

OCCUPATIONAL ACTIVITY AND BONE MINERAL DENSITY IN MEN

A STUDY FROM THE COIMBRA IDENTIFIED SKELETAL COLLECTION

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1. INTRODUCTION Osteoporosis (OP) is a major public health challenge, effectively increasing the risk of fragility fractures [1]. The risk of hip fracture, for example, roughly duplicates for each standard deviation decrease in bone mineral density (BMD) [2]. OP is a multifactorial and heterogeneous disease, influenced by different etiological factors [1]. Physical activity exerts a significant impact on bone health, but the effects of work-related physical activity on bone mineral density are ambiguous [2,3]. As such, the purpose of this study is to investigate the influence of occupational activity on BMD at the hip in a sample of male adult individuals from the Coimbra Identified Skeletal Collection (CISC).



Figure 2: Agricultural activities as depicted in Pietro de Crescenzi's «Ruralia commodata».

3. RESULTS Age at death in the occupational groups (manual and non-manual) is similar (Manual: 49.9 [21.5] / Non-manual: 51.3 [18.4]; Student's t : -0.296, $df=125$, $p=0.768$). BMD at the neck and total hip is lower in the manual occupations' group ($BMD_{neck/manual}$: 0.768 [0.16] vs. $BMD_{neck/non-manual}$: 0.788 [0.16] / $BMD_{total\ hip/manual}$: 0.886 [0.16] vs. $BMD_{total\ hip/non-manual}$: 0.969 [0.31]) but the differences are not statistically significant (Manual Student's t : 0.520, $df=125$, $p=0.604$ / Non-Manual Student's t_{Welch} : 1.144, $df=20.8$, $p=0.266$; Figure 1). Total hip area (THA, cm^2), a proxy for bone size, is also similar in both occupational groups (THA_{manual} : 43.44 [3.81] vs. $THA_{non-manual}$: 42.44 [4.44]; Student's t : -1.045, $df=125$, $p=0.298$). Univariate analysis of variance suggests that the diagnosis of osteoporosis in this sample is only influenced by age at death and not occupation. In fact, after considering the effects of «age at death», it is suggested that «occupation» did not significantly affected BMD_{total} (Anova two-way: 3.210, $df=1$, $p=0.075$, $\eta^2_p=0.025$). Likewise, after considering the influence of «age at death», «occupation» apparently did not affect BMD_{neck} (Anova two-way: 0.181, $df=1$, $p=0.671$, $\eta^2_p=0.001$). The same patterns are observed when only individuals older than 50 years are analyzed – i.e., when accounting for a long-lasting influence of occupation on bone mineral density.

2. MATERIALS & METHODS The studied sample comprised 127 adult Portuguese males from the CISC, with known profession and cause of death. Occupations were divided in manual ($N=107$) and non-manual ($N=20$). BMD at the hip (regions of interest: femoral neck and total hip area) was assessed through osteodensitometry (DXA) at the Coimbra Hospitals and University Centre.

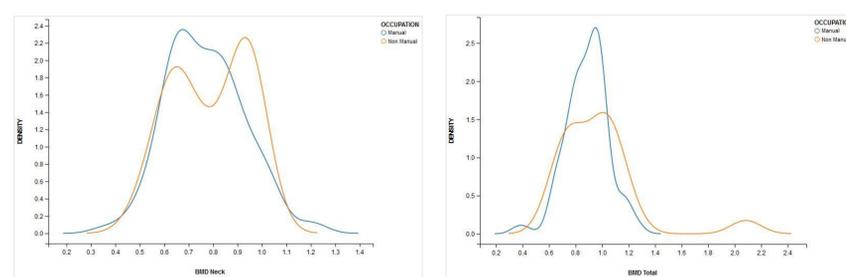


Figure 1: Density distribution of BMDneck (left) and BMDtotal (right) according to occupation.

4. DISCUSSION Physical activity exerts a significant influence in the development and maintenance of BMD, particularly activities that implicate muscle loading and weight-bearing [4]. Notwithstanding, and in agreement with some epidemiological studies [2,3], our findings suggest that sedentary work (i.e., non-manual work) is not associated with lower BMD at the hip and, consequently, does not seem to influence the diagnosis of osteoporosis. Other epidemiological studies have reported positive associations between occupational activity and BMD [5] – interestingly, a cross-sectional survey reported that female postmenopausal agricultural workers had greater hip and spine BMD than matched office workers or housewives [6]. Our sample of manual workers is mostly composed by undifferentiated agricultural workers (Figure 2) but other less physically demanding manual activities (e.g., tailors, shoemakers) are also represented. Mays [7] also did not find differences in cortical bone between manual and non-manual workers in a male sample from Spitalfields (UK). Bone metabolism is multifarious and affected by an eclectic assortment of factors, both during growth and later in life [1], of which mechanical forces are but one. As expected, age is a fundamental risk factor for bone loss in our sample.

5. FINAL REMARKS Our results suggest that habitual patterns of occupational activity do not influence bone mass at the hip. Nevertheless, limitations of this study regarding the association of occupation and BMD must be remarked: the small sample size (particularly in the non-manual occupations' group) and the assortment of different types of manual professions in the same group (see Cardoso & Henderson [8] for a wider discussion of this subject).

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