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Calcaneous Ultrasonographic Assessment of Bone Mineral Density in the Roma Minority Population of Croatia – Preliminary Report

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A B S T R A C T

A multidisciplinary anthropological and epidemiological pilot field study of the Bayash population living in 6 villages of the eastern Croatian region of Baranya has been performed in 2005/06. The Bayash (or Boyash) belong to the Roma minority population speaking a distinct archaic dialect of the Romanian language. Since the bone mineral density values in the Roma have not been explored so far and the prevalence of osteoporosis is unknown for this ethnic minority group a screening by means of the »Sahara« Hologic clinical bone sonometer has been performed on 232 voluntary participants (73 males and 159 females). The prevalence of osteoporosis (T-score <–2.5) in the Bayash aged 50 and older is found to be 9.1% in males and 34.4% in females, which is substantially higher than in the general population of Croatia. The prevalence of T-values ranging from –1 to –2.5 indicating osteopenia is found to be 63.6% in males and 45.3% in females, while T-values within the normal range are found only in 27.3% males and 20.3% females. In addition to the low bone mass in older subjects, the mean estimated bone mineral density in all age groups of Bayash men and women was lower in comparison to the manufacturer's reference ranges for European population of the same age. Since body size effects could not be declined, the reference values that would be appropriate for the Roma population should be further explored. The high estimated prevalence of developed osteoporosis calls for attention and the survey should also be extended to exploring the association of low bone mineral density with particular life style and reproductive factors present in this semi-sedentary Roma population.

Key words: *Roma minority, Bayash, bone mineral density, osteoporosis, Croatia*

Introduction

Low bone mineral density (BMD) has been established as an important predictor of future fracture risk. In recent years, a large number of techniques have been developed to estimate the bone mineral density for the diagnosis of osteoporosis.

Quantitative ultrasound (QUS) is a widely used screening tool for estimating the prevalence of low bone mineral density. There are some evidence that show that QUS is as good a predictor as DXA for the osteoporotic fractures (even independently from the bone mineral density)[1,2].

Although genetic factors are known to account for a major proportion of variation of BMD[3–7], diet, smoking, physical activity are usually highlighted as most relevant environmental risk factors for the development of osteoporosis[8,9]. Recently, there is an increasing number of studies reporting the socio-economic status, particularly social deprivation, as a potentially important risk factor for osteoporosis[10–12].

From the genetic-epidemiological perspective, Roma population might be considered as a particularly vulnerable group for developing osteoporosis and other chronic common diseases[13]. Namely, with the increase in life expectancy, the prevalence of chronic disease in Roma population may rise even at a higher rate than in other populations since bearing additional risks, both genetic and environmental. Those risks are connected with the following characteristics of Roma populations:

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a) Low socio-economic level and cultural specificities that shape lifestyle patterns compromising health-related behaviors, including the nomadic life style obstructing the possibility of permanent employment and continuity of income;
b) High degree of reproductive isolation from the surrounding population that enhances the possibility of a specific genetic makeup (e.g. increased frequencies of population-specific alleles and increased frequencies of homozygous genotypes as the consequences of drift and inbreeding).

Since the bone mineral density values in Roma have not been explored so far and the prevalence of osteoporosis is unknown for this ethnic minority group, the present study reports the preliminary results on bone mineral density and the prevalence of osteoporosis as assessed by the sonographic measurements of the calcaneus.

Materials and Methods

Population

In order to assess health status and health-related lifestyle attributes of the Roma minority population living in Croatia, a multidisciplinary anthropological and epidemiological community-based study was designed by the research team of the Institute for Anthropological Research, Zagreb. The pilot study was conducted in the fall of 2005 and spring of 2006 and involved 232 voluntary participants of the Bayash population (73 males and 159 females) aged 18–84 yrs, living in 6 villages and small towns of Baranya, eastern Croatia.

The Bayash (or Boyash) belong to the Roma minority population speaking a distinct archaic dialect of the Romanian language. This semi-nomadic group has arrived to Croatia most likely in the 19th century after the abolition of slavery in Romania and has kept traditional trades until recently. According to the 2001 census in the region of Baranya about 1000 Bayash residents are settled.

Study protocol

The study protocol was approved by the Scientific Board and Ethical Committee of the Institute for Anthropological Research in Zagreb and written consent was obtained from each individual at the onset of the study.

The protocol included the interview, ultrasound heel measurement, anthropometry, blood pressure reading and blood samples collection. Each participant completed a questionnaire developed by the research group that covered the following domains: lifestyle factors (smoking status, nutritional habits including alcohol and caffeine consumption), health history, medication usage (western and complementary), self-rated health, menstrual and reproductive history, migration history, demographics, education, economic status, housing, employment, medical insurance status, social support.

Bone densitometry

The »Sahara« Hologic clinical bone sonometer was used to estimate bone mineral density (BMD) of the calcaneus. The »Sahara« measures the broadband ultrasound attenuation (BUA, in dB/MHz) and speed of sound (SOS, in m/sec) of an ultrasound beam passed through the heel. The BUA and SOS are combined to yield a quantitative ultrasound or »stiffness« index (SI, % of age-matched controls), which is then used to estimate calcaneal BMD (in g/cm^2). The manufacturer's reference values for female and male Caucasian populations were used to determine T- and Z-scores.

For quality control and the evaluation of precision, a single machine was used for the study and one member of the research team was assigned to take all the measurements. A phantom supplied by the manufacturer was used to calibrate the machine before each screening session. The measurements were carried in a temperature-controlled environment (room temperature about 18–24°C).

Data analysis

The sample was stratified by sex and age as follow:

1. 50+ year old adults (for the prevalence of osteoporosis);
2. seven 10-year age groups (for estimated average BMD values and percentages of expected BMD as compared with manufacturer's reference data).

Descriptive statistics included sample sizes, mean values, standard deviations and minimal and maximal values. The Student t-test was used to test for significant differences.

The proportion of osteopenic (T-score ≤–1.0) and osteoporotic (T-score ≤–2.5) persons were determined using cut-off BMD T-values recommended by WHO (1994).[14]

Results and Discussion

The sample size and sex-specific descriptive statistics for age and bone densitometry parameters in Bayash population are shown in Table 1.

According to the WHO criteria[14], osteoporosis (T-score less than or equal to –2.5) is observed in 9.1% males and 34.4% females aged 50 and older (Figure 1). T-values ranging from –1 to –2.5 indicating osteopenia are found in 63.6% males and 45.3% females, while T-values within the normal range are found only in 27.3% males and 20.3% females. When the T-score cut-off value is raised to –1.8, a recently recommended threshold in quantitative ultrasonography of calcaneus[15], the osteoporosis prevalence increases to 50% in males and 56.3% in females aged 50 and older (Figure 2). The sex difference using later criteria disappears indicating that a considerable proportion of Bayash males and females are characterized by low bone mass. The prevalence of osteoporosis found in the Bayash population is substantially higher than those reported for other populations[16–19] in-

TABLE 1
DESCRIPTIVE STATISTICS FOR AGE AND BONE DENSITOMETRY PARAMETERS IN BAYASH MALES AND FEMALES. SIGNIFICANT DIFFERENCES AMONG THE SEXES (T-TEST) ARE DENOTED BOLD

	Males					Females				
	N	X	Min.	Max.	SD	N	X	Min.	Max.	SD
Age	73	42.2	18	77	15.6	159	45.6	18	84	15.3
T-score	73	–0.9	–3.3	1.5	1.1	159	–1.1	–3.6	2.0	1.1
Z-score	62	**–0.4**	–2.9	2.3	1.0	149	**–0.8**	–2.8	1.8	1.0
BMD (g/cm^2)	73	**510.9**	249	769	112.1	159	**453.0**	180	802	127.5
BMD (% expected)*	62	**92.2**	44	146	20.4	149	**82.5**	39	135	21.2

* Percentage of expected by age and sex matched values

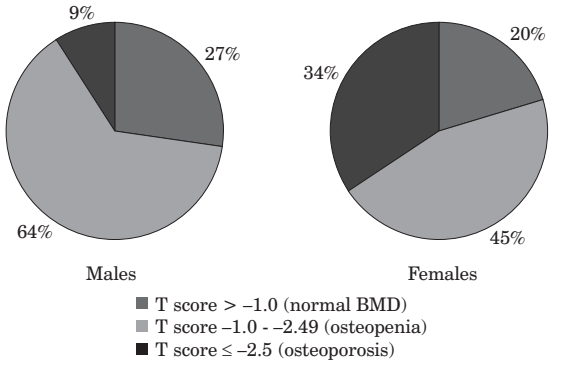

Fig. 1. Prevalence of osteopenia (T score ≤ –1.0) and osteoporosis (T score ≤ –2.5) in Bayash population aged 50 and over.

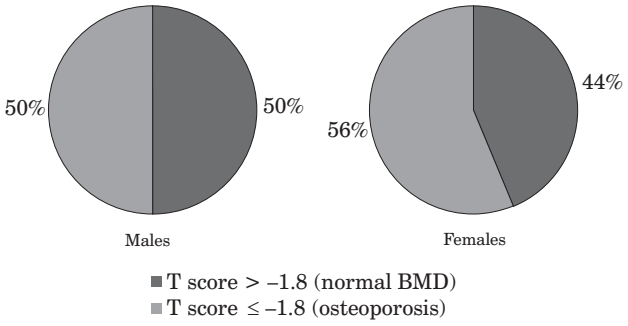

Fig. 2. Prevalence of osteoporosis (T score ≤ –1.8) in Bayash population aged 50 and over.

cluding the general population of Croatia. Respective prevalence for Croatian men are 5.8% (T-score ≤2.5) and 16.2% (T-score ≤–1.8)[20].

The age related decline of BMD that is especially pronounced in postmenopausal females (type I osteoporosis) is an extensively documented physiological phenomenon [21,22]. The same age-related trend is found in the Bayash population (Table 2, Figures 3 and 4). Figure 3 presents estimated BMD values (mean ± 0.95 CI) for Bayash males and females of different ages (7 age groups). The size of the male-female difference in means and a large confidence interval in the mail age group of 55–64 yrs provide explanation for the huge sex difference in the estimated prevalence of osteoporosis after the age of 50 yrs. This also explains the observed difference in the prevalence of osteoporosis in men when the two criteria, T-score ≤–2.5 and ≤–1.8, are applied.

Table 2 and Figure 4 show BMD values in Bayash population expressed as the percentages of expected BMD in respective sex and age groups. It is evident that the

TABLE 2
DESCRIPTIVE STATISTICS FOR BMD OF THE BAYASH BY SEX AND AGE. BMD IS EXPRESSED AS PERCENTAGE OF EXPECTED VALUE IN RESPECTIVE SEX AND AGE GROUP.

Age group	Males					Females				
	N	X	Min.	Max.	SD	N	X	Min.	Max.	SD
25–34	15	94.0	69	112	12.7	32	83.9	53	125	16.6
35–44	19	93.0	44	126	21.8	36	93.5	58	132	17.6
45–54	11	94.1	64	131	23.0	33	85.2	51	135	23.7
55–64	9	100.0	73	146	24.4	26	72.0	41	113	20.4
65+	8	75.9	53	107	15.9	22	70.6	39	116	19.9

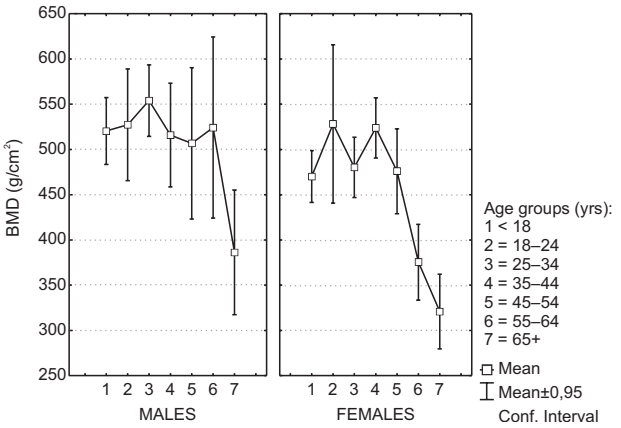

Fig. 3. BMD means and confidence intervals by sex and age in the Bayash population.

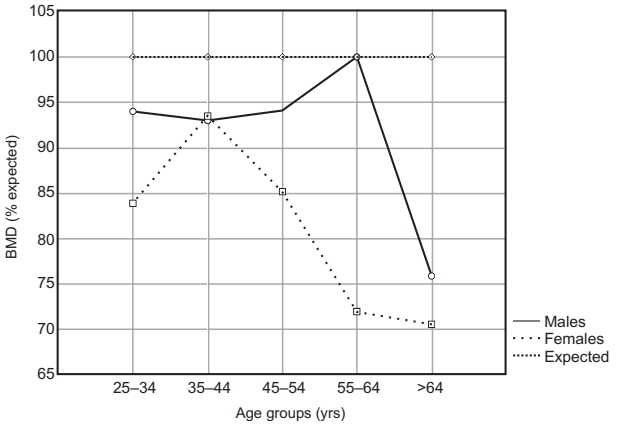

Fig. 4. BMD means by sex and age in the Bayash population. BMD expressed as percentage of expected value (i.e. 100%) in respective sex and age group.

mean estimated bone mineral density is substantially lower in comparison to the manufacturer's reference ranges in all age groups and in both sexes (with exception of 55–64 year old males). Low bone mass observed among the Bayash can arise as a result of the impaired development of the peak bone mass (e.g. due to delayed puberty or undernutrition)[23] but it may also partially be due to the diminutive body size of the studied Roma[24] compared to the European population.

Conclusion

The high prevalence of developed osteoporosis observed among the Bayash of eastern Croatia calls for attention and the survey should be extended to exploring the association of low bone mineral density with particular life style and reproductive factors present in this semi-sedentary Roma population. The findings also indicate that, in addition to exceptionally high prevalence of osteoporosis found in older subjects, the Bayash population is characterized by low bone mineral density in all adult ages. Since body-size effects can not be overseen, the normative values that would be appropriate for the Roma population are necessary to be further explored.

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ULTRAZVUČNA PROCJENA MINERALNE GUSTOĆE KOSTIJU U MANJINSKOJ POPULACIJI ROMA U HRVATSKOJ – PRELIMINARNO IZVIJEŠĆE

S A Ž E T A K

Tijekom 2005/06 godine provedena je multidisciplinarna antropološka i epidemiološka terenska pilot studija populacije Bajaša – stanovnika 6 Baranjskih sela (istočna Hrvatska). Bajaši (ili Bojaši) pripadaju Romskom manjinskom stanovništvu koje govori specifičan arhaičan dijalekt romskog jezika. Budući da vrijednosti mineralne gustoće kostiju Roma još nisu istražene i prevalencija osteoporoze nije poznata za ovu manjinsku etničku skupinu, na 232 dobrovoljaca (73 muškarca i 159 žena) provedeno je probirno istraživanje korištenjem ultrazvučnog denzitometra »Sahara« (Hologic). Prevalencija osteoporoze (T≤–2.5) u Bajaša starih 50 i više godina iznosi 9.1% kod muškaraca i 34.4% kod žena, što je višestruko veća proporcija od prevalencije u općoj populaciji Hrvatske. Prevalencija T-vrijednosti u rasponu od –1 do –2.5 koje indiciraju osteopeniju iznosi 63.6% kod muškaraca i 45.3% kod žena, dok T-vrijednosti veće od –1 (odnosno, normalne vrijednosti gustoće kostiju) ima tek 27.3% muškaraca i 20.3% žena. Osim što nižu koštanu masu imaju starije osobe, srednja vrijednost mineralne gustoće kostiju niža je u svim dobnim skupinama Bajaških muškaraca i žena u usporedbi s referentnim vrijednostima proizvođača za europsku populaciju iste dobi. Kako se učinci veličine i građe tijela ne mogu isključiti, bilo bi potrebno ustanoviti referentne vrijednosti koje bi bile prikladne za Romsku populaciju. Visoka procijenjena prevalencija razvijene osteoporoze upućuje na daljnja istraživanja koja bi trebala obuhvatiti ispitivanja asocijacije niske mineralne gustoće kostiju i čimbenika povezanih s posebnim životnim stilom i reproduktivnim karakteristikama koji su prisutni u ovoj polu-sjedilačkoj Romskoj populaciji.