Original Article

Comparative analysis of clinical and anthropometric parameters depending on risk factors for cardiovascular disease in overweight individuals

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ABSTRACT

Backgroud

Overweight and obesity are recognized as one of the most significant medical and social problems of modern health care. According to who, more than 1.7 billion people worldwide are overweight or obese. Despite the fact that many risk factors for their development are studied. There are only isolated studies on the peculiarities of ethnic and climatic-geographical characters. In this regard, we have studied the risk factors for developing cardiovascular disease and, first of all, the most accessible clinical and anthropometric parameters for research: age, height, body weight, BMI, OT (body circumference), SAD, DAP, heart rate.

The purpose of the study

to analyze the clinical and anthropometric parameters depending on the risk factors for cardiovascular disease in overweight individuals.

Materials and methods

It was revealed that out of 1143 respondents, the number of deceased persons was 213, which was 18.6% of the total number of those studied. The type of study is observational prospective cohort. In 2015, respondents were surveyed using survey maps similar to 2003, developed using standardized methods.

Results

For 12 years (2003-2015) in the cohort we studied, there is a tendency to increase almost all clinical and anthropometric indicators (except growth, SAD, DAP), not only in people with hypertension, but also in those who do not have this disease.

Conclusion

High risks of fatal complications due to socio-demographic, clinical-metabolic and behavioral factors of polymorbidity of cardiovascular diseases and diabetes mellitus dictate the need to take these factors into account when implementing a disease management program at the primary health care level.

Keywords

risk factors; cardiovascular disease; clinical and anthropometric parameters; fatal complication

INTRODUCTION

According to the world Health Organization (who), 56.4 million deaths were recorded worldwide in 2015, more than half of which (54%) accounted for the top 10 causes of death[1]. For example, coronary heart disease (CHD) and stroke have been leading diseases for 15 years, occupying the first two positions among the causes of death[2]. In 2015, a total of 15 million deaths were reported from them. The third place has also been firmly occupied by respiratory infections of the lower respiratory tract for 15 years, due to which 3.19 million people died in 2015. With a minimal gap between them, chronic obstructive pulmonary disease (COPD) is in fourth place, which has led to a fatal outcome of 3.17 million lives[3-5]. From lung

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cancer (along with cancer of the bronchi and trachea), 1.7 million people died (5%). Diabetes (D) ranks next, claiming the lives of more than 1.5 million people in 2015, while less than 1 million people died from this disease in 2000[7-9]. The death rate from Alzheimer's disease and other types of dementia increased more than 2 times in the period from 2000 to 2015, for this reason, this disease took the seventh position in the list of the world's leading causes of death in 2015[8]. Diseases such as diarrhoea and tuberculosis took the 8th and 9th places among the causes that take people's lives, with a small difference: 1.39 and 1.37 million cases, respectively. In 2015, 1.34 million deaths were recorded from road traffic accidents, of which 76 % were male[10,11]. It should be noted that the human immunodeficiency virus or acquired immunodeficiency syndrome (HIV / AIDS), prematurity and injuries at birth are not among the top ten causes of death as was established in 2000[12-15]. In our country, according to who, among all causes of death, the share of chronic non-communicable diseases (CNIDUS) accounts for 86%, of which 50% are caused by cardiovascular diseases (CVD), which, both in the Republic of Kazakhstan (ROK) and around the world are the leading cause of death.

Thus, CVD is the leading cause of overall mortality in the world and in our country[16-18]. According to the who forecast, by 2030, 23.6 million people of working age may die only from CVD[19,20].

The purpose of the study

to analyze the clinical and anthropometric parameters depending on the risk factors for cardiovascular disease in overweight individuals.

MATERIALS AND METHODS

Of the 1822 individuals surveyed in 2003, 1,143 responded after 12 years. It was revealed that out of 1143 respondents, the number of deceased persons was 213, which was 18.6% of the total number of those studied. The type of study is observational prospective cohort. In 2015, respondents were surveyed using survey maps similar to 2003, developed using standardized methods.

In the surveyed patients, the incidence was studied in a comparative aspect for 2003 and 2015. Data on morbidity are noted from the words of the studied persons, medical personnel and medical documentation. Due to the fact that a large number of combinations of diseases were obtained with an uneven number of individuals in the

groups, the studied polymorbid States were divided by disease systems. Due to the pathogenetic dependence of CVD with SD, they were combined into one group, which was 302 people in 2003 and 447 in 2015. In 2003 and 2015, 62 and 88 persons were included in the group of persons with respiratory diseases (RD), respectively. In the group with diseases of the gastrointestinal tract (GI) in 2003 there were 166, in 2015 - 364 people. With diseases of the genitourinary system (GUS) in 2003 there were 167, in 2015 there were 252. Endocrine pathology was detected in 15 patients in 2003 and 65 in 2015. Due to the fact that a sufficient number of people with anemia were identified in 2003, they were allocated to a separate group, which was 92 people in 2003, and 15 people 12 years later.

Due to the fact that the majority of the deceased were people who had CVD and D, the cohort was divided into groups with and without this pathology. Thus, of those who did not have CVD and D pathologies, 72 people out of 841 people died, which is 8.5% over a 12-year period, and 79 people out of 276 people who noted the presence of CVD and D in 2003, which is 28.6% over the same period. The influence of the following variants of isolated and combined pathology on population mortality was studied: AH, CHD, type 2 diabetes and a combination of these diseases (AH in combination with CHD, AH in combination with D, AH in combination with CHD and D). We evaluated the indicators of total mortality and mortality from BSK, as well as as a result of onmc and AMI for a 12-year period.

To identify risk factors for fatal complications, risk factors such as gender, age, Smoking, alcohol, physical activity, height, weight, blood pressure, heart rate, and BMI were studied.

As a model of polymorbid conditions, individuals with MS were studied, since this syndrome is the basis for the development of obesity, D AH CHD. The prevalence of MS in the arid zone was determined by the IDF criterion using 960 people

Body weight was measured using verified standardized lever medical scales. The body weight was calculated with an accuracy of 0.1 kg and the data was entered in the questionnaire. The height of the subjects was measured using a height meter, after preliminary removal of shoes and clothing. According to the characteristics of height and body weight, BMI was calculated according to the formula: body weight in kg/height in m2, which allows you to assess the presence or absence of overweight or

obesity.

Measuring waist circumference (FROM) held a soft measuring tape, the results were estimated in centimeters (cm). BP was measured using the manual sphygmomanometer with the mandatory requirements for proper registration AH. According to the results of two measurements with an interval of 5 minutes, the average blood pressure was determined. The pulse rate was determined on the radial artery of the right hand, lying freely on the table. The heart rate was measured for 30 seconds (s) using a stopwatch21-23.

RESULTS AND DISCUSSION

Results of comparison of these indicators in two groups (with CVD+D and without CVD+D) (table 1), according to the 2003 screening data, showed statistically significant differences in age, body weight, BMI, OT, SAD, and DAP. So, individuals with CVD+D is on average almost 12 years older and weighs 15.0% more than people who do not have these diseases. Mainly a group with CVD+D is made up of overweight people (26.82±5.29), compared to people without these pathologies, whose BMI is within the normal range (23.81±4.14). In both of the comparison groups studied, the OT is higher than normal for women, while in men, on the contrary, the OT index in the two groups is within the normal range according to the criteria of the IDF (2005), where the AO is considered to be in men from> 94 cm, in women from> 80 cm. Compared to the recommendations of who and the International society on hypertension (1999) in people with CVD+THE average level of blood pressure, both systolic and diastolic, is higher than normal, in contrast to those without these diseases. There were no statistically significant differences in height and heart rate. A comparative analysis of the same indicators after 12 years (2015) in the two groups studied, which have and do not have CVD+D (table 12) revealed that almost all parameters were statistically significantly different, with the exception of heart rate in women. The average age of the persons with combined pathology of study made up of 58.33±12.84 years, i.e. 10 years older than persons examined in 2003, and data on the age of 2015 is comparable to the results of the study Mamedov M. N. et al, the average age of which was 58.9±0.9 years. According to the results of our study, in the group with CVD+D the average age of men was 59.30±12.76 and women 57.48±12.88. Research by S. A. Shalnov et al. (2007) show that women were more likely to have minimal and very high cardiovascular risks compared to men.

They begin to move faster to the group with a very high cardiovascular risk with the arrival of premenopause (after 45 years), as a result, 48.3% of women in the age category 55-64 years belong to this risk group, in contrast to men (43.6%). The authors attribute this to a higher incidence of overweight or obesity and the prevalence of premenopausal diabetes [24-27].

Table 1-Clinical and anthropometric indicators depending on the presence or absence of CVD and D according to the 2003 study

Indicators	group of persons with CVD +D		group of persons without CVD +D		
	(n=166) M (SD) (men (n=75),		(n=520) M (SD) (men(n=223),		p
	women (n=91))		women (n=297))		
Age (years)	48,09 (14,07)		36,56 (13,24)		p<0,001
men	48,97 (13,17)		36,56 (13,82)		p<0,001
women	47,36 (14,79)		36,55 (12,80)		p<0,001
Weight (kg)	73,06 (15,19)		63,35 (12,62)		p<0,001
men	76,02 (14,52)		65,11 (13,08)		p<0,001
women	70,62 (15,37)		65,53 (12,27)		p<0,001
BMI (kg/m2)	26,82	(5,29)	23,81	(4,14)	p<0,001
men	27,45	(5,26)	23,78	(4,22)	p<0,001
women	26,31	(5,29)	23,84	(4,08)	p<0,001
VB men(cm)	92,57 (12,13)		81,98 (10,63)		p<0,001
VB women	89,60 (13,31)		82,59 (11,48)		p<0,001

Indicators	group of persons with CVD +D		group of persons without CVD +D		
	(n=166) M (SD) (men (n=75),		(n=520) M (SD) (men(n=223),		p
	women (n=91))		women (n=297))		
Height	**165,06 (9,59)**		**165,52 (8,89)**		p=0,56
men	166,65 (8,85)		165,28 (8,72)		p=0,24
women	163,75	(10,02)	165,71 (9,03)		p=0,09
SAH (mm.Hg)	**146,38**	**(16,23)**	**118,71**	**(10,16)**	p<0,001
men	146,80	(15,71)	118,45	(10,11)	p<0,001
women	146,04	(16,72)	118,90	(10,22)	p<0,001
DAH (mm.Hg)	**93,37 (10,57)**		**78,02**	**(9,17)**	p<0,001
men	94,80 (10,94)		77,48	(8,95)	p<0,001
women	92,19 (10,17)		78,43	(9,33)	p<0,001
HR	**75,36**	**(8,89)**	**74,51**	**(7,59)**	p=0,26
men	75,21	(9,32)	74,96	(7,31)	p=0,83
women	75,49	(8,57)	74,16	(7,79)	p=0,16

Also, in our study, the average BMI with OT increased. In the group with CVD+The D BMI is 29.86±5.56, the OT index in men is 99.21±14.47 and in women is 100.02±13.13, which indicates the presence of AO in respondents with cardiovascular disease and DM. It is noteworthy that excess body weight is also observed in individuals without this combination of pathologies (BMI= 26.10±4.86), moreover, women have the presence of AO, where OT is equal to 90.46±12.66. It should be noted that as BMI increases, the incidence of such diseases as hypertension, CHD and diabetes also increases, and obesity is included in the group of 5 main risk factors for death.

In addition, both men and women with CVD+D there

is a statistically significant increase in systolic and diastolic pressure levels compared to individuals without this combination of pathologies.

When comparing the studied parameters over a 12-year period, attention is drawn to the increase in weight in both groups (with CVD +D and without this combination) - by 8.5% and 12.8%, BMI – by 11.3% and 9.7%, respectively. There is an increase in OT in men with CVD+D by 7.1%, in women-by 11.6%. In men and women without CVD+D also shows an increase of 10.2% and 9.5%, respectively.

Thus, the studied individuals with CVD+D, and their combinations in the course of comparison with those who do not have these diseases, have higher values for such indicators as: age, body weight, BMI, OT, systolic and diastolic blood pressure, both in 2003 and in 2015. At the same time, there were increases over a 12-year period in both groups (with CVD+D, and their combinations and without them) of the average values of all studied clinical and anthropometric indicators, in addition to: growth, SAP, DAP also increases.

Comparative analysis of clinical and anthropometric parameters in the study group samples with CVD and D, and their combinations were conducted for the presence or absence of individual diseases of cardiovascular pathology: hypertension, CHD, D for 2003 and 2015(table 2).

Table 2-Clinical and anthropometric indicators depending on the presence or absence of CVD and DM according to the 2015 study

Indicators	group of persons with CVD+DM		group of persons without CVD+DM		
	(n=426) M (SD) (men (n=198),		(n=504) M (SD) (men		
	women (n=201))		(n=228), women (n=303))		
					P
Age (years)	58,33	(12,84)	47,03	(12,90)	p<0,001
men	59,30	(12,76)	45,96	(11,99)	p<0,001
women	57,48	(12,88)	47,75	(13,45)	p<0,001
Weight (kg)	79,34	(15,49)	71,47	(14,67)	p<0,001

Indicators	group of persons with CVD+DM (n=426) M (SD) (men (n=198), women (n=201))		group of persons without CVD+DM (n=504) M (SD) (men (n=228), women (n=303))		P
men	79,18	(15,72)	71,40	(13,43)	p<0,001
women	79,48	(15,33)	71,51	(15,46)	p<0,001
BMI (kg/m2)	**29,86**	**(5,56)**	**26,10**	**(4,86)**	p<0,001
men	29,78	(5,74)	26,01	(4,41)	p<0,001
women	29,93	(5,42)	26,16	(5,14)	p<0,001
VB men(cm)					
VB women	99,21	(14,47)	90,40	(11,48)	p<0,001
	100,02	(13,13)	90,46	(12,66)	p<0,001
	163,03	**(9,25)**	**165,36**	**(9,60)**	p<0,001
Height					
	163,12(9,18)		165,61	(9,60)	p<0,001
men					
	162,96	(9,33)	165,20	(9,62)	p<0,001
women					
	141,87	**(23,33)**	**116,54**	**(10,15)**	p<0,001
SAH (mm. Hg)					
	142,72	(20,65)	116,76	(8,42)	p<0,001
men					
	141,14	(25,44)	116,40	(11,16)	p<0,001
women					
	89,96	**(14,83)**	**77,69**	**(7,31)**	p<0,001
DAH (mm. Hg)					
	89,69	(13,88)	77,93	(6,41)	p<0,001
men					
	90,19	(15,63)	77,54	(7,86)	p<0,001

Indicators	group of persons with CVD+DM (n=426) M (SD) (men (n=198), women (n=201))		group of persons without CVD+DM (n=504) M (SD) (men (n=228), women (n=303))		P
women					
	78,61	**(8,43)**	**77,06**	**(8,81)**	p<0,001
HR					
	78,52	(8,46)	76,38	(9,51)	p<0,05
men					
women	78,68	(8,42)	77,52	(8,31)	p=0,11

Average blood pressure values are higher than normal in those with hypertension: systolic 147.19±15.91, diastolic-93.88±10.32, while in individuals without this pathology, the average blood PRESSURE level is within the normal range (SAD-118.78±10.16, dad-78.05±9.17).

In the course of studying these same groups of individuals after a 12-year period (table 14), we found that people with hypertension on average became 10 years older and weighed 8.3% more than in 2003. Their BMI increased and the average indicator was 30.00±5.48, which indicates the presence of obesity, in particular in women, this indicator increased by 10 units. In hypertensive patients, the heart rate also increased by 4.1%.

The growth of the studied indicators in 12 years is also observed among people without hypertension. Thus, their average age increased by 11 years, and their body weight by 10%. The BMI index was within the normal range in 2003, but in 2015 the group of people without hypertension was on average overweight (26.17±4.95). It is also important that the average value of OT in this group increased by 10.0%, compared to the indicator in 2003. The heart rate also increased by 4.0%, as in the group with hypertension.

Thus, for 12 years in the cohort we studied, there is a tendency to increase almost all clinical and anthropometric indicators (except growth, SAD, DAP), not only in individuals with hypertension, but also in those who do not have this disease.

An analysis of the comparison of clinical and

anthropometric parameters in patients with CHD compared with those without CHD (table 1) showed that the former are on average 16.6 years statistically significantly older and weigh 3.5 kg more than the latter. BMI in patients with CHD indicates the presence of excess body weight (26.77±5.49), while in those without this pathology, BMI is within the normal value (24.48±4.59). In women with CHD, there is a pronounced AO with OT = 96.63±17.84, which is 12.5 cm statistically significantly more than in individuals without this pathology. It should be noted that in persons without CHD, there is an AO (83.98±12.04). The average levels of SAD and DAP are 13 and 6 mmHg higher, respectively, compared to those without the studied disease.

Study of persons with CHD over a 12-year period, as in previous cases with CVD+D, with AH, gave results indicating an increase in the average values of age, body weight, BMI, OT, heart rate. Thus, in 2015 (table 2), the average age of patients with CHD increased by almost 9 years, and their body weight increased by 13.1%. If in 2003 the group of people with CHD was mainly composed of overweight people, in 2015 obese people predominate (BMI=30.97±6.99). A significant increase occurs in the average value of OT, if in 2003 this indicator was normal for men (89.80±9.27), then 12 years later it increased to 97.95±17.19, which indicates the appearance of AO in male representatives. Despite the fact that initially this indicator was high for women, however, in 2015 it increased by 9 cm. There is also an increase in heart rate, approximately 5 %.

Table 3-Clinical and anthropometric indicators depending on the presence or absence of hypertension according to the 2003 study

Indicators	group of persons with AH (n=160) M (SD) (men(n=72), women(n=88))		group of persons without AH (n=526) M (SD) (men=226, women-300))		P
Age (years)	47,88	(14,27)	36,76	(13,29)	p<0,001
men	48,87	(13,42)	36,76	(13,84)	p<0,001
women	47,06	(14,95)	36,75	(12,89)	p<0,001
Weight (kg)	73,49	(15,00)	65,31	(12,66)	p<0,001
men	76,11	(14,60)	65,23	(13,11)	p<0,001
women	71,35	(15,06)	65,37	(12,33)	p<0,001
BMI (kg/m2)	26,89	(5,32)	23,81	(4,1)	p<0,001
men	27,57	(5,27)	23,79	(4,22)	p<0,001
women	26,44	(5,32)	23,83	(4,07)	p<0,001
VB men(cm)	93,04	(12,11)	81,97	(10,57)	p<0,001
VB women	89,86	(13,24)	82,59	(11,50)	p<0,001
Height	165,22	(9,35)	165,47	(8,98)	p=0,76
men	166,36	(8,89)	165,39	(8,72)	p=0,41
women	159,89	(6,43)	160,68	(7,61)	p=0,27
SAH (mm. Hg)	147,19	(15,91)	118,78	(10,16)	p<0,001
men	147,50	(15,65)	118,60	(10,12)	p<0,001
women	146,93	(16,21)	118,91	(10,20)	p<0,001
DAH (mm. Hg)	93,88	(10,32)	78,05	(9,17)	p<0,001
men	95,27	(10,74)	77,56	(8,99)	p<0,001

Indicators	group of persons with AH (n=160) M (SD) (men(n=72), women(n=88))		group of persons without AH (n=526) M (SD) (men=226, women-300))		P
	92,73	(9,88)	78,41	(9,30)	p<0,001
women					
	75,43	**(8,98)**	**74,50**	**(7,58)**	p=0,23
HR					
	75,31	(9,38)	74,93	(7,32)	p=0,75
men					
women	75,52	(8,68)	74,17	(7,76)	p=0,16

Table 4-Clinical and anthropometric indicators depending on the presence or absence of hypertension according to the 2015 study

Indicators	group of persons with AH (n=401) M (SD) (men(n=189), women(n=212))		group of persons without AH (n=529) M (SD) (men (n=210), women(n=319))		P
Age (years)	**58,08**	**(12,82)**	**47,76**	**(13,29)**	p<0,001
men	59,33	(12,92)	46,50	(12,15)	p<0,001
women	56,96	(12,66)	48,58	(13,94)	p<0,001
Weight (kg)	**79,61**	**(15,29)**	**71,64**	**(14,86)**	p<0,001
men	79,03	(15,51)	71,87	(13,91)	p<0,001
women	80,12	(15,10)	71,48	(15,47)	p<0,001
BMI (kg/m2)	**30,00**	**(5,48)**	**26,17**	**(4,95)**	p<0,001
men	29,84	(5,61)	26,13	(4,65)	p<0,001
women	30,15	(5,37)	26,20	(5,14)	p<0,001
VB men(cm)					p<0,001
VB women	99,14	(13,95)	90,86	(12,37)	p<0,001
	100,06	(12,98)	90,91	(12,94)	
Height	**163,06**	**(9,28)**	**165,03**	**(9,66)**	p<0,001
men	162,79	(9,09)	165,80	(9,59)	p<0,001
women	158,78	(7,15)	159,87	(7,35)	p<0,05
SAH (mm. Hg)	**143,31**	**(23,11)**	**116,65**	**(10,25)**	p<0,001
men	143,76	(20,47)	116,95	(8,54)	p<0,001
women	142,92	(25,28)	116,45	(11,24)	p<0,001
DAH (mm. Hg)	**90,71**	**(14,84)**	**77,71**	**(7,35)**	p<0,001
men	90,26	(13,85)	77,92	(6,47)	p<0,001
women	91,10	(15,69)	77,57	(7,87)	p<0,001
HR	**78,54**	**(8,47)**	**77,19**	**(8,78)**	p<0,05
men	78,55	(8,48)	76,44	(9,45)	p<0,05
women	78,52	(8,48)	77,68	(8,29)	p=0,26

In the group of people without CHD, there is an increase in all the studied indicators, with the exception of the

growth indicator. So, in 2015, they became older by an average of 12.5 years and their body weight increased to 11.5%. If in 2003 the BMI was within the normal range for people without CHD, then 12 years later this group was dominated by overweight people (27.64±5.37). Also, in these individuals, the OT index increased significantly, both among men (94.59±13.54) and among women (93.90±13.09), and earlier in men this indicator was within the normal range (84.47±11.98). The average levels of SAD (127.76±21.54), DAP (83.24±12.99) and heart rate (77.73±8.71) also increased.

D in addition, a comparative analysis of clinical and anthropometric parameters in the study sample was also conducted for the presence or absence of DM and its combinations (table 3). It was found that people with D were on average 10 years older, (p<0.001) older, and 8.7% heavier (p<0.05) than people without this disease. Most people with DM are overweight (26.3±13.50), as opposed to those without D (24.83±4.73). A statistically significant difference between the two groups is observed in women (26.91±2.82 and 24.95±4.90, respectively). It is worth noting that they also have a difference in the indicator from, where with DM it is 93.25±7.72, and for people without D it is 83.65. The study of the average values of OT in women in both groups compared indicates the presence of AO (with D-103.56±16.44 and without D-84.65±12.97, respectively). The average values of SAD and DAP are higher than normal in those with D: 142.50±23.00 and 90.00±13.54, respectively, while in those without this pathology, the average level of blood pressure was within the normal range (SAD - 127.35±19.66, DAP - 82.10±13.62).

12 years later, when studying the same groups of people (table 4), we found that people with D on average became almost 9 years older and weigh 10% more than in 2003. Their BMI value increased both in General and separately by gender, where the average was 30.67±6.32, which indicates the presence of obesity. The level of blood PRESSURE after 12 years was also increased in people with this pathology, and the average value of SAD increased by 2%, DAP by 4%.

An increase in clinical and anthropometric indicators after a 12-year period of time is also observed among people without D. Thus, their average age increased by almost 9 years, and their body weight by 10%. BMI in the first year was within the normal range, but after 12 years, the cohort of people who do not have D was on average overweight (27.86±5.54). It should be noted

that in 2015, the average value of OT in this group increased by 12%, compared to the indicator in 2003. At the same time, the levels of SAD and DAP increased by 1% and heart rate by 4.0%.

Thus, over a 12-year period of time in the cohort we studied, there is a tendency to increase almost all clinical and anthropometric indicators, both in people with D and those who do not have this disease. We found statistically significant differences in clinical and anthropometric parameters in individuals with CVD+D and without them make it necessary to further study the contribution of risk factors in the development of the studied diseases.

Table 5-Clinical and anthropometric indicators depending on the presence or absence of CHD according to the 2003 study

Indicators	group of persons with CHD		(n=18)	group of persons without CHD		
	M (SD) (men(n=10), women (n=8))			(n=668) M (SD)		
				(men(n=288), women (n=380))		
						p
Age (years)	55,55	(7,41)		38,91	(14,20)	p<0,001
men	54,50	(7,14)		39,17	(14,60)	p<0,001
women	56,87	(8,02)		38,71	(13,91)	p<0,001
Weight (kg)	70,72	(16,98)		67,13	(13,58)	p=0,27
men	70,50	(10,65)		67,77	(14,36)	p=0,55
women	71,00	(23,54)		66,64	(12,96)	p=0,62
BMI (kg/m2)	26,77	(5,49)		24,48	(4,59)	p<0,05
men	25,99	(4,12)		24,66	(4,80)	p=0,39
women	27,75	(7,04)		24,35	(4,43)	p=0,22

Indicators	group of persons with CHD M (SD) (men(n=10), women (n=8)) (n=18)		group of persons without CHD (n=668) M (SD) (men(n=288), women (n=380))		p
VB (cm) VB men	89,80	(9,27)	84,47	(11,98)	p=0,16
VB women	96,63	(17,84)	83,98	(12,04)	p<0,001
Height	**162,22**	**(10,44)**	**165,50**	**(9,01)**	p=0,13
men	165,00	(8,19)	165,64	(8,79)	p=0,81
women	158,75	(12,41)	165,39	(9,19)	p<0,05
SAH (mm. Hg)	**138,05**	**(12,50)**	**125,07**	**(16,78)**	p<0,001
men	140,50	(11,17)	125,06	(16,97)	p<0,001
women	135,00	(14,14)	125,06	(16,66)	p=0,09
DAH (mm. Hg)	**87,83**	**(10,32)**	**81,63**	**(11,60)**	p=0,13
men	87,00	(8,23)	81,66	(12,19)	p=0,17
women	84,37	(12,94)	81,60	(11,14)	p=0,49
HR	**74,94**	**(8,50)**	**74,71**	**(7,92)**	p=0,90
men	75,70	(8,90)	75,00	(7,83)	p=0,78
women	74,00	(8,48)	74,48	(7,99)	p=0,86

Table 6-Clinical and anthropometric indicators depending on the presence or absence of CHD according to the 2015 study

Indicators	group of persons with CHD (n=52) M (SD) (men(n=22), women(n=30))		group of persons without CHD (n=879) M (SD) (men=377, women-520)		p
Age (years)	**64,39**	**(9,07)**	**51,50**	**(13,96)**	p<0,001
men	63,73	(7,86)	51,93	(14,07)	p<0,001
women	64,89	(10,01)	51,18	(13,89)	p<0,001
Weight (kg)	**79,98**	**(18,18)**	**74,79**	**(15,35)**	p<0,05
men	76,04	(12,40)	75,22	(15,26)	p=0,80
women	82,96	(21,29)	74,47	(15,42)	p<0,001
BMI (kg/m2)	**30,97**	**(6,99)**	**27,64**	**(5,37)**	p<0,001
men	29,46	(5,85)	27,79	(5,41)	p=0,16
women	32,12	(7,65)	27,53	(5,34)	p<0,001
VB (cm) VB men					
VB women	97,95	(17,19)	94,59	(13,54)	p<0,05
	106,00	(18,52)	93,90	(13,09)	p<0,001
	160,82	**(10,00)**	**164,50**	**(9,45)**	p<0,001
Height	161,32	(8,36)	164,56	(9,51)	p=0,12
men	160,45	(11,23)	164,46	(9,41)	p<0,05
women	**134,90**	**(20,62)**	**127,76**	**(21,54)**	p<0,05
SAH (mm. Hg)					

Indicators	group of persons with CHD (n=52) M (SD) (men(n=22), women(n=30))		group of persons without CHD (n=879) M (SD) (men=377, women-520)		p
men	138,63	(19,59)	129,50	(20,34)	p<0,05
women	132,07	(21,27)	126,73	(22,37)	p=0,21
DAH (mm.Hg)	**84,71**	**(11,72)**	**83,24**	**(12,99)**	p=0,43
men	86,36	(12,16)	83,62	(12,28)	p=0,31
women	83,45	(11,42)	82,94	(13,50)	p=0,84
HR	**78,47**	**(7,96)**	**77,73**	**(8,71)**	p=0,56
men	76,82	(8,83)	77,48	(9,08)	p=0,74
women	79,72	(7,13)	77,92	(8,43)	p=0,26

Table 7-Clinical and anthropometric indicators depending on the presence or absence of DM according to the 2003 study

Indicators	group of persons with SD (n=32) M (SD) (men(n=4),women(n=28))		group of persons without SD (n=662) M (SD) (men (n=490), women (n=621))		p
Age (years)	**53,47**	**(11,40)**	**43,27(16,27)**		p<0,001
men	52,50	(11,73)	43,24(16,58)		p=0.26
women	53,61	(11,57)	43,29(16,04)		p<0,001
Weight (kg)	**74,00**	**(9,76)**	**68,06**	**(14,14)**	p<0,05
men	70,33	(10,69)	71,61	(12,64)	p=0,84
women	75,57	(9,76)	68,47	(14,38)	p<0,05
BMI (kg/m2)	**26,31**	**(3,50)**	**24,83**	**(4,73)**	p=0.08
men	24,93	(5,21)	24,65	(4,65)	p=0,90
women	26,91	(2,82)	24,95	(4,90)	p<0,05
VB (cm) **VB men**	90,66	(13,01)	85,02	(14,02)	p=0,42
VB women	93,25	(7,72)	84,65	(12,97)	p<0,001
Height	**161,34**	**(7,58)**	**164,63 (9,18)**		p<0,05
men	166,50	(6,76)	166,51(9,31)		p=0,99
women	160,61	(7,51)	163,20(8,83)		p=0,13
SAH (mm. Hg)	**142,50**	**(23,00)**	**127,35(19,66)**		p<0,001
men	143,33	(12,47)	128,41(19,56)		p=0,13
women	142,14	(26,75)	126,62(19,71)		p<0,001
DAH (mm. Hg)	**90,00**	**(13,54)**	**82,10(13,62)**		p<0,05
men	98,33	(10,41)	81,92(14,36)		p<0,05

Indicators	group of persons with SD	(n=32)	group of persons without SD	
	M (SD) (men(n=4),women(n=28))		(n=662) M (SD)	
			(men (n=490), women (n=621))	
				p
	86,43	(13,76)	82,21(13,15)	p=0,09
women				
	78,00	**(7,84)**	**74,58(7,93)**	p<0,05
HR				
men	77,87	(7,95)	74,18(8,43)	p=0,38
women	78,15	(8,03)	74,84(7,58)	p<0,05

Table 8-Clinical and anthropometric indicators depending on the presence or absence of DM according to the 2015 study

Indicators	group of persons with SD	(n=62)	group of persons without SD		
	M (SD) (men (n=19), women(n=43))		(n=871) M (SD)		
			(men (n=379), women (n=536))		
					p
Age (years)	**62,29**	**(11,25)**	**52,16(14,05)**		p<0,001
men	59,95	(13,01)	51,28(13,91)		p<0,05
women	63,32	(10,38)	52,77(14,13)		p<0,001
Weight (kg)	**81,52**	**(16,51)**	**75,11**	**(15,58)**	p<0,05
men	85,74	(13,56)	75,75	(15,25)	p<0,05
women	79,65	(17,47)	74,66	(15,80)	p<0,05
BMI (kg/m2)	**30,67**	**(6,32)**	**27,86**	**(5,54)**	p<0,001
men	29,44	(4,74)	27,51	(5,45)	p=0,13
women	31,19	(6,85)	28,10	(5,58)	p<0,001
VB (cm) VB men					
VB women	101,89	(9,79)	95,18	(13,73)	p<0,05
	103,56	(16,44)	94,32	(13,63)	p<0,001
	163,13	**(8,54)**	**164,50**	**(9,45)**	p=0,27
Height					
	170,67	(8,20)	164,56	(9,51)	p<0,05
men					
	160,00	(6,52)	164,46	(9,41)	p<0,05
women					
	145,89	**(26,73)**	**128,14**	**(21,44)**	p<0,001
SAH (mm. Hg)					
	147,37	(30,34)	127,69	(20,66)	p<0,001
men					
	145,23	(25,33)	128,46	(21,97)	p<0,001
women					
	94,03	**(16,24)**	**83,32(12,86)**		p<0,001
DAH (mm. Hg)					
	94,21	(16,44)	83,00(12,37)		p<0,001
men					
	93,95	(16,35)	83,54(13,19)		p<0,001
women					
	78,08	**(8,28)**	**77,74(8,76)**		p=0,76
HR					
	80,47	(7,51)	77,54(8,70)		p=0,15
men					
women	75,21	(14,42)	77,88(8,81)		p=0,07

Table 9-RR of CHD development depending on BMI

BMI	Numerator	Denominator	Prevalence per 1000 population	SD (CI)	
<18,5	1	42	23,8	0,948	(0,126;7,116)
18,5-24,9	12	477	25,1	Reference	
25-29	5	225	22,2	0,886 (0,316;2,485)	
30>	8	99	80,8	**3,047**	**(1,277;7,271)**

Table 10-RR of D development depending on BMI

BMI	Numerator	Denominator	Prevalence per 1000 population	SD (CI)
<18,5	0	42	0	0
18,5-24,9	5	495	10,1	Reference
25-29	11	233	47,2	4,508
				(1,584;12,832)
30>	14	108	129,6	11,475
				(4,214;31,249)

Table 11-HR of AH+CHD development depending on

BMI	Numerator	Denominator	Prevalence per 1000 population	SD (CI)
<18,5	0	42	0	0
18,5-24,9	10	490	20,4	Reference
25-29	6	229	26,2	1,277 (0,470;3,471)
30>	6	100	60	2,830 (1,051;7,618)

Table 12 - incidence of hypertension+DM depend

BMI	Numerator	Denominator	Prevalence per 1000 population	SD (CI)
<18,5	0	42	0	0
18,5-24,9	5	497	10,0	Reference
25-29	8	234	34,1	3,319
				(1,097;10,039)
30>	11	108	101,8	9,281
				(3,287;26,207)

table 19 shows that overweight people (BMI=25-29) have a 1.68 (CI:1.24;2.27) risk of developing hypertension, and obese people have a 2.04-times (DI:1.37;3.03) higher risk of developing hypertension than those with a normal BMI. According to NHANES II studies conducted in the United States (1985), it was found that the risk of hypertension among people aged 20-45 years with an overweight body is almost 6 times higher, compared to those with a normal BMI. The results of our research show that people who live in the arid zone of Kazakhstan and are mainly representatives of the Kazakh ethnic group are characterized by similar patterns, but less pronounced. Overweight, according to our research, is not a predictor of CHD, while obesity contributes to an increase in SD by 3.04 times (DI:1.27;7.27).

Table 13-Prevalence and risk of developing hypertension, CHD, DM and their combinations depending on the risk factor-Smoking

Smoking / not Smoking	Disease / combination of diseases	Numerator	Denominator	Prevalence per 1000 population	SD (DI)
Smoking		27	118	228,8	0,71 (0,50;1,02)
	AH				
not Smoking		269	766	351,12	Reference
Smoking		4	156	25,6	0,83 (0,29;2,34)
	CHD				
not Smoking		29	942	30,78	Reference
Smoking		5	162	30,8	0,86 (0,34;2,18)
	D				
not Smoking		34	949	35,82	Reference
Smoking		3	159	18,8	0,79 (0,24,2,59)
	AH+CHD				
not Smoking		23	957	24,03	Reference
Smoking		4	162	24,6	0,53 (0,19;1,46)
	AH+D				
not Smoking		46	974	47,22	Reference

Smoking / not Smoking	Disease / combination of diseases	Numerator	Denominator	Prevalence per 1000 population	SD (DI)
Smoking		1	162	6,1	1,20 (0,14;10,24)
	CHD+D				
not Smoking		5	977	5,11	Reference
Smoking		1	162	6,1	1,50 (0,17;13,38)
	AH+CHD+D				
not Smoking		4	977	4,09	Reference

As a result of the study of the risk indicator for such diseases as hypertension, CHD, diabetes and their combinations depending on Smoking, no statistically significant changes were found (table 14)

Table 14-Prevalence and risk of developing hypertension, CHD, DM and their combinations depending on alcohol use/non-use

Drink alcohol/ not drink alcohol	Disease / combination of diseases	Numerator	Denominator	Prevalence per 1000 population	SD (CI))
Drink alcohol		48	214	224,3	0,68 (0,51;0,89)
	AH				
not drink alcohol		248	670	370,1	Reference
Drink alcohol		6	308	19,5	0,58 (0,24;1,39)
	CHD				

Drink alcohol/ not drink alcohol	Disease / combination of diseases	Numerator	Denominator	Prevalence per 1000 population	SD (CI)
not drink alcohol		27	790	34,2	Reference
Drink alcohol		11	328	33,5	0,94 (0,47;1,86)
	DM				
not drink alcohol		28	783	35,8	Reference
Drink alcohol		4	320	12,5	0,46 (0,16;1,32)
	AH+CHD				
not drink alcohol		22	796	27,64	Reference
Drink alcohol		7	331	21,2	0,41 (0,19;0,90)
	AH+D				
not drink alcohol		43	805	53,42	Reference
Drink alcohol		2	334	0,005	1,20 (0,22;6,54)
	CHD+D				
not drink alcohol		4	805	0,004	Reference
Drink alcohol		2	334	5,99	1,60 (0,27,9,55)
	AH+CHD+D				

Drink alcohol/ not drink alcohol	Disease / combination of diseases	Numerator	Denominator	Prevalence per 1000 population	SD (CI)
not drink alcohol		3	805	3,73	Reference

According to table 25, no statistically significant RR results were found for these pathologies and their combinations. However, according to the results of the huge European study EPIC in 2014, it was found that people who consumed alcohol on average less than 30 grams per day had a risk of developing CHD, where HR=0.64 (95% CI: 0.53; 0.71), which is close to the results of our study.

Table 15-Prevalence and risk of developing hypertension, CHD, DM and their combinations depending on the presence/absence of hypodynamia

With the lack of physical activity/ no inactivity	Disease / combination of diseases	Numerator	Denominator	Prevalence per 1000 population	SD (DI)
With the lack of physical activity		59	227	260,1	0,78
	AH				(0,61;1,00)
no inactivity		237	657	360,7	Reference
With the lack of physical activity		7	273	25,6	0,82
	CHD				(0,36;1,86)
no inactivity		26	825	31,5	Reference
With the lack of physical activity		14	279	50,2	1,64
	D				(0,86;3,12)
no inactivity		25	832	30,05	Reference
With the lack of physical activity		7	276	25,4	1,12

With the lack of physical activity/ no inactivity	Disease / combination of diseases	Numerator	Denominator	Prevalence per 1000 population	SD (DI)
	AH+CHD				(0,47;2,63)
no inactivity		19	840	22,6	Reference
With the lack of physical activity		10	279	35,8	0,78
	AH+D				(0,39;1,53)
no inactivity		40	857	46,7	Reference
With the lack of physical activity		3	279	10,7	3,06
	CHD+D				(0,62;15,07)
no inactivity		3	860	3,5	Reference
With the lack of physical activity		3	279	10,7	4,58
	AH+CHD+D				(0,77;27,30)
no inactivity		2	860	2,3	Reference

Pathological conditions and common Diseases	Numerator	Denominator	Prevalence per 1000 population	SD (DI)
Without USD	252	740	340,54	Reference
Diseases of the gastrointestinal tract	43	108	398,14	1,14 (0,80;1,50)
Without diseases of the gastrointestinal tract	244	733	332,88	Reference
Diseases of the endocrine system (thyroid)	6	12	500,00	1,30 (0,68;2,55)
Without diseases of the endocrine system (thyroid)	281	829	338,96	Reference
Anemia	21	80	262,50	0,80 (0,54;1,19)
Not anemia	266	761	349,54	Reference

As a result of the study of the risk of developing the diseases we study and their combinations among people with hypodynamia, no statistically significant data were found relative to those who do not have hypodynamia (table 16).

Table 16-risk of CSD depending on the presence of pathology from other systems and common diseases:

Pathological conditions and common Diseases	Numerator	Denominator	Prevalence per 1000 population	SD (DI)
Diseases of the respiratory system	11	35	314,28	0,94 (0,55;1,58)
Without diseases of the respiratory system	276	806	342,43	Reference
USD	35	101	346,53	1,01 (0,74;1,37)

An analysis of the study of the risk of developing CVD (table 16), depending on the presence of systemic and frequent diseases, showed that no statistically significant data were found.

CONCLUSION

High risks of fatal complications due to socio-demographic, clinical-metabolic and behavioral factors of polymorbidity of cardiovascular diseases and diabetes mellitus dictate the need to take these factors into account when implementing the disease management

program at the primary health care level, ensuring their careful monitoring within the joint register of patients with a combination of arterial hypertension and type 2 diabetes and including compliance monitoring in mobile applications.

Authors's contribution

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