Analysis of Loss of Years Resulting From Diseases of the Musculoskeletal System of the Adult Population of Kazakhstan

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***Abstract*—**A comprehensive assessment on losing years of population in Kazakhstan on the diseases of the musculoskeletal system by YLD-analysis and osteodensitometry has been carried out. The negative dynamics of increasing of years lost due to disability resulting from injuries and diseases of the musculoskeletal system and the potential risk groups on medical and social losses have been revealed. The work was performed as a part of STP "Integrated approaches to the health management of the population in Aral Sea region".

***Keywords* -** Diseases of the musculoskeletal system, index YLD, osteodensitometry.

I. Introduction

According to the WHO, osteoporosis occupies a significant place in the world in regards to overall disability. In the world there are more than 75 million people diagnosed with osteoporosis. In addition there appear to be many more patients who are found undiagnosed. On average, osteoporosis occurs in one out of every three females and one out of very five males older than 50 years [1]-[3]. The problem of timely diagnosis of bone strength is very sigmificant and has ramifications of the outcomes of the disease. Due to the aging population in the coming decades, fracture rate will proportedly increase by 2-4 times .

***The purpose and objectives* -** Determination of loss of years for diseases of the musculoskeletal system of Kazakhstan's population and its analysis.

II. Materials And Methods

In a pilot study of the state of the musculoskeletal system of the adult population of Kazakhstan was performed: YLD-class analysis of injury (all locations), diseases of the musculoskeletal system in ecologically unfavorable Aral Sea region (Kyzylorda region) for 2009-2013; ultrasound machine osteodensitometry Omnisense-7000 («Sunlight Medical», Israel) of 589 people, a random sample of seven cities of different regions of Kazakhstan and the Russian city of Barnaul (Altai region).

The indicator YLD, years lived with disability, with absolute and intense indicators calculated for age groups: 15-29, 30-44, 45-59, 60-69, 70-79, 80 and older, according to the following formula according to WHO recommendations [4].

$$YLD = \Sigma\, nx * ix * Lx * D, \quad (1)$$

where nx - population aged x,
ix - the incidence of this disease at age x,
Lx - average time in group x,
D - the level of disability,
x - 15 to 85 years and above.

The study of bone density was carried out by usage the of an ultrasonic device focused on the middle of the tibia and the distal third of radius. Indicators of bone density were expressed as the standard deviation (SD) from the corresponding normative parameters: peak bone mass of healthy individuals of appropriate gender (T-score) and age norm of the patient (Z-test). According to WHO recommendations, assessment of bone tissue is evaluated by T-test. Deviation of less than 1 SD treated is considered to fall within the norm, a decrease of 1-2.5 SD regarded as osteopenia, more than 2.5 SD - as osteoporosis [5].

Statistical data processing was performed in the program Statistica-10. The significance of differences between mean values were detected by the method of parametric statistics Student t-test. Descriptive statistics are presented in the form of relative coefficients.

III. Results, discussion

For the population of Kyzylorda region, the average number of 701,366.60 index YLD class of injuries and diseases of the musculoskeletal system amounted to a total of over 5 years - 4154.0 absolute units (1% of total losses). The share of total years lost among the male population was greater than that of the female population, the ratio being 63.52% to 36.48%. Within the male and female population, differences were revealed in various age groups in reference the magnitude of the relative and absolute losses YLD. The mass value of the age groups relative indicators per 1000 population differs from the distribution of age in an array of absolute indicators. Since

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the ratio of the average values of the relative youth groups (15 to 29 years), people of working (from 30 to 59 years) and retirement age (60 and older) was as follows: 13.4%, 45.36% and 41.24%, and in absolute terms - 29.08%, 63.14% and 7.78%. The predominant mass loss occured in the group of the working-age population (Table I). In this case, in addition to the costs of health and social services to citizens, temporary or permanent disability due to diseases of the musculoskeletal system, should take into account losses to society from lost output and loss employment potential as a result of disability [6]. There is a negative trend of increasing the number of years an average of 11 times, both men and women lost due to disability from injuries and diseases of the musculoskeletal system (Fig.1).

TABLE I

INDEX YLD ON INJURIES AND DISEASES SLM OF POPULATION IN KYZYLORDA REGION FOR 2009-2013

	units	YLD			2009-2013
		male	female	total	
15-29 years	per 1000	1,7	0,9	1,3	M (mean)
		0,2-3,3	0,01-1,7	0,1-2,6	95% CI
	abs.	173,4	80,6	254,2	M (mean)
		19,5-327,3	0,4-160,8	10,8-497,6	95% CI
		867,0	403,0	1208,0	∑
30-44 years	per 1000	2,4	1,3	1,7	M (mean)
		0,8-4,1	0,1-2,4	0,4-3,1	95% CI
	abs.	179,8	90,3	252,2	M (mean)
		55,1-304,5	5,6-174,9	52,1-452,3	95% CI
		899,0	361,0	1195,0	∑
45-59years	per 1000	3,7	1,8	2,7	M (mean)
		0,7-6,7	0,2-3,3	0,5-4,9	95% CI
	abs.	188,0	98,8	286,8	M (mean)
		30,4-345,6	11,2-186,4	40,6-533,0	95% CI
		940,0	494,0	1428,0	∑
60-69 years	per 1000	1,9	1,3	1,6	M (mean)
		0,2-3,5	0,1-2,6	0,1-3,1	95% CI
	abs.	24,6	23,0	47,8	M (mean)
		1,7-47,5	0,9-45,1	1,5-94,1	95% CI
		123,0	115,0	234,0	∑
70-79 years	per 1000	1,0	1,8	1,1	M (mean)
		0,5-1,4	0,6-3,0	0,3-1,8	95% CI
	abs.	6,7	18,0	18,3	M (mean)
		3,4-9,9	5,5-30,5	5,9-30,6	95% CI
		20,0	54,0	73,0	∑
80 years, >	per 1000	2,3	1,2	1,3	M (mean)
		1,3-3,3	0,6-1,8	0,7-1,9	95% CI
	abs.	3,0	3,5	5,3	M (mean)
		1,4-4,6	1,4-5,6	2,7-8,0	95% CI
		9,0	7,0	16,0	∑
total	per 1000	1,6	0,8	1,2	M (mean)
		0,4-2,9	0,04-1,5	0,2-2,2	95% CI
	abs.	572,2	286,6	858,8	M (mean)
		120,7-1023,7	12,7-560,5	107,2-1610,4	95% CI
		2861,0	1433,0	4154,0	∑

CI - confidence interval

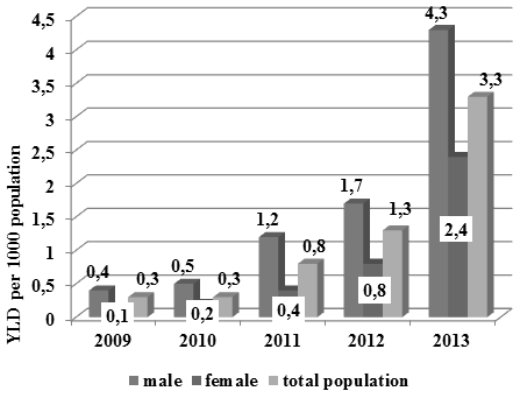

Fig. 1 Index dynamics of YLD (per 1000 population) for 2009-2013 in Kyzylorda region on injuries and diseases of the musculoskeletal system

Index YLD by age groups from year to year increases were observed peaks of growth and decay losses, which were more pronounced in the male population (Fig.2).

When one adds a trend line with the forecast for two periods, the prevalence of disease and damage caused by the UDF of this disease in the next two years will likely increase, which may be due to increases in population.

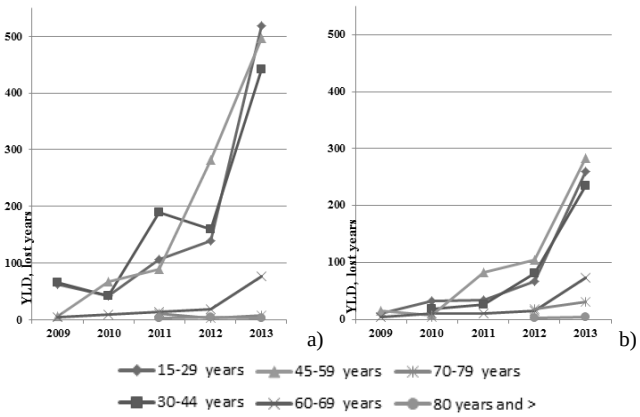

Fig. 2 Index dynamics of YLD on injuries and diseases of the musculoskeletal system of the population in Kyzylorda region among men (a) and women (b)

The average survival time for Kyzyl-Orda region is smaller than the standard, although it is observed in the trend of increase. If the difference between the standard and having an average life expectancy is factored in as the lost years of life, the number of lost years, relative to population increases significantly (Table II).

TABLE II

THE AVERAGE REMAINING TIME OF LIVING FOR THE PEOPLE IN KYZYLORDA REGION IN COMPARISON (DIFFERENCE) WITH STANDARD DATA

years	standard		Kyzylorda region, 2009-2013			
			M / M difference		CI / CI difference	
	male	female	male	female	male	female
15	65,4	68,0	51,6/ 13,76	59,94/ 8,10	51,01-52,35/ 13,07-14,45	59,45-60,43/ 7,59-8,61
20	60,4	63,1	46,9/ 13,50	55,12/ 7,94	46,27-47,61/ 12,86 -14,14	54,66- 55,58/ 7,46 - 8,42
25	55,5	58,2	42,4/ 13,06	50,36/ 7,84	41,80-43,04/ 12,44 -13,68	49,88- 50,84/ 7,36 - 8,32
30	50,5	53,3	37,9/ 12,56	45,58/ 7,68	37,41-38,55/ 11,99 -13,13	45,12- 46,04/ 7,23 - 8,13
35	45,6	48,4	33,7/ 11,86	40,78/ 7,60	33,22-34,22/ 11,35 -12,37	40,33 -41,23/ 7,12 - 8,08
40	40,6	43,5	29,5/ 11,12	36,12/ 7,42	29,02-30,02/ 10,60 -11,64	35,66 -36,58/ 6,97 - 7,87
45	35,8	38,7	25,4/ 10,32	31,48/ 7,24	24,95 25,97/ 9,82 - 10,82	31,03 -31,93/ 6,82 - 7,66
50	31,0	34,0	21,5/ 9,44	26,94/ 7,06	21,07-22,05/ 8,95-9,93	26,52 -27,36/ 6,64 - 7,48
55	26,3	29,4	17,9/ 8,36	22,64/ 6,76	17,56-18,40/ 7,94 - 8,78	22,27 -23,01/ 6,39 - 7,13
60	21,8	24,8	14,7/ 7,10	18,50/ 6,34	14,39-15,13/ 6,70 - 7,50	18,12 -18,88/ 5,97 - 6,71
65	17,5	20,4	12,0/ 5,44	14,82/ 5,66	11,81-12,31/ 5,19 - 5,69	14,56-15,08/ 5,40 - 5,92
70	13,6	16,2	9,50/ 4,06	11,48/ 4,74	9,11 - 9,89 / 3,70 - 4,42	11,23-11,73/ 4,48 - 5,00
75	10,2	12,3	7,44/ 2,76	8,82 / 3,48	7,23 - 7,65 / 2,55 - 2,97	8,54 - 9,10 / 3,20 - 3,76
80	7,5	8,9	6,16/ 1,30	6,82 / 2,10	5,94 - 6,38 / 1,08 - 1,52	6,70 - 6,94 / 1,98 - 2,22
85	5,2	6,2	5,64/ 0,38	5,62 / 0,58	5,43 - 5,85 / 0,16 - 0,60	5,59 - 5,65 / 0,55 - 0,61
90	3,5	4,3	2,38/ 1,16	2,76 / 1,50	2,19 - 2,57 / 0,96 - 1,36	2,70 - 2,82 / 1,45 - 1,55
95	2,3	2,9	0,70/ 1,62	1,40 / 1,50	0,36 - 1,04 / 1,30 - 1,94	1,31 - 1,49 / 1,41 - 1,59

M – mean, CI - confidence interval.

The osteodensitometry percentages of age group of 15 to 29 years was 7.98%, 16.81% 30-44 years, 45-59 - 42.44%, 27.33% 60-69 years, 70-79 years, 4.92% 80 years and over 0.51%. When surveyed using the T-index radius 45.34% had normal bone density was observed in 28.97% osteopenia and osteoporosis 25.69% was observed. Those with diagnosed osteoporosis within groups of young persons amounted to 6.71% of working age from 30 to 59 years - 44.3% of elderly people 60-69 years 37.58% and 70-79 years - 11.41%. People with osteopenia detected respectively - 8.93%, 60.71%, 25.60% and 4.76%. Using T-index of the tibia resulted in similar rates: 43.28% of the patients had normal bone density was observed in 36.90% osteopenia and osteoporosis 19.82% was observed. With osteoporosis tibial group of young persons amounted to 4.6% of working age from 30 to 59 years - 59.77% of elderly people 60-69 years 25.29% and 70-79 years - 10.34%. People with osteopenia respectively detected - 9.26%, 56.79%, 30.25% and 3.7%. In the cities of Kazakhstan: Stepnogorsk population diagnosed with osteopenia 24%, with 32% of osteoporosis, in Ust-Kamenogorsk 35.38%, respectively, in Ekibastuz - 39.39% and 18.18%, in Karaganda - 27.66% and 12.77% in Aktau - 22.81% and 17.54%, in Almaty equal to 37.72% and in Taraz with osteopenia 40% of people with osteoporosis and 27.5%. In the Russian city of Barnaul the population with osteopenia was 34.72% and 43.06% with osteoporosis. Using T-test shows proportionality in regards to the risk of fracture which is reduced in parallel with a gradual decrease of bone mass age. By reducing the amount of bone mass per 1 SD risk of fracture is increased by 50-100% [7]. Thus, the potential risk group for health and social losses also has considerable significance (Fig. 3).

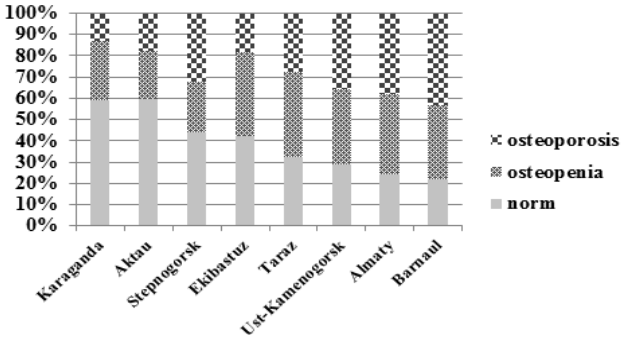

Fig. 3 The correlation of normal osseous tissue density, osteopenia and osteoporosis in cities of Kazakhstan

Given the low absorbability of calcium and its ramifications, one may benefit by supplementation of Osteo-Complex producer AdMedicine, form colloidal complex composition which differs (natural ipriflavone, vitamin mikroaktivirovanny colloidal D (cholecalciferol), calcium citrate, orotate, hydroxyapatite, magnesium citrate, orotate, zinc citrate, boron citrate) and high level of bioavailability, as high as 98% [8].

IV. Conclusion

Based on the above, the problem of diseases UDF should play an important role in prevention programs in the region. This may be partially achieved by taking into account age and gender characteristics of the global burden of disease.

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