ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Analysis of Obesity Prevalence among Adults in the Southern Regions of Kazakhstan by Body Measurements.

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ABSTRACT

Obesity is an unresolved public health problem, but it causes a variety of serious medical complications, reduces the quality of life and leads to increased morbidity and premature death. The article aimed to identify current epidemiological data on the prevalence of obesity by body composition measurements among adults older 15 years in the Southern regions of Kazakhstan. Research was conducted within the framework of scientific and research work "Comprehensive prevention of overweight and obesity epidemics in Kazakhstan". For present research we randomly selected 30 households from each of 18 Southern Kazakhstan Region clusters, making together 540 households. Body composition measurements include body mass index based on reported weight, height and additional measurements: waist and hip circumference

Keywords: obesity, overweight, body mass index (BMI), basal metabolism, weight, visceral fat, metabolic syndrome, average of waist circumference, average of hip circumference.

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ISSN: 0975-8585

INTRODUCTION

Obesity is the major public health problem due to its increasing prevalence [1] and its associations with higher morbidity and mortality from multiple diseases [2].

Currently, in most countries of Western Europe and the United States more than 40% of the population are obese, whereas in Germany obesity index is up to 60%. Moreover, these figures are rising every year, even in developing countries [3].

Obesity may be complicated by cardio - vascular diseases (CVD), diabetes (C), cancer, respiratory diseases, gallstones and other diseases. The accumulation of 4-5 kg excess fat in the body creates a dangerous shift in metabolism, which is enough to start the mechanism of the development of atherosclerosis [4].

According to studies conducted by WHO, the direct costs of medical care for obesity account for 2-4% in the total national expenditure on health. Sturm (2002), Finkelsteinetal (2005), Thorpe et al. (2004) found that health care costs for obese people about 35% higher mainly because of the high cost of treatment and associated costs [5].

According to WHO: Worldwide obesity has nearly doubled since 1980; In 2008, more than 1.4 billion adults 20 and older, were overweight. Of these over 200 million men and nearly 300 million women were obese; 35% of adults aged 20 and over were overweight in 2008, and 11% were obese; 65% of the world's population live in countries where overweight and obesity kills more people than underweight; More than 40 million children under the age of five were overweight in 2011 [6].

Obesity has become a disease of public health concern for both developed and developing countries. Globally, obesity has been estimated to be the fifth leading cause of mortality [7].

The aim of this research is to study of prevalence of overweight and obesity among adults in the Southern region of Kazakhstan.

METHODS

Participants

Inclusion criteria: aged 15 years and older, residing in the Southern Kazakhstan region.

Republic of Kazakhstan consists of 14 oblasts (regions) and 2 cities of state significance. The population as of January 1, 2012 is 16 675.4 thousand people, based on the National Census 2009. (National Analytical Center, 2014) Southern Kazakhstan region consist of 3 oblasts: Zhambyl Kyzylorda and South – Kazakhstan. Population of Southern Kazakhstan region is 4390491.

Moreover, Kazakhstan is divided for 70 clusters. A cluster is a control area of population census (CAPC), created for the Census in 2009. There are 18 clusters in Southern Kazakhstan region.

The list is presented by the Agency for Statistics of the Republic of Kazakhstan.

For our research we randomly selected from list presented by the Agency for Statistics of the Republic of Kazakhstan 30 households from each of 18 Southern Kazakhstan Region clusters, making together 540 households.

Sampling design allows obtaining representative results for all indicators for the Southern region of Kazakhstan. Target sample is distributed by Southern region, in proportion to the population in the area.

The sample for the household survey on obesity is a two-stage stratified sample. At the first stage a list of all households in the area is defined. In the second stage, 30 households are randomly selected in each cluster based on established lists. (Table 1).

ISSN: 0975-8585

Table 1 - Distribution of the sampled clusters and households on areas and regions.

Characteristics	Population	Amount of clusters	Amount of households*
The Republic of Kazakhstan	16675392	70	
Southern Region	4390491	18	540
Zhambyl	1055976	4	120
Kyzylorda	712992	3	90
South – Kazakhstan	2621523	11	330

** Amount of households, that randomly selected from list is presented by the Agency for Statistics of the Republic of Kazakhstan 30 households*

From each household men and women aged 15 and older were selected.

Interviewers were provided by lists with 30 households from each cluster , which should be carried out a survey showing the location of the cluster, placing the selected houses, household addresses and other useful information. Interviewers interviewed only in pre-selected households. Fixed sample size is already taking into account the expected failure rate (the proportion of households reached by the survey estimated at 90%) .

However, interviewers must achieve a maximum level of participation among pre- selected households, since the refusal to participate entails selection bias. Three repeat visits would be made to reach each household or respondent that does not respond. The policy of impossibility of replacement of unreachable units such as household or individual is designed to improve data quality.

Anthropometry: BMI, Waist and hip circumference, Visceral fat in the body

The height in cm is determined by stadiometer, waist circumference in cm by measuring tape, weight in kg on the instrument Body Composition Monitor BF511, OMRON, Japan Technology & Design, Clinically validated. Before the weight measurement the data, such information as gender, age and height of the subject is entered into the memory of the device.

Computer software of this device, along with the weight determines the body mass index, the value of basal metabolism of an organism at complete rest in calories, percentage of total and visceral fat in the body (BF511, 2012). In general, body mass index was calculated as weight in kilograms divided by the square of height in meters. For adults, overweight was defined as BMI of 25.0 or higher, obesity as BMI of 30.0 or higher. These definitions are consistent with those of the World Health Organization.

Waist and hip circumference

Waist-to-hip ratio (WHR) is the ratio of person's waist circumference to his/her hip circumference (calculated by dividing the waist circumference by the hip circumference). WHR is a measurement tool that looks at the proportion of fat stored on person's waist, hips and buttocks. Centers for Disease Control and Prevention (CDC) confirms save ratio for men at .90 or less and for women the ratio of .80 or less. WHR of 1.0 or higher is considered "at risk" for both men and women, that leads to heart disease and other problems associated with being overweight [8].

Table 2 - a benchmark for assessing the waist and hip, as well as indicators of risk of metabolic complications according to the World Health Organization.

Indicator	Benchmark for assessing	Risk of metabolic complications
waist circumference	>94 cm (M); >80 см (F)	Increased
waist circumference	>102 cm (M); >88 см (F)	substantially increased
The ratio of waist-to-hip ratio	≥0.90 cm (M); ≥0.85 см (F)	substantially increased

Note: (M) = male, (F) = female

ISSN: 0975-8585

Visceral fat in the body

The sex hormon considered to be the major factor in determining fat distribution and cause of visceral fat accumulation. Vague, who pioneered in obesity classification by fat distribution, divided obesity into android and gynoid type. Even though visceral fat obesity does not match to android type, visceral fat mass is more prevails among men than women when compared in similar age range in terms of obese subject with similar BMI. Aging appears to be essential factor that contributes in accumulating of visceral fat. Among men, linear correlation between age and visceral fat volume was discovered, where visceral fat increased constantly with aging [9].The level of visceral fat between 1 and 9 is considered to be "normal", from 10 to 14 as "high" and from 15 to 30 as "very high". Shown in Table 3.

Table 3 - Interpretation of results of measurement of the visceral fat in the body (in accordance with the instructions to Omron Healthcare).

Visceral Fat Level	classification level
1-9	Norm
10-14	High
15-30	Very high

RESULTS

General characteristics of surveyed population.

As shown in the Table 4, 1191 people were surveyed in total from three areas: : Zhambyl Kyzylorda and South – Kazakhstan, of which women constitute 732 people (61.5%) and men constitute 459 people (38.5%). Noteworthy predominance of women among surveyed in all areas, it is to some extent due to the fact that men are often not available for the survey because they are on the field work or earnings in other regions or countries.

Table 4 - Distribution of surveyed men and women ≥ 15 years by oblast.

Region	Gender of the respondent				Total	
	Woman		Man			
	n	%	n	%	n	%
Zhambyl	160	58.4	114	41.6	274	100
Kyzylorda	115	73.7	41	26.3	156	100
South – Kazakhstan	457	60	304	40	761	100

Anthropometric characteristics of the surveyed population.

The study examined weight, age and height indices of 1191 people aged over 15 years old living in nine clusters included to sample (Table 1). To calculate the weight, height and age indices appropriate performance standards were used recommended by the WHO. Among people studied, the average height of women was 159,8 cm, and among men was 170,4 cm. Average weights of women and men were 67 kg and 74,1 kg respectively. Shown in Table 5.

Table 5 - Distribution (%) of women and men ≥ 15 years of height in size depending on gender.

Height, cm	Number	Age groups, the number of full years							Total
Gender		15-19	20-24	25-29	30-34	35-49	50-64	≥65	
Southern region									
Women									
<150,0	58	2,6	2,8	4,7	6,0	4,7	9,8	20,6	7,9
150-159	293	21,1	43,1	39,1	33,3	41,1	41,5	47,4	40,1
160-169	329	60,5	43,1	50,0	53,6	45,3	45,4	28,9	45,1

ISSN: 0975-8585

Height, cm	Number	Age groups, the number of full years							Total
Gender		15-19	20-24	25-29	30-34	35-49	50-64	≥65	
170-179	46	15,8	11,1	6,3	6,0	7,8	2,7	3,1	6,3
≥180	4	0,0	0,0	0,0	1,2	1,0	0,5	0,0	0,5
Total	Number	38	72	64	84	192	183	97	730
	%	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Average height of women = 159,8 cm									
standard deviation = 6,59									
Men									
<150,0	3	3,4	0,0	0,0	0,0	0,0	1,0	1,8	0,7
150-159	23	3,4	5,4	4,5	3,7	3,7	4,9	10,7	5,0
160-169	182	41,4	27,0	36,4	38,9	34,1	44,1	57,1	39,8
170-179	193	31,0	45,9	38,6	40,7	52,6	42,2	25,0	42,2
180-189	54	17,2	21,6	20,5	16,7	9,6	7,8	3,6	11,8
≥190	2	3,4	0,0	0,0	0,0	0,0	0,0	1,8	0,4
Total	Number	29	37	44	54	135	102	56	457
	%	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Average height of men = 170,4 cm									
standard deviation 7,03									

Table 6 presents information on the distribution of women and men surveyed by body weight. As the table shows, the average weight of women of 15 years and older in Kazakhstan constitute 67 and men's average weight is 74,1 kg.

Table 6 - Distribution (%) of women and men ≥ 15 years by body weight, depending on age and gender in the Southern region of Kazakhstan

Weight, kg	Number	Age groups, the number of full years							Total
Gender		15-19	20-24	25-29	30-34	35-49	50-64	≥65	
Southern region									
Women									
<50,0	77	23,7	13,7	14,1	10,7	10,9	3,8	12,4	10,5
50-59	189	42,1	46,6	32,8	28,6	20,7	20,2	17,5	25,8
60-69	188	21,1	26,0	25,0	29,8	23,8	24,0	30,9	25,7
70-79	146	13,2	6,8	17,2	20,2	22,3	23,5	22,7	19,9
80-89	82	0,0	5,5	9,4	10,7	10,9	16,9	11,3	11,2
≥90	50	0,0	1,4	1,6	0,0	11,4	11,5	5,2	6,8
Total	Number	38	73	64	84	193	183	97	732
	%	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Average weight of women = 70,9 kg									
Standard deviation = 17,67									
Men									
<50,0	29	10,3	8,1	4,5	3,7	6,7	6,8	5,4	6,3
50-59	39	24,1	18*,9	11,4	7,4	3,0	7,8	7,1	8,5
60-69	112	48,3	37,8	22,7	24,1	25,9	14,6	19,6	24,5

ISSN: 0975-8585

Weight, kg	Number	Age groups, the number of full years							Total
Gender		15-19	20-24	25-29	30-34	35-49	50-64	≥65	
70-79	134	10,3	21,6	34,1	35,2	31,1	29,1	30,4	29,3
80-89	86	3,4	10,8	22,7	22,2	18,5	19,4	25,0	18,8
≥90	58	3,4	2,7	4,5	7,4	14,8	22,3	12,5	12,7
Total	Number	29	37	44	54	135	103	56	458
Examined	%	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Average weight of men = 74,1 kg									
Standard deviation = 12,65									

Table 7 shows the mean BMI of the studied 732 women and 458 men.For adults, overweight was defined as BMI of 25.0 or higher, obesity as BMI of 30.0 or higher and extreme obesity as BMI of 40 or higher [1]. These definitions are consistent with those of the World Health Organization. [1]

Table 7 Distribution (in%) of men and women ≥15 years by body mass index (BMI) according to gender and age in the Southern region of Kazakhstan

BMI, gender	Number	Age groups, the number of full years							Total
		15-19	20-24	25-29	30-34	35-49	50-64	≥65	
Southern region									
Women									
<18,5	19	15,8	4,8	5,3	1,2	1,6	0,5	1,0	2,6
18,5-24	335	76,3	72,6	58,7	56,0	42,0	31,1	33,0	45,8
25-29	200	5,3	17,7	22,7	28,6	26,9	32,8	35,1	27,3
30-39	162	2,6	4,8	13,3	14,3	25,9	31,7	28,9	22,1
≥40	16	0,0	0,0	0,0	0,0	3,6	3,8	2,1	2,2
≥25	378	7,9	22,6	36,0	42,9	56,5	68,3	66,0	51,6
≥30	178	2,6	4,8	13,3	14,3	29,5	35,5	30,9	24,3
Total	Number	38	62	75	84	193	183	97	732
examined	%	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
The average BMI of women = 26,3									
Standard deviation = 5,54									
Standard error of the mean = 0,205									
Men	11	10,3	13,3	2,0	1,9	0,7	0,0	1,8	2,4

[1] Media centre of WHO; Obesity and overweight
Fact sheet N°311
Updated March 2013

ISSN: 0975-8585

<18,5	203	75,9	60,0	54,9	51,9	43,7	33,0	25,0	44,3
18,5-24	175	13,8	26,7	43,1	31,5	39,3	38,8	55,4	38,2
25-29	68	0,0	0,0	0,0	14,8	16,3	28,2	16,1	14,8
30-39	1	0,0	0,0	0,0	0,0	0,0	0,0	1,8	0,2
≥40	244	13,8	26,7	43,1	46,3	55,6	67,0	73,2	53,3
≥25	69	0,0	0,0	0,0	14,8	16,3	28,2	17,9	15,1
≥30	Number	29	30	51	54	135	103	56	458
Total	%	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
examined	11	10,3	13,3	2,0	1,9	0,7	0,0	1,8	2,4
The average BMI of men = 25,5									
Standard deviation = 4,21									
Standard error of the mean = 0,197									

Prevalence (%) of malnutrition, norms, overweight and obesity

BMI <25, indicates the presence of overweight, defined in 27.3% women, 38.2% men. BMI <30, indicates the presence of obesity, defined in 24.3% women, 15.1% men. gender differences in the prevalence of underweight (malnutrition), overweight and obesity in women and men over 15 are illustrated in Figure 1.

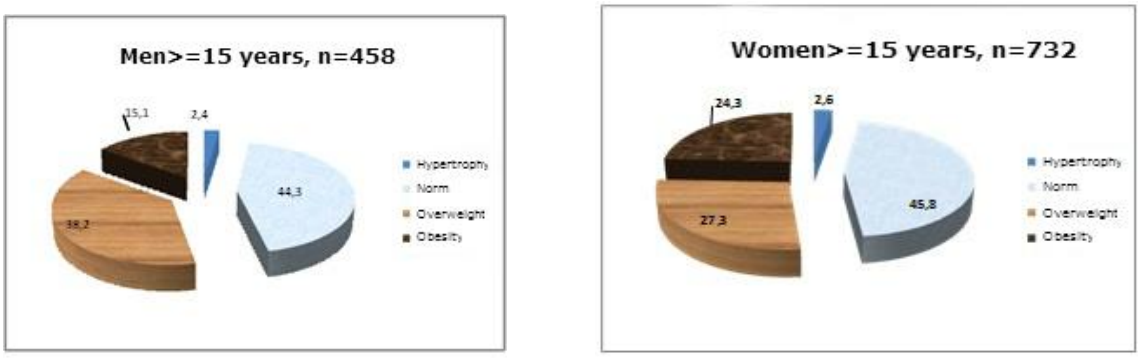

Figure 1 - Proportion (%) of malnutrition, norms, overweight and obesity among women n = 732 and men n = 458 in the southern regions of Kazakhstan.

Waist circumference.

The average waist circumference in women exceeded benchmark (> 80 cm) that is used to calculate increased risk of metabolic disorders in accordance with WHO recommendations. In women with low and normal BMI levels average waist circumference was below 80 cm and women with excess weight and especially obesity were well above the specified benchmark. Higher the BMI greater the average waist circumference and higher the risk of metabolic disorders in women.

Average waist circumference in male with normal or excessive BMI and obesity of the first and second degree was significantly higher than the corresponding groups of female.

ISSN: 0975-8585

Table 9 - Waist circumference (cm) in men and women ≥ 15 years, depending on body mass index in the southern region of Kazakhstan.

Gender of the	BMI	Waist circumference (cm)					Amount of
respondent		Average	SEM	95% CIM		SE	surveyed
				From	To		
Southern Region							
Female	<18,5	67,7	1,8	64,2	71,2	7,6	19
	18,5-24	77,8	0,6	76,6	78,9	9,4	282
	25-29	88,3	0,7	86,8	89,7	9,2	168
	30-39	101,6	0,8	100,1	103,1	9,6	158
	40+	116,7	2,2	112,2	121,2	9,0	16
	Bcero	87,0	0,6	85,9	88,2	14,5	643
Male	<18,5	71,3	1,9	67,5	75,0	6,2	11
	18,5-24	80,9	0,7	79,5	82,2	8,6	166
	25-29	92,1	0,7	90,8	93,5	8,9	164
	30-39	104,1	1,4	101,4	106,8	11,2	68
	40+	130,0					1
	Bcero	89,1	0,6	87,8	90,4	12,8	410
Total	<18,5	69,0	1,3	66,4	71,7	7,3	30
	18,5-24	78,9	0,4	78,0	79,8	9,2	448
	25-29	90,2	0,5	89,2	91,2	9,2	332
	30-39	102,4	0,7	101,0	103,7	10,2	226
	40+	117,5	2,3	113,0	122,0	9,3	17
	Total	87,8	0,4	87,0	88,7	13,9	1053

Note, here and further:
SEM - standard error of the mean
CIM 95% - 95% confidence interval of the mean
SE - standard error

Table 11 - Hip circumference (cm) in men and women ≥ 15 years, depending on body mass index in the southern region of Kazakhstan.

Gender of the	BMI	Hip circumference (cm)					Amount of
respondent		Average	SEM	95% CIM		SE	Surveyed
				From	To		
Southern Region							
Female	<18,5	86,1	1,3	83,5	88,6	5,5	19
	18,5-24	91,4	0,5	90,3	92,4	8,6	282
	25-29	100,8	0,7	99,4	102,1	8,8	168
	30-39	113,2	0,7	111,9	114,5	8,2	158
	40+	126,1	1,9	122,3	130,0	7,7	16
	Total	99,9	0,5	98,9	100,9	13,0	643
Male	<18,5	87,9	1,4	85,1	90,7	4,7	11
	18,5-24	92,2	0,7	90,8	93,6	8,9	166
	25-29	98,4	0,7	97,1	99,7	8,4	164
	30-39	106,1	1,1	103,9	108,3	9,3	68

ISSN: 0975-8585

	40+	120,0					1
	Total	96,9	0,5	95,9	97,9	10,1	410
Total	<18,5	86,7	1,0	84,8	88,6	5,2	30
	18,5-24	91,7	0,4	90,8	92,5	8,7	448
	25-29	99,6	0,5	98,6	100,5	8,7	332
	30-39	111,1	0,6	109,9	112,3	9,1	226
	40+	125,8	1,8	122,1	129,4	7,6	17
	Total	98,7	0,4	98,0	99,5	12,0	1053

With increasing values of body mass index decreases the percentage of women and men with normal visceral fat in the body.

With increasing age decreases the percentage of women and men with normal total body fat and increases the percentage of women and men with high, especially with a very high content of total body fat. Influence of age to the body fat may be, in a certain extent, due to an increase in body mass index value with age.

Among surveyed women percentage of the high visceral fat was 25.0 %, among men 27.1 %,and with very high fat content was 4.3% among women and 14.9 % among men.

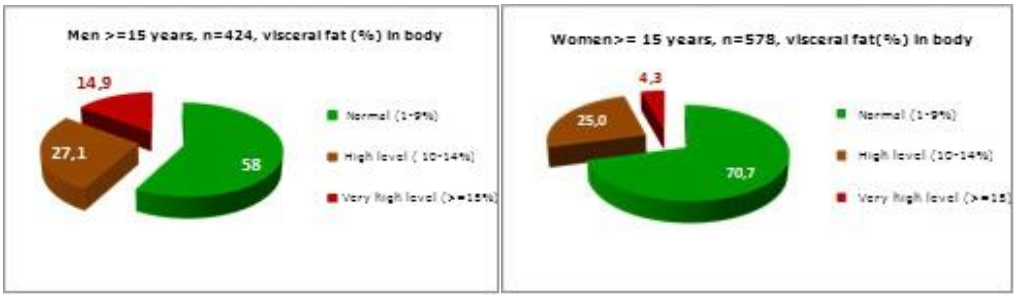

Figure 2 - Prevalence (%) of normal, high, and very high levels of visceral fat (in%) in the body of women and men.

DISCUSSION

Our study was carried out in part of "Comprehensive prevention of overweight and obesity epidemics in Kazakhstan" among adults older 15 years of the Southern region a study was conducted by measuring body composition. For our research we randomly selected 30 households from each of 18 Southern Kazakhstan Region clusters, making together 540 households. Distribution of surveyed men and women by gender showed: women n=732; men n=459. Total: n=1191 . According to our research prevalence of overweight and obesity by body composition measurements among adults in the Southern regions of Kazakhstan among women (n = 732) indicated overweight is 27.3 %, obesity is 24.3 % and among men (n = 459) indicated overweight is 38.3%, obesity is 15.1%. Average BMI: women=26,3 and men=25,5. Average of waist circumference (cm): for women=87,0 for men = 89,1 cm. Average of hip circumference (cm): for women =99,9 cm, for men = 96,9 cm. Prevalence (%) of high and very high levels of visceral fat (in %) in the body of women: high is 25,9%, very high is 4,3%; in the body of men: high is 27,6%, very high is 15,4%

An average joint prevalence of overweight and obesity in Southern Region of the Republic of Kazakhstan (BMI ≥25) in 2012-2013 was 51.6 % of women and 53.4% of men during the assessment of body mass index;

Thus, the results show that the population of the Southern region of Kazakhstan has higher levels of overweight and obesity, according to the data for the Republic. Among Kazakhstan population in 2012 the prevalence of overweight (BMI 25-29) was 30.6% in women and 36.8% in men respectively by the assessment of body mass index;

If we compare the example of Southern Kazakhstan with National Research conducted during 1995 [10] -96 [11] in Kazakhstan 42% of the adult population (or 4.36 million people) were overweight (27%) and obese (15%), meanwhile women suffered more (47%) compared to men (42%) we can see increase in the percentage of are obese

In the example of Southern Kazakhstan, with total number of n = 1191 surveyed people, 32.8 % and 19.7 % of population were overweight and obese respectively.

Also according our research prevalence of obesity in the Southern region of Kazakhstan more among women than men.

As we can see from the results, as well as at national level, in Southern region the prevalence of obesity is 9.2% higher among women than men.

In accordance with WHO statistics, all areas covered by WHO show that women are tend to be more obese than men. For instance, African, Eastern Mediterranean and South East Asian women almost twice prevail in obesity than men. The highest indicator of overweight and obesity is found among Americans (62% for overweight and 26% for obesity in both sexes), whereas lowest indicator is detected in South East Asian countries (14% overweight and 3% for obesity in both sexes). In addition WHO regions such as America, Europe and Eastern Mediterranean illustrate that half population of women were overweight. Among these overweight women, almost 50% of them were to be obese. (29% in the Americas, 24% in the Eastern Mediterranean and 23% in Europe) [12].

Obesity is one of the main, but avoidable risk factor for type 2 diabetes, cardiovascular diseases and cancer minutes, the pathology of the locomotor and digestive system, and reproductive dysfunction in women and men.

Also, currently Obesity and all obesity related issues are becoming increasingly heavy economic burden on society. In the developed countries, the treatment of obesity accounts for 8-10% of all annual healthcare costs [13].

Currently available weight loss treatment involves changing diet, increasing physical activity, behavior modification, medication and surgery.

CONCLUSION

In conclusion, research shows that an average joint prevalence of overweight and obesity in Southern Region of the Republic of Kazakhstan (BMI ≥25) in 2012-2013 was 51.6 % of women and 53.4% of men during the assessment of body mass index;

The results of this research illustrate that the population of the Southern region of Kazakhstan has higher levels of overweight and obesity, according to the data for the Republic. Among Kazakhstan population in 2012 the prevalence of overweight (BMI 25-29) was 30.6% in women and 36.8% in men respectively by the assessment of body mass index;

The reason for the high levels of overweight and obesity among the population of the Southern region of the Republic of Kazakhstan in comparison with the Republic may be related to diet and physical activity.

Treatment of obesity, as well as any chronic disease is a lifetime process, and only the joint efforts of the doctor and the patient can achieve a positive result.

Limitation

During the research were obstacles such as the small amount of participants of study, the number of participants in the article varies because some participants in the study refused to participate in some stages of study. However, the data variability is insignificant.

ACKNOWLEDGMENTS

We would like to thank staff of Kazakh academy of nutrition for their assistance in writing this article.

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