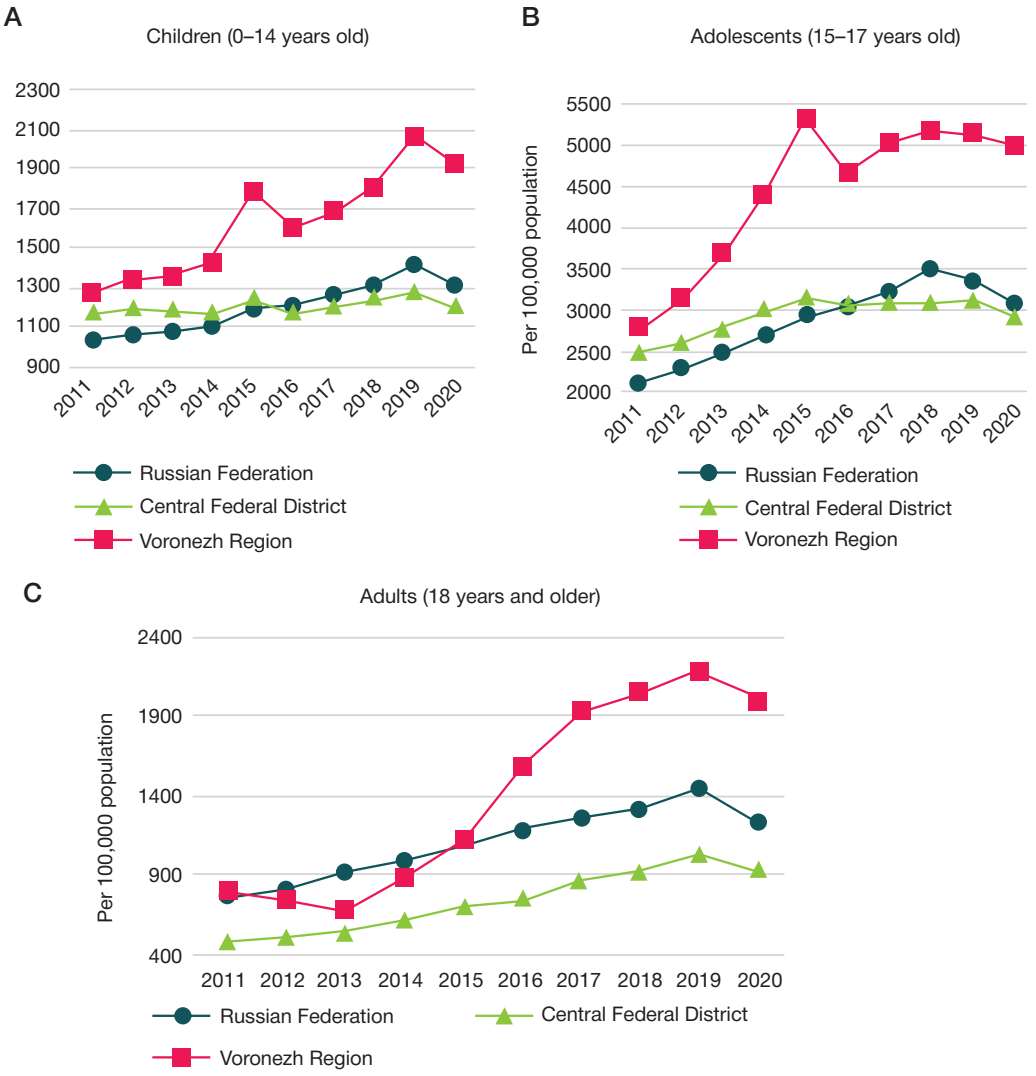

Fig. 1. Trends in obesity per 100,000 population (according to official data from the Ministry of Health of the Russian Federation)

registered in the CFD and Russia in general), we have found high prevalence of mental and behavioral disorders that may be associated with obesity, the said association shown in a study [24] that reported the set of obesity-related factors to influence cognitive well-being. The high incidence of urolithiasis requires further study to determine additional factors unrelated to dietary patterns. For the diseases with a long latency period (those of the circulatory and digestive systems), the morbidity rates in the adult population of the Voronezh Region were significantly higher, which may be a consequence of a long-term persistent high level of obesity in children and adolescents, which is also consistent with the available literature [7,11–14, 21].

CONCLUSIONS

Thus, in the Voronezh Region, we found significantly higher obesity indicators across all age groups, with a stable trend over time. Among the specifics elated to this morbidity in the considered territory are the upward trends for the endocrine system (type 2 diabetes mellitus), digestive diseases (gastritis

Table 1. Groups of diseases with significantly higher mid- and longterm prevalence in the Voronezh Region, children and adolescents, per 100,000 population

Groups of diseases	Children (0–14 years old)			Adolescents (15–17 years old)		
	VR	CFD	RF	VR	CFD	RF
V. Mental and behavioral disorders	4580	2475.6	2874.6	7823.6	5256.3	6016.5
Gastritis and duodenitis (XI. Diseases of the digestive system)	2310.2	1667.3	1891.2	6620.8	5602.6	6182.2
Obesity (IV. Endocrine, nutritional and metabolic diseases)	1629.6	1206.8	1199.9	4431	2921.6	2870.6
Diseases of the thyroid gland (IV. Endocrine, nutritional and metabolic diseases)	136.8	131.6	112.4	347.5	310	274.7
Urolithiasis (XIV. Diseases of the genitourinary system)	49.5	19	24.5	167.1	79.2	90.2
Cystic fibrosis (IV. Endocrine, nutritional and metabolic diseases)	12	10.5	9.2	9.1	7.7	6.8
IV. Endocrine, nutritional and metabolic diseases	4107.3	3580.3	4045.4	12429.9	8528.6	9555.3

Note: VR — Voronezh Region; CFD — Central Federal District; RF — Russian Federation.

Table 2. Groups of diseases with significantly higher mid- and longterm prevalence in the Voronezh Region, adults, per 100,000 population

Groups of diseases	Adults (18 years and older)		
	Voronezh Region	Central Federal District	Russian Federation
Obesity (IV. Endocrine, nutritional and metabolic diseases)	1397	733.2	1108.2
V. Mental and behavioral disorders	5728.4	4398.5	4669
Urolithiasis (XIV. Diseases of the genitourinary system)	912.1	712.9	709.9
IX. Diseases of the circulatory system	37067	28293.2	28979.4
Hypertension (IX. Diseases of the circulatory system)	18553.9	11558.9	2239.7
Stomach ulcer and duodenal ulcer (XI. Diseases of the digestive system)	1299.5	1027.6	1065.2

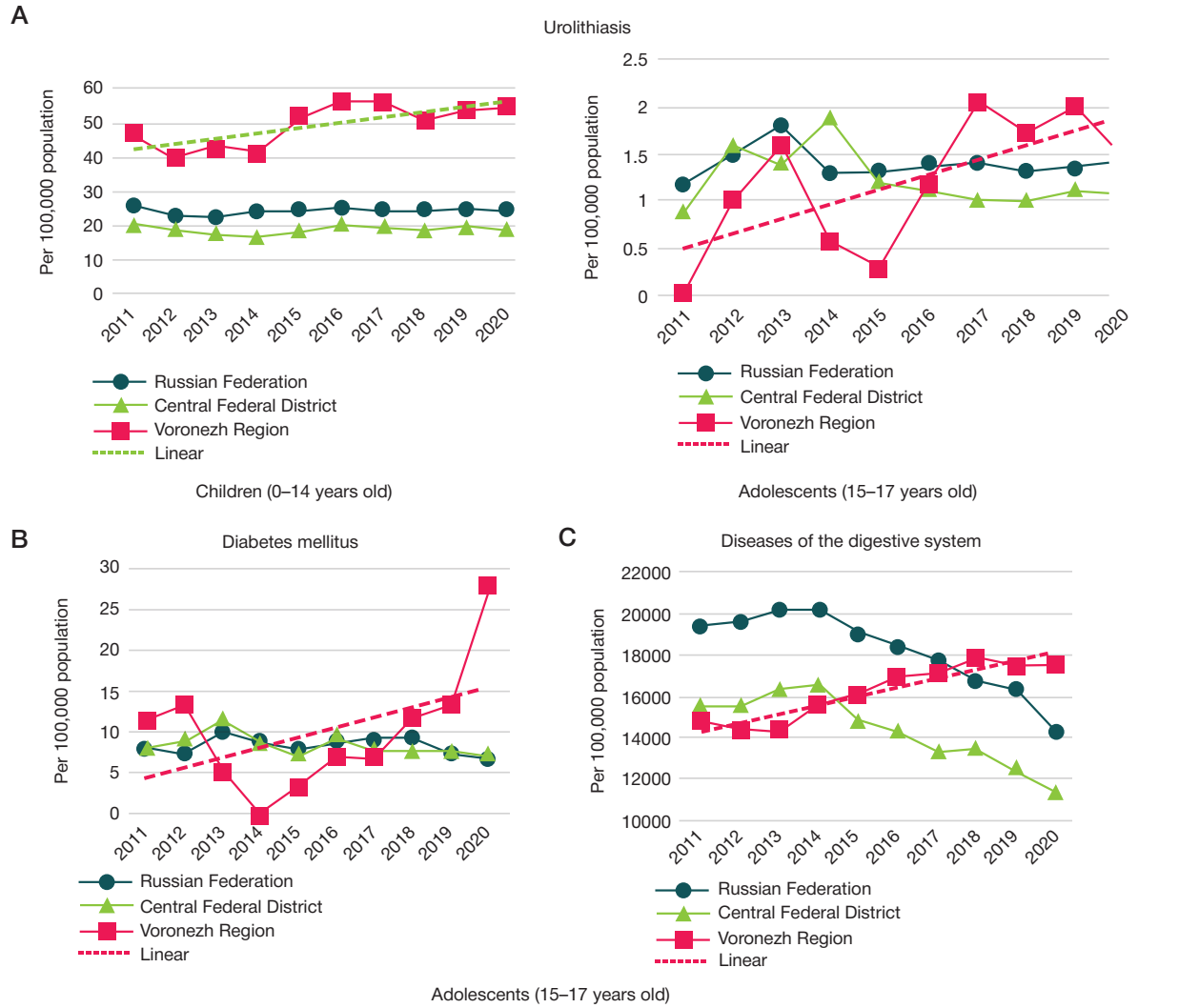

Fig. 2. The dynamics of morbidity in children and adolescents, 2011 to 2020; the Voronezh Region, the Russian Federation, and the Central Federal District compared

and duodenitis), and urolithiasis in children and adolescents, while the situation registered on the level of the nation in general for these diseases is downward in the respective population cohorts. The results of this study support the need to continue research and investigate the potential risk factors that determine the specifics of morbidity in the given area, including the vitamin and mineral content in the mainstay foods, and factors unrelated to nutrition, such as the chemical composition of drinking water and soil composition.

References

1. Ozhirenie i izbytochnaja massa tela. Vsemirnaja organizacija zdravoohranenija [Internet]. 2024 March [cited 2025 Jan 15]. (In Rus.). URL: https://www.who.int/ru/news-room/fact-sheets/detail/obesity-and-overweight.
2. Bischoff SC, Boirie Y, Cederholm T, Churdakis M, Cuerda C, Delzenne NM, et al. Towards a multidisciplinary approach to understand and manage obesity and related diseases. Clin Nutr. 2017; (36): 917–38. DOI: 10.1016/j.clnu.2016.11.007.
3. Engin A. The definition and prevalence of obesity and metabolic syndrome. Adv Exp Med Biol. 2017; (960):1–17. DOI: 10.1007/978-3-319-48382-5_1.
4. Lobstein T, Jackson-Leach R, Moodie ML. Child and adolescent obesity: part of a bigger picture. Lancet. 2015; 385 (9986): 2510–20. DOI: 10.1016/S0140-6736(14)61746-3.
5. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014; 384 (9945): 766–81. DOI: 10.1016/S0140-6736(14)60460-8.
6. Zhang, Y, Zhao J, Chu Z. Increasing prevalence of childhood overweight and obesity in a coastal province in China. Pediatric Obesity. 2015; 11 (6): 22–6. DOI: 10.1111/ijpo.12070.
7. Razina AO, Runenko SD, Achkasov EE. Problema ozhirenija: sovremennye tendencii v Rossii i v mire. Vestnik Rossijskoj akademii medicinskih nauk. 2016; 71 (2): 154–9 (in Rus.). DOI: 10.15690/vramn655.
8. Dedov II, Shestakova MV, Galstjan GR. Rasprostranennost' saharnogo diabeta 2 tipa u vzroslogo naselenija Rossii (issledovanie NATION). Saharnyj diabet. 2016; 19 (2): 104–12 (шт Кгыю). DOI: 10.14341/DM2004116-17.
9. Borodkina DA, Gruzdeva OV, Kvitkova LV, Barbarash OL. Mozhno li nazvat' visceral'noe ozhirenie kljuchevym faktorom paradoksa ozhirenija? Problemy jendokrinologii. 2016; 62 (6): 33–9 (in Rus.). DOI: 10.14341/probl201662633-39.
10. Karpin VA, Shuvalova OI. Ozhirenie — pandemija XXI veka. Medicinskaja nauka i obrazovanie Urala. 2020; 21 (1): 145–8 (in Rus.).
11. Shvangiradze TA, Bondarenko IZ, Troshina EA. Rol' mikroRNK v diagnostike serdechno-sosudistyh zabolevanij u pacientov s ozhireniem. Consilium Medicum. 2021; 23 (4): 358–62 (in Rus.). DOI: 10.26442/20751753.2021.4.200827.
12. Zhou SS, Jin JP, Wang JQ, Zhang ZG, Freedman JH, Zheng Y, et al. miRNAS in cardiovascular diseases: potential biomarkers, therapeutic targets and challenges. Acta Pharmacol Sin. 2018; 39 (7): 1073–84. DOI: 10.1038/aps.2018.30.
13. Vasilkova TN, Baklaeva TB, Mataev SI, Rybina Ju A. Rol' ozhirenija v formirovanii serdechno-sosudistoj patologii. Prakticheskaja medicina. 2013; 7 (76): 117–22 (in Rus.).
14. Herouvi D, Karanasios E, Karayianni C, Karavanaki K. Cardiovascular disease in childhood: the role of obesity. Eur J Pediatr. 2013; 172 (6): 721–32. DOI: 10.1007/s00431-013-1932-8.
15. Bondarenko VM, Marchuk VP, Pimanov SI, Mihajlova NA, Makarenko EV. Korreljacija soderzhanija visceral'noj zhirovoj tkani po dannym komp'juternoj tomografii s antropometricheskimi pokazateljami i rezul'tatami ul'trazvukovogo issledovanija. Vestnik Vitebskogo gosudarstvennogo medicinskogo universiteta. 2013; (1): 31–8 (in Rus.).
16. Chumakova GA, Kuznecova TJu, Druzhilov MA, Veselovskaja NG. Visceral'noe ozhirenie kak global'nyj faktor serdechno-sosudistogo riska. Rossijskij kardiologicheskij zhurnal. 2018; (5): 7–14 (in Rus.). DOI: 10.15829/1560-4071-2018-5-7-14.
17. Neinfekcionnye zabolevanija: faktory riska. Vsemirnaja organizacija zdravoohranenija [Internet]. 2024 Dec [cited 2025 Jan 15]. (In Rus.). URL: https://www.who.int/ru/news-room/fact-sheets/detail/noncommunicable-diseases.
18. Andersen IG, Holm JC, Homøe P. Obstructive sleep apnea in children and adolescents with and without obesity. Eur Arch Otorhinolaryngol. 2019; 276 (3): 871–8. DOI: 10.1007/s00405-019-05290-2.
19. Motta AB. The role of obesity in the development of polycystic ovary syndrome. Curr Pharm Des. 2012; 18 (17): 2482–91. DOI: 10.2174/13816128112092482.
20. Jung SY, Park DC, Kim SH, Yeo SG. Role of obesity in otorhinolaryngologic diseases. Curr Allergy Asthma Rep. 2019; 19 (7): 34. DOI: 10.1007/s11882-019-0865-3.
21. Harper JW, Zisman TL. Interaction of obesity and inflammatory bowel disease. World J Gastroenterol. 2016; 22 (35): 7868–81. DOI: 10.3748/wjg.v22.i35.7868.
22. Dixon AE, Peters U. The effect of obesity on lung function. Expert Rev Respir Med. 2018; 12 (9): 755–67. DOI: 10.1080/17476348.2018.1506331.
23. Pasport nacional'nogo proekta “Demografija”. Utverzhden Sovetom pri Prezidente Rossijskoj Federacii po strategicheskomu razvitiju i nacional'nym proektam (protokol ot 24 dekabrja 2018 g. № 16). (In Rus.).
24. Matveeva MV, Samojlova JuG, Zhukova NG. Ozhirenie i kognitivnaja disfunkcija. Ozhirenie i metabolizm. 2016; 13 (3): 3–8 (in Rus.). DOI: 10.14341/omet201633-8.

Литература

1. Ожирение и избыточная масса тела. Всемирная организация здравоохранения [Интернет]. Март 2024 г. [дата обращения 15.01.2025]. URL: https://www.who.int/ru/news-room/fact-sheets/detail/obesity-and-overweight.
2. Bischoff SC, Boirie Y, Cederholm T, Churdakis M, Cuerda C, Delzenne NM, et al. Towards a multidisciplinary approach to understand and manage obesity and related diseases. Clin Nutr. 2017; (36): 917–38. DOI: 10.1016/j.clnu.2016.11.007.
3. Engin A. The definition and prevalence of obesity and metabolic syndrome. Adv Exp Med Biol. 2017; (960):1–17. DOI: 10.1007/978-3-319-48382-5_1.
4. Lobstein T, Jackson-Leach R, Moodie ML. Child and adolescent obesity: part of a bigger picture. Lancet. 2015; 385 (9986): 2510–20. DOI: 10.1016/S0140-6736(14)61746-3.
5. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014; 384 (9945): 766–81. DOI: 10.1016/S0140-6736(14)60460-8.
6. Zhang, Y, Zhao J, Chu Z. Increasing prevalence of childhood overweight and obesity in a coastal province in China. Pediatric Obesity. 2015; 11 (6): 22–6. DOI: 10.1111/ijpo.12070.
7. Разина А. О., Руненко С. Д., Ачкасов Е. Е. Проблема ожирения: современные тенденции в России и в мире. Вестник Российской академии медицинских наук. 2016; 71 (2): 154–9. DOI: 10.15690/vramn655.
8. Дедов И. И., Шестакова М. В., Галстян Г. Р. Распространенность сахарного диабета 2 типа у взрослого населения России (исследование NATION). Сахарный диабет. 2016; 19 (2): 104–12. DOI: 10.14341/DM2004116-17.
9. Бородкина Д. А., Груздева О. В., Квиткова Л. В., Барбараш О. Л. Можно ли назвать висцеральное ожирение ключевым фактором парадокса ожирения? Проблемы эндокринологии. 2016; 62 (6): 33–9. DOI: 10.14341/probl201662633-39.
10. Карпин В. А., Шувалова О. И. Ожирение — пандемия XXI века. Медицинская наука и образование Урала. 2020; 21 (1): 145–8.
11. Швангирадзе Т. А., Бондаренко И. З., Трошина Е. А. Роль микроРНК в диагностике сердечно-сосудистых заболеваний у пациентов с ожирением. Consilium Medicum. 2021; 23 (4): 358–62. DOI: 10.26442/20751753.2021.4.200827.
12. Zhou SS, Jin JP, Wang JQ, Zhang ZG, Freedman JH, Zheng Y, et al. miRNAS in cardiovascular diseases: potential biomarkers, therapeutic targets and challenges. Acta Pharmacol Sin. 2018; 39 (7): 1073–84. DOI: 10.1038/aps.2018.30.
13. Василькова Т. Н., Баклаева Т. Б., Матаев С. И., Рыбина Ю. А. Роль ожирения в формировании сердечно-сосудистой патологии. Практическая медицина. 2013; 7 (76): 117–22.

14. Herouvi D, Karanasios E, Karayianni C, Karavanaki K. Cardiovascular disease in childhood: the role of obesity. Eur J Pediatr. 2013; 172 (6): 721–32. DOI: 10.1007/s00431-013-1932-8.
15. Бондаренко В. М., Марчук В. П., Пиманов С. И., Михайлова Н. А., Макаренко Е. В. Корреляция содержания висцеральной жировой ткани по данным компьютерной томографии с антропометрическими показателями и результатами ультразвукового исследования. Вестник Витебского государственного медицинского университета. 2013; (1): 31–8.
16. Чумакова Г. А., Кузнецова Т. Ю., Дружилов М. А., Веселовская Н. Г. Висцеральное ожирение как глобальный фактор сердечно-сосудистого риска. Российский кардиологический журнал. 2018; (5): 7–14. DOI: 10.15829/1560-4071-2018-5-7-14.
17. Неинфекционные заболевания: факторы риска. Всемирная организация здравоохранения [Интернет]. Декабрь 2024 г. [дата обращения 15.01.2025]. URL: https://www.who.int/ru/news-room/fact-sheets/detail/noncommunicable-diseases.
18. Andersen IG, Holm JC, Homøe P. Obstructive sleep apnea in children and adolescents with and without obesity. Eur Arch Otorhinolaryngol. 2019; 276 (3): 871–8. DOI: 10.1007/s00405-019-05290-2.
19. Motta AB. The role of obesity in the development of polycystic ovary syndrome. Curr Pharm Des. 2012; 18 (17): 2482–91. DOI: 10.2174/13816128112092482.
20. Jung SY, Park DC, Kim SH, Yeo SG. Role of obesity in otorhinolaryngologic diseases. Curr Allergy Asthma Rep. 2019; 19 (7): 34. DOI: 10.1007/s11882-019-0865-3.
21. Harper JW, Zisman TL. Interaction of obesity and inflammatory bowel disease. World J Gastroenterol. 2016; 22 (35): 7868–81. DOI: 10.3748/wjg.v22.i35.7868.
22. Dixon AE, Peters U. The effect of obesity on lung function. Expert Rev Respir Med. 2018; 12 (9): 755–67. DOI: 10.1080/17476348.2018.1506331.
23. Паспорт национального проекта «Демография». Утвержден Советом при Президенте Российской Федерации по стратегическому развитию и национальным проектам (протокол от 24 декабря 2018 г. № 16).
24. Матвеева М. В., Самойлова Ю. Г., Жукова Н. Г. Ожирение и когнитивная дисфункция. Ожирение и метаболизм. 2016; 13 (3): 3–8. DOI: 10.14341/omet201633-8.