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Measurement of Bone Mineral Density from Different Race of Elderly Population in Mianyang, China

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Abstract

Background: To investigate the relationship between bone mineral density (BMD) and race in the different race of old population living in Mianyang, a region in West China.

Methods: By dual energy X-ray absorptiometry, BMD was detected in lumbar spine, femoral neck and femoral trochanter of 5039 cases living in urban, suburban and rural areas (1895 cases of male, 3144 cases of female). BMD was also compared among different races including Han, Tibetan, Qiang and Hui.

Results: In the Mianyang, whether male or female, BMD in Han was significantly higher than that in Tibetan, Qiang and Hui ($P<0.05$). Furthermore, BMD in Hui was also greater than that in Tibetan and Qiang while BMD in Qiang was dramatically higher than that in Tibetan ($P<0.05$).

Conclusion: Our study demonstrates that BMD is closely associated with race in aged people in Mianyang, China.

Keywords: Race; Bone mineral density; Dual energy X-ray absorptiometry; Relationship

Abbreviations: BMD: Bone Mineral Density; FN: Femoral Neck; SD: Standard Deviation; WHO: World Health Organization

Introduction

Osteoporosis is the decrease of bone mineral content in the whole body and the degradation of bone microstructure, a degenerative disease of bone which leads to the increase of bone fragility and fracture risk [1,2]. Bone mineral density (BMD) is often used as criteria for diagnosis and therapeutic efficacy for osteoporosis in clinic. There are many detection methods of BMD, in which the dual energy X-ray bone density detection, whose test results are the gold standard for the diagnosis of osteoporosis, is widely used and recognized [3-6]. With the increase of population aging, osteoporosis has become a public health problem with a high incidence, a wide range of people, complex risk factors and serious consequences [7-11]. There are many risk factors for osteoporosis, including age, bad habits and so on, but the relationship between osteoporosis and race remains unclear [7-16]. The purpose of this study, therefore, was to analyze the BMD data in the Han, Tibetan, Qiang and Hui people of Mianyang city and to further explore the relationship between osteoporosis and race.

Materials and Methods

Detected objects

The detected objects were 5039 (1895 male and 3144 female) volunteers aged over 50 years from urban, suburban and rural areas of Mianyang, and their races covered Han, Tibetan, Qiang and Hui. The study was also approved by the Ethics Committee of the Third People's Hospital of Mianyang City.

Detection methods and diagnostic criteria

BMD of the lumbar spine 1-4 (L1-L4), left femoral neck (FN) and Ward's Triangle were detected using dual energy X-ray bone density detector (American General Co.) according to the manufacturer's instructions and the previous studies [3-6,17].

Statistical analysis

Statistical analysis was performed with the SPSS software system (SPSS for Windows, version 13.0; SPSS Inc., Chicago, IL). The measurement data were expressed as mean ± SD. Moreover, the comparisons between different groups were examined by with Student's t test or one-way analysis of variance followed by post hoc tests when appropriate. A significant difference was defined as $p< 0.05$.

Results

According to age, BMD in the male was compared among different races

In different age groups (50-59 years old, 60-69 years old, 70-79 years old, above 80 years old), BMD in male was compared among different races. Our results showed that the level of BMD in Han people from different age groups was higher than that in Hui, Tibetan and Qiang people. In addition, BMD in Hui was greater than that in Qiang and Tibetan; BMD in Qiang was remarkably higher than that in Tibetan ($P<0.05$) (Table 1).

According to age, BMD in the female was compared among different races

In different age (50-59 years old, 60-69 years old, 70-79 years old, above 80 years old), BMD in female was compared among different race. The study revealed that in different age groups, BMD in Han people was higher than that in Hui, Tibetan and Qiang people. Furthermore, BMD in Hui was more than that in Qiang and Tibetan while BMD in Qiang was greater than that in Tibetan ($P<0.05$) (Table 2).

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Age group	n	L_1-L_4	Left femoral neck (FN)	Ward's Triangle
50-59 years old				
Han	178	0.912 ± 0.113	0.820 ± 0.159	0.795 ± 0.101
Tibetan	8	0.813 ± 0.207*	0.763 ± 0.138*	0.722 ± 0.241*
Qiang	9	0.875 ± 0.196#	0.841 ± 0.245#	0.743 ± 0.271#
Hui	7	0.888 ± 0.212#	0.827 ± 0.279#	0.788 ± 0.243@,#
60-69 years old				
Han	429	0.893 ± 0.106	0.807 ± 0.142	0.773 ± 0.096
Tibetan	15	0.745 ± 0.182*	0.725 ± 0.191*	0.685 ± 0.173*
Qiang	18	0.812 ± 0.274*,#	0.814 ± 0.238	0.695 ± 0.169*,#
Hui	16	0.825 ± 0.168#	0.783 ± 0.251#	0.742 ± 0.216#,@
70-79 years old				
Han	575	0.848 ± 0.127	0.791 ± 0.185	0.743 ± 0.089
Tibetan	17	0.729 ± 0.131*	0.698 ± 0.170*	0.637 ± 0.212*
Qiang	24	0.772 ± 0.168*,#	0.787 ± 0.139#	0.672 ± 0.173*,#
Hui	16	0.809 ± 0.226#	0.758 ± 0.281#	0.731 ± 0.194#
80-years-old				
Han	548	0.788 ± 0.113	0.764 ± 0.107	0.743 ± 0.071
Tibetan	15	0.716 ± 0.152*	0.688 ± 0.176*	0.624 ± 0.201*
Qiang	13	0.726 ± 0.193#	0.720 ± 0.115#	0.660 ± 0.218#
Hui	7	0.785 ± 0.209#	0.784 ± 0.262#,@	0.701 ± 0.271#,@
Compared with Han, *P<0.05, **P<0.01; Compared with Tibetan, #P<0.05, ##P<0.01; Compared with Qiang, @P<0.05, @@P<0.01				

Table 1: Stratified by age, BMD in different men was compared (g/cm^2, mean ± SD)

Age group	n	L_1- L_4	Left femoral neck (FN)	Ward's Triangle
50-59 years old				
Han	612	0.839 ± 0.113	0.781 ± 0.068	0.746 ± 0.079
Tibetan	35	0.756 ± 0.165*	0.713 ± 0.184*	0.709 ± 0.293*
Qiang	21	0.793 ± 0.158*,#	0.731 ± 0.243*	0.715 ± 0.264*
Hui	19	0.819 ± 0.127#	0.776 ± 0.297#,@	0.738 ± 0.261#
60-69 years old				
Han	493	0.795 ± 0.140	0.748 ± 0.117	0.728 ± 0.135
Tibetan	79	0.715 ± 0.196**	0.689 ± 0.205**	0.632 ± 0.212**
Qiang	54	0.768 ± 0.152*,#	0.716 ± 0.317*,#	0.666 ± 0.237***
Hui	58	0.799 ± 0.121##	0.742 ± 0.261##	0.721 ± 1.079##
70-79 years old				
Han	933	0.748 ± 0.097	0.736 ± 0.095	0.718 ± 0.081
Tibetan	56	0.723 ± 0.185*	0.669 ± 0.222**	0.623 ± 0.286**
Qiang	57	0.737 ± 0.201	0.705 ± 0.266*,#	0.653 ± 0.244*,#
Hui	76	0.753 ± 0.164#	0.729 ± 0.138*,#	0.701 ± 0.358*,#
80-years-old				
Han	492	0.725 ± 0.128	0.736 ± 0.113	0.728 ± 0.147
Tibetan	51	0.709 ± 0.138	0.650 ± 0.276*	0.623 ± 0.189*
Qiang	44	0.728 ± 0.337	0.667 ± 0.283*	0.635 ± 0.244*
Hui	64	0.739 ± 0.258	0.729 ± 0.138#,@	0.697 ± 0.073#,@
Compared with Han, *P<0.05, **P<0.01; Compared with Tibetan, #P<0.05, ##P<0.01; Compared with Qiang, @P<0.05, @@P<0.01				

Table 2: Stratified by age, comparison of BMD in different women (g/cm^2, mean ± SD).

Discussion

In this study, BMD in Han, Tibetan, Qiang and Hui people living in Mianyang was compared. According to their gender and age, our results suggested that BMD in Han people was higher than that in Hui, Tibetan and Qiang people; BMD in Hui was more than that in Qiang and Tibetan; BMD in Qiang was greater than that in Tibetan.

BMD is an important indicator of bone quality, and it is used as a clinical index for the diagnosis of osteopenia and osteoporosis [18]. The diagnostic criteria for osteopenia and osteoporosis are generally diagnosed with the comparison of peak bone mass in the same race group, and the mean values of the BMD in peak bone mass and the people be tested is known as T values. According to the diagnostic criteria recommended by WHO: The T value ≥ -1.0 (standard deviation, SD) was diagnosed as normal bone mass, T value between -1.0 SD and -2.5 SD was diagnosed as osteopenia and T value ≤ -2.5 SD was diagnosed as osteoporosis. But this standard is formulated in accordance with the western developed countries, not all countries in the world adopt the above standards. The standard that China's most industry experts recommend is different from WTO: T value between -1.0 SD and -2.0 SD was diagnosed as osteopenia and T value ≤-2.0 SD was diagnosed as osteoporosis. The diagnostic criteria for osteopenia and osteoporosis were higher than that of WHO, but the specificity was poor. Not all countries in the world adopt WHO standards, in addition to considering the living environment and the level of the relevant, the national factors are also considered. BMD of different national groups have differences, which have been recognized by level of development and national medical standards. [18-20]. At the same time, reports about the prevalence of osteoporosis were very different, and this difference may also be related to the race groups in the population.

In addition to suggest that BMD and race are related, the study has following significance. First: the results of this study showed that the relationship between the BMD and the four different race groups in Mianyang and BMD of the order from high to low is Han, Hui, Qiang and Tibetan. Second, although people in Mianyang live in the same district, different nationality lives relatively concentrate (For example, there are Hui Autonomous Township, Qiang Autonomous County and Tibetan Autonomous Township). The Hui Autonomous Township and the Han nationality have no significant difference in altitude and climate, Qiang Autonomous County's elevation is higher than that of Han habitat (the temperature is relatively lower), and the Tibetan Autonomous township seats near the Northwest Plateau of Sichuan Province. BMD differences between different race groups may be related to the climate and elevation of the living area, which can be confirmed using the same race groups living in different environment [16]. Third, the living habits of different nation are different. Han population living habit was no special, the Hui people are generally vegetarian, Qiang and Tibetan people eat more beef and mutton. Differences in BMD between different races may be lifestyle-related.

Limitations

There are some limitations in this article. Firstly, for epidemiological investigation, sample size was small. But, in Chinese, people are not paying enough attention to prevention and treatment of osteoporosis, fewer people have bone mineral density tests, therefore, it was difficult to conduct a large sample of related studies and no participant was exclude. Secondly, there is a big difference between the numbers of subjects in the compared groups (Han=178, Tibetan=8, Qiang=9, Hui=7), this might affect the results of the analysis; however, they were minority and it was difficult Get more Han, Tibetan, Qiang participants.

Conclusion

In the study, BMD of four race groups in Mianyang were compared, the results showed that BMD is race-related, and national differences may be related to genetics, living area and their diet. Factors caused BMD differences in different races need to be further confirmed.

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