medicinska revija
medical review

UDK: 616.71-007.234-055.1

Zvekić Svorcan J. et al MD-Medical Data 2013;5(3): 235-239 *MEDICAL DATA / Vol. 5. No 3 /* IX *2013.*

Originalni članci/
Original articles

PREDICTIVE FACTORS FOR OSTEOPOROSIS DEVELOPMENT IN MEN

PREDIKTIVNI FAKTORI ZA NASTANAK OSTEOPOROZE KOD MUŠKARACA

Jelena Zvekić-Svorcan[1], Karmela Filipović[1], Tanja Janković[1], Snežana Tomašević-Todorović[2], Jelena Vasić[3]

[1]Special Hospital for Rheumatic Diseases Novi Sad, Serbia
[2]Clinic for Medical Rehabilitation, Clinical Center of Vojvodina, Novi Sad, Serbia
[3]Railway Healthcare Center, Belgrade, Serbia

Correspondence to:

Asist. mr sc. med. dr **Jelena Zvekić-Svorcan**
Medical Faculty, University of Novi Sad,
Special Hospital for Rheumatic Diseses
Futoška 68, 21000 Novi Sad
Serbia

Phone: +381 64 9512190
E mail: zvekic.svorcan@gmail.com

Key words
risk factors, osteoporosis, fractures, men

Ključne reči
faktori rizika, osteoporoza, prelomi, muškarci

Abstract

INTRODUCTION: Osteoporosis in men is a large problem and often it is not recognized or treated adequately. Besides bone mineral density, risk factors have a large role in development of osteoporosis.
AIM: To determine effect of certain risk factors, and their number, on osteoporosis development in men.
MATERIAL AND METHODS: The prospective study encompassed 55 men who were referred to osteodensitometric tests at the lumbar spine and the hip. All patients were questioned about their risk factors. Results were interpreted according to the valid definition of osteoporosis. Effect of certain risk factors on bone mineral density was observed, especially previous fractures. In statistical analysis descriptive statistics, central tendency measures, parametric ANOVA test and multinomial logistic regression were used.
RESULTS: Average age of patients was 63.54±11.88 years. Most of patients had their bone mineral density at the osteopenia level. Pervious fractures, rheumatoid arthritis and low body mass index were found to be statistically significant risk factors. One in four patients had low-trauma fractures. BMD of lumbar spine and the hip was similar regardless the risk factors number and the number of previous fractures.
CONCLUSION: Bone mineral density, previous fractures, rheumatoid arthritis and low body mass index were found to be predictors for osteoporosis development, while the risk factors number and the number of previous fractures were of no significant importance.

INTRODUCTION

Osteoporosis in men is a rising problem in public health. One of five men over 50 years of age had suffered a fracture during his lifetime, and those with previous fractures have increased mortality risk [(1)].

Frequency of osteoporotic fractures in elderly men, as well as in elderly women, rises exponentially with age, but in men this increase occurs 5-10 years later than in women, probably because men initially have greater bone mass [(2, 3)].

Primary osteoporosis in men is linked to changes in sex hormones, the growth hormone-insulin-like growth factor-1 and the vitamin D-parathyroid hormone (PTH) with 25-hydroxyvitamin D (25OH) – PTH system. The most common identified causes of decreased bone mineral density in men are excessive alcohol consumption, glucocorticoid excess and hypogonadism [(4)].

Evaluation of elderly male patients should be pointed to identification of lifestyle or conditions that cause decreased bone mineral density. Therefore it is necessary to identify secondary causes, i.e. risk factors since by their prevention we could affect the bone mineral density and prevent fractures [(2,5,6)].

AIM

To determine effect of certain risk factors, and their number, on osteoporosis development in men.

MATERIAL AND METHODS

The prospective study encompassed 55 men of different age, who were referred to osteodensitometric tests at the Special Hospital for Rheumatic Diseases in Novi Sad. All patients were subjected to the osteodensitometric test (DXA), i.e. they had their bone mineral density (BMD)

measured at the lumbar spine and at the hip. Values obtained were expressed in g/cm2 and as the T score. T score values were interpreted according to the valid definition of osteoporosis. All patients had their body height and body weight measured and their body mass index (BMI) was calculated. They all had been questioned regarding the risk factors: presence of autoimmune diseases, rheumatoid arthritis, glucocorticoid medications, alcohol consumption, smoking and previous low-trauma fractures and/or their radiographic findings were observed from medical documentation. In statistical analysis, descriptive statistics, central tendency measures, parametric ANOVA test and multinomial logistic regression were used.

RESULTS

The study encompassed 55 men with average age of 63.545±11.88 years. Distribution of patients' age is shown in Table 1.

Table 1. *Age of patients*

	Frequency (f)	Percent (%)	Min	Max	$\overline{X}$	SD
30 - 40	3	5,5				
41 - 50	6	10,9				
51 - 60	13	23,6				
61 - 70	16	29,0	38,0	85,0	63,545	11,885
71 - 80	14	25,5				
81 - 89	3	5,5				
Total (Σ)	55	100,0				

Min – minimum, Max – maximum, X arithmetic mean, SD-standard deviation

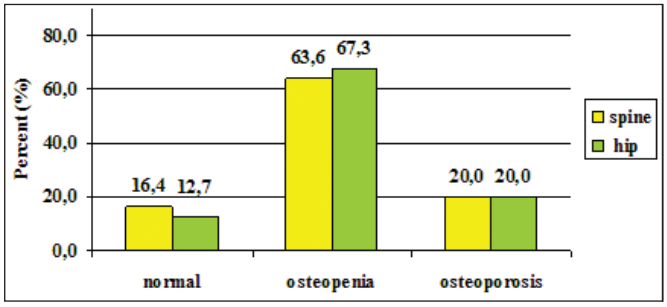
For body mass index, average is 25.992 ± 4.148 kg/m2 and most patients belong to group of normal weight and overweight, as shown in Table 2.

Table 2 *Body mass index of patients*

Body Mass Index (kg/m2)	Frequency (f)	Percent (%)	Min	Max	$\overline{X}$	SD
Underweight (< 18,5)	1	1,8				
Normal (18,5 - 25)	20	36,3				
Overweight (25 - 30)	25	45,5	17,8	37,3	25,992	4,148
Obesity (>30)	9	16,4				
Total (Σ)	55	100,0				

Min – minimum, Max – maximum, X- arithmetic mean, SD-standard deviation

The most patients had T score at the level of osteopenia, as shown in Graph 1.



Graph 1*. T score of the spine and the hip*

Regarding observed risk factors, 27.3% patients were smokers, 25.5% had previous low-trauma fractures, 23.6% had autoimmune disease, 21.8% were taking glucocorticoid medications, 20% consumed alcohol, 10.9% had rheumatoid arthritis, 1.8% had low body mass index, and not a single subject mentioned any fractures in his family.

According to the risk factors number, the most subjects had two or more risk factors, and there were no subjects without any risk factors, as shown in Table 3.

Table 3. *Number of risk factors*

Number of risk factors	Frequency (f)	Percent (%)
without risk factors	0	0
1	9	16,4
2	24	43,6
>2	22	40,0
Total (Σ)	55	100,0

Table 4*. Number of risk factors compared to the T score and BMD*

BMD and T skor	**Number of risk factors** 1	2	> 2	**F**	**p**
BMD of hip	0,814	0,841	0,856	0,319	0,728
BMD of lumbar spine	1,00	0,952	0,945	0,279	0,758
T skor of hip	-2,044	-1,888	-1,968	0,098	0,907
T skor of lumbar spine	-1,778	-1,688	-2,168	0,911	0,408

F – analysis of variance; p –statistical significance

Using analysis of variance (ANOVA) as a parametric method to examine differences, we examined differences between subjects with one, two or more than two risk factors regarding BMD score at the hip and spine, as well as the T score at the hip and spine.(Table 4) Since statistical significance (p) did not exceed the 0.05 level limits, we may say that there is no statistically significant difference between these groups of subjects for parameters measured (BMD and T score). In other words, BMD at hip and spine and T score at hip and spine is similar in men with different risk factors number.

Table 5. *Effect of risk factors on development of*

Risk factors	Hip p	ExsB	Lumbar spine p	ExsB
BMI	0,998	1,91	0,05	0,139
Alcohol	0,890	0,661	0,110	0,245
Smoking	0,989	1,93	0,986	0,115
Autoimmune diseases	0,992	0,125	0,657	0,164
Glucocorticoids	0,897	0,224	0,351	0,234
Rheumatoid	0,428	0,227	0,041	0,312
Previous fractures arthritis	0,476	0,178	0,004	1,86

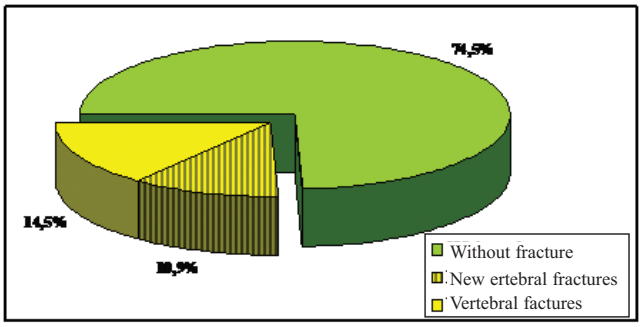
osteopenia/osteoporosis

ExsB –exponential beta coefficient; p - statistical significance

Multinomial logistic regression was used in order to examine how the risk factors number affects development of osteopenia and osteoporosis (Table 5). None of factors examined had any effect on development of hip osteoporosis. The spine osteoporosis was mostly connected to previous fractures ($p<0.01$), rheumatoid arthritis ($p<0.05$), and BMI ($p<0.05$).

Of all fractures noted, the most belonged to vertebral fractures (Graph 2).

Graph 2 *The frequency and type of fracture*



Most patients had two vertebral fractures (62.5%), and nonvertebral fractures were noted only as single fractures, as shown in Table 6.

Table 6. *Number of nonvertebral and vertebral fractures*

Nonvertebral fractures	**Frequency (f)**	**Percent (%)**
1	6	100,0
Vertebral fractures	**Frequency (f)**	**Percent (%)**
1	2	25,0
2	5	62,5
>2	1	12,5
Total	8	100,0

Table 7*. Number of fractures in comparison to T score and BMD*

BMD and T skor	**Number of fractures**			**F**	**p**
	1	2	> 2		
BMD of hip	0,86725	0,81940	0,88500	0,412	0,672
BMD of lumbar spine	1,02500	0,98460	0,96200	0,386	0,688
T skor of hip	-1,713	-2,080	-1,600	0,404	0,677
T skor of lumbar spine	-1,412	-1,980	-2,100	0,500	0,620

F – analysis of variance; p –statistical significance

Using analysis of variance (ANOVA) as a parametric method to examine differences, we examined differences between subjects with one, two and more fractures regarding BMD score at the hip and the spine and the T score at the hip and the spine (Table 7). Since statistical significance (p) did not exceed the 0.05 level limit, we may say that there is no statistically significant difference between these subject groups for parameters measured (BMD and T score). In other words, BMD at hip and spine and T score at hip and spine were similar in men with different number of fracture factors.

DISCUSSION

Osteoporosis in men is a large problem and often it is not recognized or treated adequately. Men aged 50 years or more have 13% higher risk for fractures. Morbidity and mortality after fractures is higher in men than in women [7].

Most men included in our study were older than 50, while average age was 63 years.

Kenny and Taxel published a study in 2000, revealing that osteoporotic fractures are increasing in men; more precisely, men older than 50 years have 19-25% higher risk of osteoporotic fractures. They explained this by extended life expectancy and better management of other chronic diseases [8].

In study that included 4720 men aged 65 years or more, subjects were followed up 4.6 years in average, and during this time their BMD at the neck of the femur was measured three times. The study concluded that BMD is lost with age, and this process is faster in those with lower BMD to start with; this could be the adequate explanation for increased risk of fractures in the elderly [9].

Perry and Morley point out that hypogonadism is connected to decrease in muscle and bone mass, because testosterone given as a replacement therapy in hypogonal older men brings improvements in both muscle and bone mass. On the other hand, osteoporosis in men occurs with and without hypogonadism [10].

In our study, BMD values for all subjects were obtained by osteodensitometric test. More than 60% of patients had their BMD at the osteopenia level at both the hip a spine, while 20% had osteoporosis results on both locations.

The osteodensitometric apparatus is now available and widely used in clinical practice. BMD is the main predictor for fractures, but analysis should also include the other risk factors [5, 11].

In 2007 a study was published that was done at the tertiary hospital in United Arab Emirates, with the aim to establish a pattern for referral of men to osteodensitometric test. Hospital files were reviewed regarding referral of men to DXA. 49% patients had osteopenia, 22.5% had osteoporosis and 28% had normal results for bone mineral density. Average age of patients was 55.2 years. The most common reasons for referral were: corticosteroid therapy (20.5%), bone rarefaction on radiographs (13%) and fragility fractures (12%). After nine months of follow-up, it was concluded that the low rate of DXA test referrals and relatively high normal BMD results point that osteoporosis is still considered a female population disease [12].

In our study, most frequent risk factors were previous fractures, rheumatoid arthritis and lower body mass, while the risk factors number present has not shown any impact on lowering the BMD.

Similar results were obtained by Vasić et al., in a study from 2013. They analyzed relations between the risk factors number and the bone mineral density in 2328 patients from two Serbian DXA reference centers: Railway Healthcare Center in Belgrade and Special Hospital for Rheumatic Diseases in Novi Sad. From all patients, 97% were women

and only 3% were men. Observing male patients only, there was no statistically significant correlation between the number of their risk factors and the BMD at lumbar spine and at the hip (p=0,689 and p=0,291, respectively) [13].

Importance of risk factors, besides absorptiometry results, was explained by Briot et al. in 2009. In their study, almost half the cases of osteoporosis were connected to diseases, medications or risk factors. Absorptiometry T score ?-2.5 SD is useful in diagnosing osteoporosis, but is not successful in adequately predicting fracture risk. Identification of men with high risk of osteoporotic fracture calls for assessment of bone mineral density, clinical risk factors and ones regarding a fall [14].

In another study, evaluation was done of 686 healthy men between 40 and 59 years of age who had submitted to osteodensitometric test, including physical strength test and questionnaire regarding smoking, alcohol consumption, physical activity and diet. From those subjects, 9.5% had BMD at the osteoporosis level, 26.5% at the osteopenia level and 64% had normal results. Multiple regression analyze pointed out that body mass index and leg strength are statistically positive determinants of BMD while calcium intake, exercise and alcohol consumption were not significant determinants of BMD [15].

Hippisley and Coupland published in 2008 their prospective open cohort study with routinely collected data from 357 general practices. They analyzed 1183663 women and 174232 men aged 30-85. There were 24350 osteoporotic fractures diagnosed in women and 7934 in men, from which 9302 and 5424 were hip fractures in women and men, respectively. Predictors for occurrence of osteoporotic fractures in men were age, BMI, smoking status, alcohol use, rheumatoid arthritis, cardiovascular disease, type 2 diabetes, asthma, tricyclic antidepressant medications, corticosteroids, history of falls and liver disease [16].

A meta analysis was published in 2004 with the aim to establish relations between previous fractures and age, gender and BMD. Total of 15259 men and 44902 women from 11 cohorts was observed. Previous fractures were connected to considerably higher risk than in those who had no previous fractures. There were no significant differences in risk between men and women. The risk ratio was stable with age except in the case of hip fracture, where the risk ratio increased with age. Regarding BMD, risk ratio was only 8%, but for hip fracture it was 22%. This is certainly an international validation of the previous fracture as a risk factor [17].

In our study, vertebral fractures were more frequent, but number of fractures did not show any connection to lowered BMD.

Since vertebral fractures are most frequent complication of osteoporosis and are recognized in only 25-30% cases, a retrospective analysis was done in Saudi Arabia with analyzing thorax radiographs in men aged 50 or more during 12 months, from 2007 to 2008. Total of 876 thorax radiographs was analyzed, and 13.1% patients had 157 fractures; the average age of patients was 67.85±10.1 years. In 18.2% patients there was more than one fracture. 64.9% fractures were at thoracic spine; 45.2% fractures were classified as mild, 34.4% as moderate and 20.4% as severe. In 22.6% patients the report of the radiologist highlighted the fracture. It all led to the conclusion that an early identification of vertebral fractures is needed, in order to conduct appropriate treatment and to avoid limb fractures that include a high mortality rate [18].

Our study had a small number of patients analyzed, and this may serve as an appeal to physicians at all levels of health care to identify men with risks for development of osteoporosis and fractures and to refer them to osteodensitometric test.

CONCLUSION:

Besides bone mineral density as a main determinant for development of osteoporosis, previous fractures, rheumatoid arthritis and body mass index were proven to be statistically significant risk factors in men examined.

Bone mineral density at lumbar spine and at hip was similar in men with different number of risk factors, and with different number of previous fractures.

These facts should be used in better selection of male patients, since osteoporosis is not exclusively “female” disease, in order to prevent fractures and therefore lower mortality and morbidity.

Sažetak

UVOD Osteoporoza kod muškaraca je veliki problem koji često nije prepoznat i nije dovoljno lečen. Pored mineralne koštane gustine u nastanku osteoporoze veliku ulogu imaju i faktori rizika.

CILJ: Odrediti uticaj pojedinih faktora rizika kao i njihov broj za nastanak osteoporoze kod muškaraca.

MATERIJAL I METODE: Prospektivno ispitivanje je obuhvatilo 55 muškaraca kojima je rađen osteodenzitometrijski nalaz na lumbalnom delu kičme i na kuku. Svi pacijenti su ispitivani o faktorima rizika. Nalazi su interpretirani prema važećoj definiciji osteoporoze. Posmatran je uticaj pojedinih faktora rizika, posebno već pretrpljenih preloma na mineralnu koštanu gustinu. U statističkoj analizi korišćena je deskriptivna statistika, mere centralne tendencije, parametarski ANOVA test i multinominalna logistička regresija.

REZULTATI: Pacijenti su bili prosečne starosne dobi 63,54±11,88 god. Najveći broj pacijenata je imao mineralnu koštanu gustinu na nivou osteopenije. Kao statistički signifikantni faktori rizika su se izdvojili prethodni prelomi, reumatoidni artritis i niži indeks telesne mase. Kod četvrtine pacijenata je identifikovano postojanje preloma na malu traumu. Mineralna koštana gustina lumbalnog dela kičme i kuka slična je kod različitog broja faktora rizika i različitog broja pretrpljenih preloma.

ZAKLJUČAK: Kao prediktori za nastanak osteoporoze kod muškaraca izdvojili su se mineralna koštana gustina, prethodno pretrpljeni prelomi, reumatoidni artritis i niži indeks telesne mase, dok broj faktora rizika i broj preloma nije pokazao signifikantnu značajnost.

REFERENCES :

1. Khosla S. Update in male osteoporosis. J Clin Endocrinol Metab 2010;95(1):3-10.
2. Tuck SP, Datta HK. Osteoporosis in the aging male: Treatment options. Clin Interv Aging 2007;2(4):521-536.
3. Cauley JA. Osteoporosis in men : prevalence and investigation. Clin Cornerstone 2006;8(3):20-5.
4. Kamel HK. Male osteoporosis : new trends in diagnosis and therapy. Drugs Aging 2005;22(9):741-8.
5. Janković T, Zvekić-Svorcan J, Petrović V. Uticaj rizikofaktora i smanjenje vrednosti serumskog 25(OH)D u nastanku osteoporotičnih preloma. Dijagnostika i lečenje osteoporoze. Balneoclimatologia 2013; 39(1): 241-246.
6. Klimo A. T skor i klinički faktori rizika u nastanku osteoporotičnih preloma. MD-Medical data 2011;3(4):361-365.
7. Amin S. Male osteoporosis : epidemiology and pathophysiology. Curr Osteoporos Rep 2003;1(2):71-7.
8. Kenny A, Taxel P. Osteoporosis in older men. Clin Cornerstone 2000; 2(6):45-51.
9. Cawthon PM,Ewing SK, McCulloch CE, Ensurd KE, Cauley JA, Cummings SR. Loss of hip BMD in older men : the osteoporostic fractures in men (MrOS) study. J Bone Miner Res 2009;24(10):1728-35.
10. Perry HM, Morley JE. Osteoporosis in men: are we ready to diagnose and treat?. Curr Rheumatol Rep 2001; 3(3): 240-4.
11. Cummings SR, Bates D, Black DM. Clinical use of bone densitometry: scientific review. JAMA 2002;288(15):1889-97.
12. Al Attia H, Adams B. Osteoporosis in men: we are referring enough for DXA and how? Clin Rheumatol 2007; 26(7): 1123-6.
13. Vasic J, Zvekic-Svorcan J, Elez J, Gojkovic F, Radojkovic T, Jankovic T, Filipovic K, Lazarevic M, Vojinovic-Culafic V. Correlation between number of present risk factors and BMD. European Congress on Osteoporosis and Osteoarthritis. Rome, Italy 17-20.Apr 2013. Osteoporosis International 2013; 24(1): 185-6.
14. Briot K, Cortet B, Tremollieres F, Sutter B, Thomas T, Roux C et al. Male osteoporosis : diagnosis and fracture risk evaluation. Joint Bone Spine 2009; 76(2):129-33.
15. Izumotani K, Hagiwara S, Izumotani T, Miki T, Morii H, Nishizawa Y. Risk factors for osteoporosis in men. J Bone Miner Metab 2003;21(2):86-90.
16. Hippisley-Cox J, Coupland C. Predicting risk of osteoporotic fracture in men and women in England and Wales:prospective derivation and validation of QFractureScores. BMJ 2009; 339b4229.
17. Kanis JA, Johnell O, De Laet C, Johansson H, Oden A, Delmas P et al. A meta-analysis of previous fracture and subsequent fracture risk. Bone 2004;35(2):375-82.
18. Sadat-Ali M, Gullenpet AH, Al-Turki HA, AbdulRahman TW, Al-Elq AH, Azzam MQ. Are we missing osteoporosis-related vertebral fractures in men? Asian Spine J 2011;5 (2): 107-110.

■ The paper was received on 02.07.2013., Accepted on 08.07.2013.