



HAL
open science

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

Elina Tan, Sophie Tuffet, Alexandra Rousseau, Bruno Fautrel, François Rannou, Francis Berenbaum, Jérémie Sellam, Alice Courties

► To cite this version:

Elina Tan, Sophie Tuffet, Alexandra Rousseau, Bruno Fautrel, François Rannou, et al.. Variability of factors associated with grip strength in hand osteoarthritis according to sex: results from the DIGICOD cohort. *Joint Bone Spine*, 2023, 90 (4), pp.105548. 10.1016/j.jbspin.2023.105548 . hal-04166283

HAL Id: hal-04166283

<https://hal.sorbonne-universite.fr/hal-04166283v1>

Submitted on 19 Jul 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

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

3
4
5 Elina Tan¹, Sophie Tuffet², Alexandra Rousseau², Bruno Fautrel³, François Rannou⁴, Francis
6 Berenbaum¹, Jérémie Sellam¹, Alice Courties¹.

7
8 1 : Sorbonne Université, Assistance Publique – Hôpitaux de Paris (AP-HP), Service de
9 rhumatologie, Hôpital Saint-Antoine, CRSA Inserm UMRS_938, Paris, 75012, France

10 2 : Sorbonne-Université, AP-HP, Service de Pharmacologie Clinique et Plateforme de
11 Recherche Clinique de l'Est Parisien (URCEST, CRB, CRC), Hôpital Saint-Antoine, Paris,
12 75012, France

13 3 : Sorbonne Université, AP-HP, Service de rhumatologie, Hôpital Pitié-Salpêtrière, GRC 08,
14 Institut Pierre-Louis Epidémiologie et Santé Publique, Paris 75013, France

15 4 : Université de Paris Cité, AP-HP, Service de médecine physique et de réadaptation, Hôpital
16 Cochin, Inserm U1124, Paris, 75014, France

17 **Word count for the manuscript (not including abstract, references, tables, and figure**
18 **legends): 488 words.**

19 **Correspondence to :**

20 Pr Jérémie SELLAM, MD, PhD

21 Rheumatology Department, AP-HP Saint-Antoine Hospital

22 184, rue du Faubourg Saint-Antoine

23 75012 Paris, FRANCE

24 Tel: + 33 1 49 28 25 20

25 Fax : + 33 1 49 28 25 13

26 jeremie.sellam@aphp.fr

27
28 **Keywords:** hand osteoarthritis, grip strength, pain, comorbidities.

29

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 (adjustement 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.

70 **Grant research:** Unrestricted grant from TRB Chemedica and AP-HP, which did not take part
71 in the study design, collection, analysis and interpretation of data, writing of the report or the
72 decision to submit the article for publication.

73 **Acknowledgements:** All the patients who have accepted to participate to the DIGICOD cohort.
74 All the investigators who manage or have managed patients' recruitments, and the monitoring
75 the clinical visits (Dr. Camille Deprouw, Dr. Sandra Desouches, Dr. Ariane Do, Dr. Emeline
76 Gaigneux, Dr. Camille Glanowski, Dr. Karine Louati, Dr. Stéphanie Malbos, Dr. Sabine Trelu,
77 Dr. Houda Ajlani, Dr. Juliette-Louise Petit and Dr. Clémence Gorlier all from the
78 Rheumatology Department of AP-HP Saint-Antoine Hospital), the staff members of the
79 URCEST and of the Centre des Ressources Biologiques from AP-HP Saint-Antoine Hospital.

80

81

82
83

Table 1: Initial characteristics of the population by sex

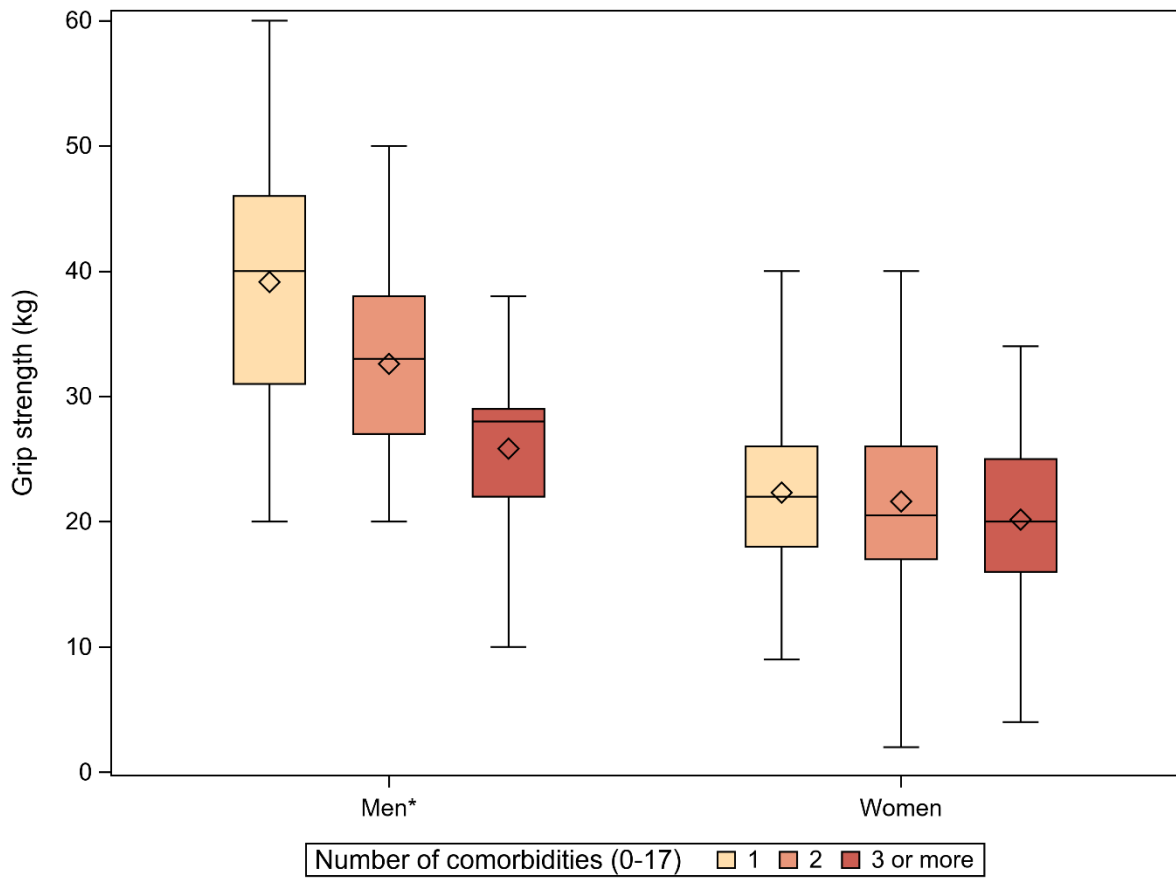
	Women (n = 329)		Men (n = 65)		P-value
	n*		n*		
Age at baseline (years), m ± sd	329	66.9 ± 7.1	65	66.9 ± 8.4	NS**
Body Mass Index (kg/m²), m ± sd	324	24.9 ± 4.4	64	26.7 ± 3.8	0.0019
Socioprofessional category	322		65		<.0001
1- Farmers, craftsmen, tradesmen and workers		16 (5.0)		9 (13.8)	
2 - Intermediate 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

REFERENCES

- [1] Yorke AM, Curtis AB, Shoemaker M, Vangsnes E. The impact of multimorbidity on grip strength in adults age 50 and older: Data from the health and retirement survey (HRS). *Archives of Gerontology and Geriatrics* 2017;72:164–8. <https://doi.org/10.1016/j.archger.2017.05.011>.
- [2] Reeve TE, Ur R, Craven TE, Kaan JH, Goldman MP, Edwards MS, et al. Grip strength measurement for frailty assessment in patients with vascular disease and associations with comorbidity, cardiac risk, and sarcopenia. *Journal of Vascular Surgery* 2018;67:1512–20. <https://doi.org/10.1016/j.jvs.2017.08.078>.
- [3] Celis-Morales CA, Welsh P, Lyall DM, Steell L, Petermann F, Anderson J, et al. Associations of grip strength with cardiovascular, respiratory, and cancer outcomes and all cause mortality: prospective cohort study of half a million UK Biobank participants. *BMJ* 2018;361:k1651. <https://doi.org/10.1136/bmj.k1651>.
- [4] Bohannon RW. Grip Strength: An Indispensable Biomarker For Older Adults. *CIA* 2019;Volume 14:1681–91. <https://doi.org/10.2147/CIA.S194543>.
- [5] Courties A, Sellam J, Maheu E, Cadet C, Barthe Y, Carrat F, et al. Coronary heart disease is associated with a worse clinical outcome of hand osteoarthritis: a cross-sectional and longitudinal study. *RMD Open* 2017;3. <https://doi.org/10.1136/rmdopen-2016-000344>.
- [6] Zhang Y. Prevalence of Symptomatic Hand Osteoarthritis and Its Impact on Functional Status among the Elderly: The Framingham Study. *American Journal of Epidemiology* 2002;156:1021–7. <https://doi.org/10.1093/aje/kwfl41>.
- [7] Sellam J, Maheu E, Crema MD, Touati A, Courties A, Tuffet S, et al. The DIGICOD cohort: A hospital-based observational prospective cohort of patients with hand osteoarthritis – methodology and baseline characteristics of the population. *Joint Bone Spine* 2021;88:105171. <https://doi.org/10.1016/j.jbspin.2021.105171>.