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1 **Variability of factors associated with grip strength in hand osteoarthritis according to**
2 **sex: results from the DIGICOD cohort**

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28 **Keywords:** hand osteoarthritis, grip strength, pain, comorbidities.

30 Decreased grip strength (GS) is a marker of comorbidities and of mortality over 60 years-old
31 [1–3]. As it is simple and easily reproducible, GS can be used in outpatient follow-up [4].
32 However, hand osteoarthritis (HOA), which can modulate GS and which is associated with
33 comorbidities [5], is never considered [6]. The aims of this study were to describe GS in HOA
34 and to determine whether decreased GS is associated with comorbidities in this population.

35 DIGICOD is a single-center prospective hospital cohort, which has included 426 patients over
36 35 years of age with symptomatic HOA [7]. Analysis involved the baseline data. GS was the
37 higher score of 3 repeated measures using a Jamar dynamometer.

38 Baseline grip strength of the dominant hand was compared between men and women (Student's
39 T test) and was described by age (by 10-year age groups using Kruskal-Wallis test). 394 patients
40 were analyzed, including 329 women (mean \pm SD of the dominant hand's grip strength of
41 21.6 ± 6.9 kg) and 65 men (34.9 ± 9.8 kg) with a mean age of 66.9 ± 7.3 years (**Table 1**). GS
42 decreased with age ($p<0.001$) and was lower in women ($p<0.0001$).

43 Then, factors associated with decreased GS (general characteristics, including cumulative
44 comorbidities and markers of pain et radiographic severity of HOA, namely the AUSCAN pain
45 score and total KL score) were investigated using univariate and then multivariate linear
46 regression analysis (adjustment on age, BMI and variables with $p \leq 0.2$ in univariate analysis)
47 and stratified by sex. Results were presented by beta coefficients and their 95% confidence
48 intervals. In women, decreased GS was not associated with comorbidities but with pain and
49 radiographic severity (i.e., Kellgren-Lawrence sum score) ($p<0.05$). In men, decreased GS was
50 associated with the presence of 3 comorbidities or more (-8.5 [-15.5 ; -1.43] kg *versus* a single
51 comorbidity being OA), independently of radiographic severity (**Figure 2**). The study of each
52 comorbidity separately did not show any association with GS.

53 We performed, for the first time in HOA, a stratified analysis of GS by sex because of an
54 interaction between GS and sex. In women, decreased GS was associated with pain and
55 radiographic severity. Therefore, hand pain and joint destruction due to HOA could interfere
56 with GS interpretation and its association with comorbidities. In men, decreased GS was
57 associated with the accumulation of comorbidities with a dose effect, independently of HOA
58 symptoms and radiographic severity. This difference could be explained by a lesser pain score
59 at baseline compared with women, whereas the number of comorbidities and radiographic
60 severity was similar. A lack of power in men due to small sample size could also explain that
61 no association was found.

62 In this cohort of symptomatic HOA, decreased GS reflects the radiographic severity of HOA in
63 women but is not associated with comorbidities. The independent association between
64 decreased GS and comorbidities remains only in men. Presence of symptomatic HOA should
65 be considered for future studies investigating the relationship between GS and morbidity,
66 especially in women.

67

68 **Ethical committee:** This study was approved by the French Ethical Committee (Comité de
69 Protection des Personnes), reference: PARIS ILE DE FRANCE IV.

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Table 1: Initial characteristics of the population by sex

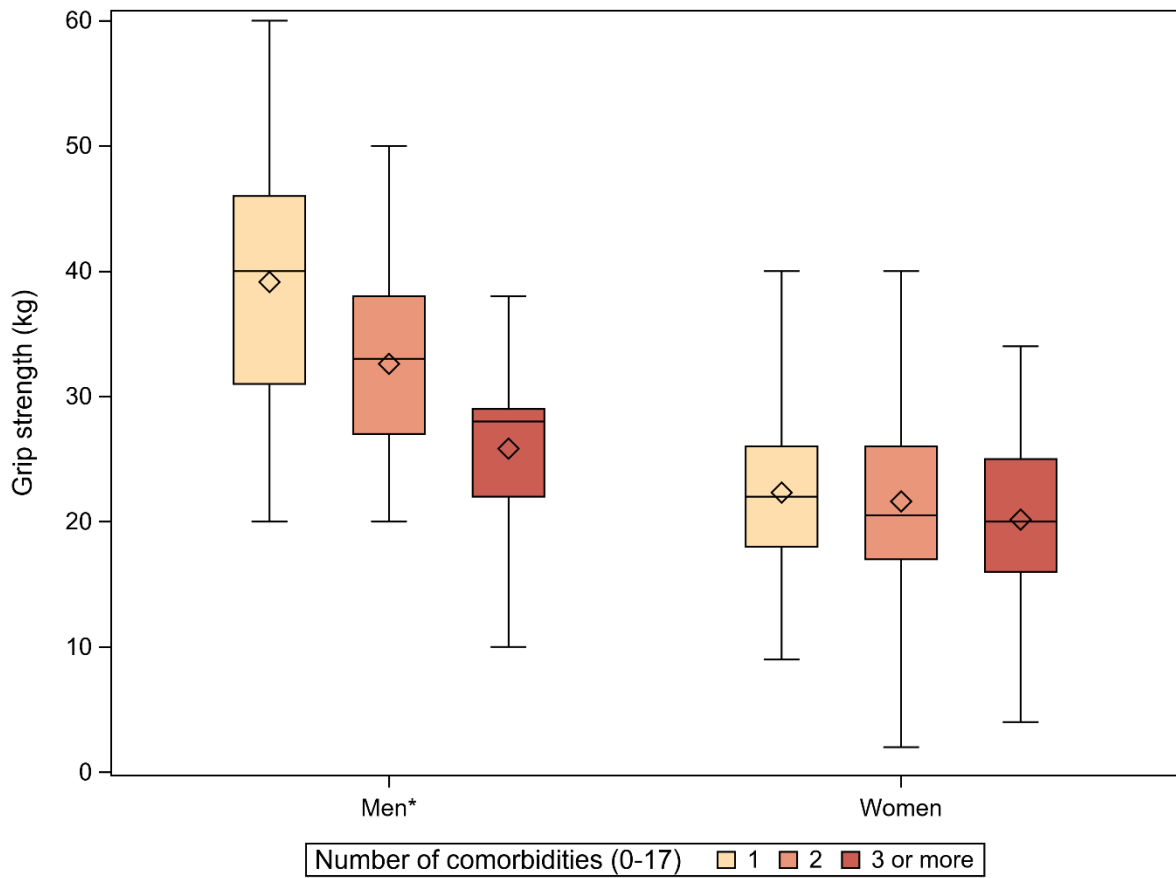
	Women (n = 329)		Men (n = 65)		P-value
	n*		n*		
Age at baseline (years), m ± sd	329	66.9 ± 7.1	65	66.9 ± 8.4	NS**
Body Mass Index (kg/m²), m ± sd	324	24.9 ± 4.4	64	26.7 ± 3.8	0.0019
Socioprofessional category	322		65		<.0001
1- Farmers, craftsmen, tradesmen and workers		16 (5.0)		9 (13.8)	
2 - Intermediate occupations and employees		147 (45.7)		13 (20.0)	
3 - Intellectual occupations		159 (49.4)		43 (66.2)	
Current tobacco consumption	325	25 (7.7)	64	2 (3.1)	NS
Current alcohol consumption	325	248 (76.3)	64	54 (84.4)	NS
Physical Activity Index (EPIC score)	314		60		
Inactive		55 (17.5)		10 (16.7)	NS
Moderately inactive		125 (39.8)		24 (40.0)	NS
Moderately active		68 (21.7)		15 (25.0)	NS
Active		66 (21.0)		11 (18.3)	NS
CRP	267		54		
< 5 mg/L		239 (89.5)		47 (87.0)	NS
≥ 5 mg/L		28 (10.5)		7 (13.0)	NS
TSH (mU/L), m ± sd	301	1.5 ± 0.8	63	1.6 ± 0.7	NS
Albuminemia (g/L), m ± sd	270	43.7 ± 3.1	55	45.0 ± 2.6	0.0052
Creatininemia (µmol/L), m ± sd	323	75.3 ± 9.9	63	93.6 ± 19.1	<.0001
Vitamin D level (ng/mL), m ± sd	309	34.0 ± 17.3	64	29.5 ± 13.8	0.0258
COMORBIDITIES					
Functional Comorbidity Index (0-18)	294		55		NS
1		122 (41.5)		26 (47.3)	
2		105 (35.7)		19 (34.5)	
≥ 3		67 (22.8)		10 (18.2)	
Mean ± sd		1.9 ± 1.0		1.7 ± 0.8	
Modified Functional Comorbidity Index (0-17)	299		56		NS
1		134 (44.8)		30 (53.6)	
2		110 (36.8)		20 (35.7)	
≥ 3		55 (18.4)		6 (10.7)	
Mean ± sd		1.8 ± 0.9		1.6 ± 0.7	
PAIN INTENSITY					
AUSCAN Pain subscore (0-100), median [IQR]	310	21.2 [9.2 ; 42.8]	57	16.4 [4.5 ; 28.6]	0.0228
RADIOGRAPHIC SEVERITY					
Total Kellgren-Lawrence sum score (0-128), median [IQR]	314	47.5 [33.0 ; 60.0]	64	49.0 [37.0 ; 62.5]	NS
Total Kellgren-Lawrence sum score at the dominant hand (0-64), median [IQR]	322	24.0 [16.0 ; 30.0]	65	24.0 [19.0 ; 31.0]	NS

84 Data are n (%), mean ± sd or median [IQR 25% to 75%].

85 *n: number of available data

86 ** NS: Not significant

87 **Figure 2: Boxplot representing GS of the dominant hand according to sex and number of**
88 **comorbidities**



89 *p < 0.05 using linear regression models

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