Clinical aspects of hand osteoarthritis : are erosions of importance?

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EROSIVE HAND OSTEOARTHRITIS: ITS PREVALENCE AND CLINICAL IMPACT IN THE GENERAL POPULATION AND SYMPTOMATIC HAND OSTEOARTHRITIS

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ABSTRACT

Objective

To estimate the prevalence of erosive hand osteoarthritis (EOA) in the general population and its relation to symptomatic hand osteoarthritis (HOA), hand pain and disability.

Methods

Baseline data of participants from a population-based study (age ≥ 55 years) were used. Symptomatic HOA was defined as hand pain and in addition to radiographic HOA (at least one interphalangeal (IP) joint or 1st carpometacarpal joint with Kellgren-Lawrence grade ≥ 2). EOA was defined as having at least one IP joint with erosions according to the Verbruggen-Veys scoring method. Hand pain and disability were self-reported. Multivariate logistic regression analyses were used to estimate the effect of EOA on pain and disability. Results were presented as odds ratios (OR) with a 95% confidence interval (95%CI), adjusted for age and sex.

Results

Of 3430 participants, radiographic HOA was seen in 56% (n=1916) and symptomatic HOA in 11% (n=371). Erosions were seen in 96 subjects. The prevalence of EOA in the general, radiographic and symptomatic HOA population was 2.8%, 5.0% and 10.2%, respectively. Presence of EOA led to adjusted ORs for pain of 3.6 (95%CI 2.4 to 5.6) and for disability 2.4 (95%CI 1.1 to 5.4). In radiographic HOA, people with erosion(s) had more hand pain (adjusted OR 3.1, 95%CI 2.0 to 4.8) or disability (adjusted OR 2.5, 95%CI 1.1 to 5.8) than people without erosion(s).

Conclusion

The prevalence of EOA is 2.8% in the general population and 10.2% in individuals with symptomatic HOA. It has a substantial impact on hand pain and disability.

INTRODUCTION

Hand osteoarthritis (HOA) is a prevalent, heterogeneous musculoskeletal disorder[1,2], comprised of different subsets[3]. It is often considered as a mild disease[4]. But the clinical burden of HOA can be considerable, especially with regard to disability[5]. Disability is, however, variable. In the general population, only 26.2% of the women and 13.4% of the men with radiographic HOA experienced functional problems, such as with writing, handling or fingering small objects[1]. In a HOA population from a rheumatologic outpatient clinic, a high clinical burden was determined, illustrated by decreased health-related quality of life in comparison to the general population[5]. The health-related quality of life in patients with HOA was even as low as in patients with rheumatoid arthritis (RA)[6]. Which aspects of HOA are related to the clinical burden is unknown.

Erosive hand osteoarthritis (EOA) is a subset of HOA, although it is unclear whether it represents a severe phase or a separate disease entity[3]. Diagnosis of EOA is based on central erosions and collapse of the subchondral bone plate on radiographs in interphalangeal joints[4,7]. In 1966, Peter *et al*. were the first to use the term EOA and described several cases[8]. We showed that EOA is associated with a higher clinical burden than non-erosive OA in patients in secondary care[9]. At the moment no data are available on the prevalence of EOA in the general population and its impact. Few data are available on the prevalence of erosions in HOA[9].

The objective of this study was to estimate the prevalence of EOA in the general population and in individuals with radiographic and symptomatic HOA. Furthermore, the clinical burden of EOA was explored and associations with possible risk factors for EOA were investigated.

PATIENTS AND METHODS

Patient population

The Rotterdam Study (comprising subpopulations RS I, II and III) was used, which is a population-based prospective cohort ongoing since 1990 studying determinants of chronic disabling disease. All inhabitants (n=10,275), aged ≥55 years, were invited to participate. The present study involves 7,983 persons (RS-I), living in the Ommoord district (Rotterdam, the Netherlands), who were examined from 1990-1993 (response 78%). Complete detailed information of the study is described elsewhere[10]. Extensive home interviews were conducted by trained interviewers. The study population was a selection of 3,906 individuals, who were available for follow-up 6 years later, for whom standardized posterior-anterior radiographs were available. For 451 persons, no information about the osteophyte scores and for 25 persons, no complete clinical data were available. Eventually, 3430 persons were included in the analyses.

Clinical characteristics

General characteristics (such as age, sex, height, weight) were determined at the research center[11]. During home interviews self-reported diseases, such as RA, Parkinson's disease and stroke were noted. Information about lifetime occupations

was also collected. A history of occupation or present occupation was classified in 'non-manual' versus 'manual' occupation, according to the Central Office of Statistics Netherlands (C.B.S.) code 1984[12].

Radiographic scoring and definitions

In 3,906 participants radiographs of both hands were scored by two trained assessors (2206 by Mrs S Dahaghin, 1700 by Mr U Cimen), who were blind for clinical and demographic data as described elsewhere[13]. In short, distal interphalangeal joints (DIPJs), proximal interphalangeal joints (PIPJs), 1st interphalangeal joints (IPJs) and 1st carpometacarpal joints (1st CMCJs) were scored for osteophytes and joint space narrowing (JSN) and graded for overall radiographic OA using a modified Kellgren-Lawrence (KL) grade (scaled 0-4). Both assessors read the same random sample of 205 radiographs: the inter-observer reliability calculated as a dichotomous variable (KL-grade ≥ 2) was good (kappa= DIPJs/1st IPJs 0.60, PIPJs 0.61, 1st CMCJs 0.74). Erosions were scored by the Verbruggen-Veys scoring method and defined as having eroded (E-phase) or remodelled irregular sclerotic subchondral plates (R-phase) in DIPJs, PIPJs or 1st IPJs[14]. Other structural abnormalities (subchondral cysts, sclerosis in DIPJs/PIPJs, pseudowidening in DIPJs) and erosions in 1st CMCJs were scored in EOA with the OARSI atlas[15] by WYK (blinded for clinical and demographic data). The intraobserver reliability of erosions as a dichotomous variable in the Verbruggen-Veys scoring method was excellent (kappa=0.94)[5].

'Mild' radiographic HOA was defined as KL-grade ≥ 2 in at least one DIPJ, PIPJ, 1st IPJ or 1st CMCJ and extensive radiographic HOA as the presence of KL-grade ≥2 in two out of three groups of hand joints (DIPJs/1st IPJs, PIPJs and 1st CMCJs) of each hand[16,17]. The groups were defined positive if at least one joint of the group showed KL-grade ≥ 2. Metacarpal joints (MCPJs) were not included in these definitions since the predominant localization of osteophytes in primary OA are the DIPJs, PIPJs, 1st IPJs and 1st CMCJs. If osteophytes are only seen in the MCPJs, other (secondary) causes of OA should be considered in these patients. EOA was defined as having at least one E- or R-phase in DIPJs, PIPJs or 1st IPJs.

Sample drawings for scoring erosions in hand radiographs

A selection of radiographs was made in order to achieve the most efficient way to determine all erosions, without scoring every single radiograph in the whole population. The assumption was that erosions are not present in subjects with no or few radiographic osteoarthritic features. To determine this selection, scores of osteophytes in the DIPJs, PIPJs and IPJs derived by the former scorers were used for the summation score (OSTsum) for every participant. The population was divided in subgroups by the summation scores (range 0-45). For example, if 3 DIPJs were scored for osteophyte grade 2 and 2 PIPJs for grade 1, the OSTsum for this participant would be 8. All radiographs in subgroups with OSTsum=6 to OSTsum=45 were scored. Samples of at least 10% of subgroups with OSTsum=0 to OSTsum= 5 were screened for erosions. Participants with a large osteophyte (grade ≥ 3) somewhere in their interphalangeal joint were also scored, except for 3 persons due to missing radiographs (Figure 1).

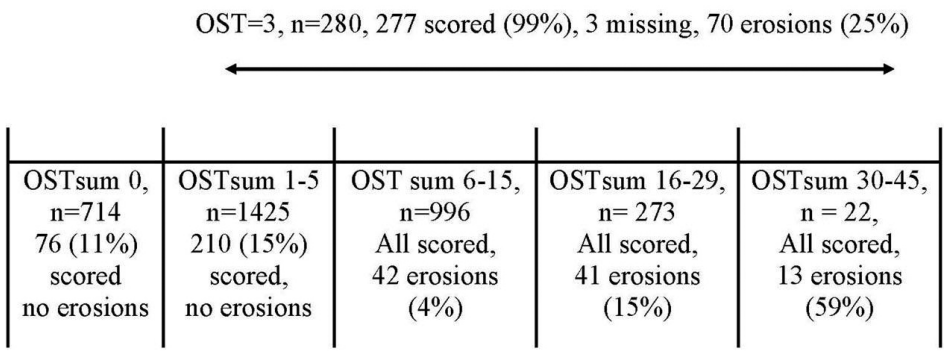

Figure 1: Distribution of sample drawings (n=3430). OSTsum = summation score of osteophyte scores.

Hand pain

Self-reported pain was evaluated by a standardized question: 'Did you have any pain in the right or left hand during last month?' and graded yes/no. Participants who had pain and fulfilled the criteria for radiographic HOA, as described above, were defined as symptomatic HOA.

Hand disability

For the assessment of disability, eight questions in the Stanford Health Assessment Questionnaire (HAQ) concerning hand function were used[18,19]. The questions were as follows: *Are you able to: 1. Dress yourself, including handling of closures? 2. Comb your hair or do your own make-up? 3. Turn taps on and off? 4. Cut your meat, and lift a full cup or glass to your mouth? 5. Open a new milk carton? 6. Open car doors? 7. Hold a pen or a pencil? 8. Open jars, which have been previously opened?* Scores ranged from grade 0 to 3 (from no difficulty to unable to do). Dependence on helping aids or physical assistance from family or friends was ignored and it represents residual disability after compensatory efforts. Scores were averaged into an overall hand disability score; a score of ≥ 0.5 was considered as hand disability [20,21].

Statistical analysis

Data were analyzed using SPSS, version 17 (SPSS Inc, Chicago, Illinois).

Prevalence was calculated by dividing the number of participants with EOA by the population size. The 95% CIs of prevalences were calculated based on binomial distributions[22]. The age distribution of the Dutch population in 2005, aged ≥ 55 years, was used to calculate the age-standardised prevalence of EOA in the general population[23].

For the association of pain and disability with EOA, participants suffering from RA (n=44), Parkinson's disease (n=12) and stroke (n=80) were excluded in this analysis, since they could contribute to hand pain and disability. Multivariate logistic regression analyses were used for comparison of pain and disability with a HAQ score ≥ 0.5 between participants with and without EOA in the general population and in

radiographic HOA population, adjusted for age and sex. Results were presented as odds ratios (OR) with a 95% CI.

RESULTS

Clinical characteristics and demographics

In the total population (n=3430), radiographic HOA was seen in 56% (n=1916), hand pain in 16% (n=551) and symptomatic HOA in 11% (n=371). The mean age was 66 years with a mean BMI of 26.3 for participants without EOA. Participants with EOA were significantly older, more overweight, tended to be female and reported more often hand pain (Table 1).

Table 1: Baseline characteristics of the participants in study population.

Characteristics	Participants without EOA (n=3334)	Participants with EOA (n= 96)	Mean difference (95%CI)
Female, % (n)	55.7 (1858)	65.6 (63)	9.9 (-0.2 to 20)
Age (years), mean, SD	66.1 (7.0)	68.6 (6.5)	2.6 (1.2 to 4.1)*
BMI (kg/m^2), mean, SD	26.3 (3.6)	27.5 (3.5)	1.2 (0.5 to 1.9)*
Hand pain, % (n)	15.5 (513)	39.6 (38)	24.1 (14.2 to 33.9)*
HAQ**≥ 0.5, % (n)	3.2 (105)	7.3 (7)	4.1 (-1.1 to 9.4)
Manual occupation, % (n)	28.5 (910)	22.6 (21)	-5.9 (-14.6 to 2.7)

EOA= erosive hand osteoarthritis,
BMI= Body Mass Index,
95%CI= 95% confidence interval,
*= statistically significant with p-value < 0.05,
**= HAQ (=Stanford Health Assessment Questionnaire) based on eight questions concerning hand function.

Pattern and prevalence of EOA

At least one interphalangeal erosion was seen in 96 participants, while 44 participants had ≥ 2 erosions (46% of persons with EOA). In 29 persons, erosions of 1st CMCJs were also seen. Erosions were predominantly seen in the DIPJs. More R-phases (according to Verbruggen-Veys) were seen than E-phases (78% and 22% respectively, supplementary figure S1). Other structural abnormalities were seen in participants with EOA; for example cysts, sclerosis and pseudowidening in 80 (83%), 87 (91%) and 31 (32%) persons, respectively.

The prevalence of EOA for all ages in the general population was 2.8%, in those with mild radiographic HOA 5.0%, in persons with extensive radiographic HOA 8.0%, in persons with hand pain 6.9% and in people with symptomatic HOA 10.2% (Table 2). EOA was most prevalent in older persons and rather similar between men and women (supplementary table S1). The age-standardised prevalence is 2.82% for the population aged ≥ 55 years.

EOA and hand pain

Pain was reported in 16% (n=551) of the general population and in 19% (n=371) of the radiographic HOA population. In participants with EOA, 40% (n=38) had pain.

Table 2: Prevalence* of EOA in the general population (n=3430) and several subpopulations, stratified age categories.

Prevalence EOA, all	All ages	55-64 years	65-74 years	75-84 years	> 85 years
General population	2.8 (2.3-3.4) 96/3430	1.8 (1.3-2.6) 31/1681	3.8 (2.9-5.0) 51/1339	3.4 (1.8-5.7) 13/382	3.6 (0.1-18.4) 1/28
Mild radiographic HOA**	5.0 (4.0-6.0) 96/1916	4.0 (2.7-5.6) 31/777	6.1 (4.6-7.9) 51/842	4.7 (2.5-7.9) 13/278	5.3 (0.1-26.0) 1/19
Extensive radiographic HOA***	8.0 (6.4-10.0) 74/922	7.9 (5.1-11.8) 22/277	9.3 (6.8-12.4) 43/461	5.2 (2.4-9.6) 9/174	0 0/10
Hand pain	6.9 (4.9-9.3) 38/551	3.8 (1.9-7.0) 10/260	10.5 (6.6-14.5) 25/237	6.1 (1.3-16.9) 3/49	0 0/5
Symptomatic HOA****	10.2 (7.2-13.3) 38/371	6.6 (3.2-11.8) 10/151	14.3 (9.1-19.5) 25/175	7.3 (1.5-19.9) 3/41	0 0/4

*= in % (95% confidence interval), no. of persons with EOA/all,
**= defined as having at least one joint (DIPJ, PIPJ, IPJ or 1st CMCJ) with KL-grade ≥ 2,
***= presence of KL-grade ≥ 2 in two out of three groups of hand joints (DIPJs/IPJs, PIPJs and 1st CMCJs) of each hand
****= persons with hand pain and signs of mild radiographic HOA,
EOA= erosive hand osteoarthritis,
HOA= hand osteoarthritis,
KL= Kellgren and Lawrence.

In the total population, EOA was associated with hand pain (adjusted OR 3.6, 95%CI 2.4 to 5.6). In radiographic HOA, participants with erosions have more pain (adjusted OR 3.1, 95%CI 2.0 to 4.8) than those without. These associations remained after additional adjustment for the number of affected joints with osteophyte grade ≥ 2 (data not shown). Presence of pain was dependent on the number of eroded joints (Table 3). If participants had ≥ 2 joints with erosions, they were five times more likely to have pain than non-erosive OA in the general population (adjusted OR 5.3, 95%CI 2.9 to 9.9). A similar pattern of association with pain was seen in participants with radiographic HOA. Also in this subgroup, subjects with ≥ 2 erosions were also more likely to have pain (adjusted OR 4.4 (95%CI 2.4 to 8.3). Similar results were found in the extensive radiographic HOA group (data not shown).

EOA and hand disability

Hand disability (HAQ score ≥ 0.5) was reported in 3.3% (n=112) of the general population and in 2.3% (n=44) of radiographic HOA population. In participants with EOA, 7.3% (n=7) had disability. The mean HAQ score for all participants with EOA was 0.10 (range 0.00-1.25). If the HAQ questions about the hand were analyzed separately, participants with EOA scored more often positive (grade ≥1) in 5 of the 8 questions (Table 4).

Participants with EOA in the general population were more often disabled than with non-EOA (adjusted OR 2.4, 95%CI 1.1 to 5.4). In radiographic HOA, presence of erosions was associated with a two times increased risk for hand disability (adjusted

Table 3: Associations between hand pain and EOA and between hand disability (defined as a mean categorical HAQ score ≥ 0.5) and EOA, in the general population (n= 3294, excluding persons with rheumatoid arthritis, Parkinson's disease and stroke) and in the radiographic HOA population (n=1830).

Hand pain	Crude OR (95% CI)	Adjusted OR (95%CI)*
General population (n=3294)		
No erosion	1	1
1 erosion	2.84 (1.57 to 5.12)	2.59 (1.41 to 4.75)
≥2 erosions	5.40 (2.96 to 9.93)	5.32 (2.85 to 9.94)
Radiographic HOA (n=1830)		
No erosion	1	1
1 erosion	2.27 (1.25 to 4.11)	2.20 (1.20 to 4.04)
≥2 erosions	4.33 (2.35 to 7.97)	4.44 (2.37 to 8.31)
Disability	**Crude OR (95% CI)**	**Adjusted OR (95%CI)***
General population (n=3294)		
No erosion	1	1
1 erosion	2.46 (0.75 to 8.05)	1.66 (0.50 to 5.57)
≥2 erosions	4.03 (1.41 to 11.55)	3.49 (1.19 to 10.24)
Radiographic HOA (n=1830)		
No erosion	1	1
1 erosion	2.19 (0.66 to 7.28)	1.81 (0.54 to 6.12)
≥2 erosions	3.59 (1.24 to 10.46)	3.57 (1.20 to 10.61)

Radiographic HOA = at least one joint (DIPJ, PIPJ, IPJ or 1st CMCJ) with KL-grade ≥ 2,
* Adjusted for age and sex,
95%CI= 95% confidence interval,
CMCJ = carpometacarpal joint, DIPJ = distal interphalangeal joint, EOA = erosive hand osteoarthritis, HAQ = Health Assessment Questionnaire, HOA = hand osteoarthritis, IPJ = interphalangeal joint, KL = Kellgren and Lawrence, PIPJ = proximal interphalangeal joint, OR = odds ratio.

OR 2.5, 95%CI 1.1 to 5.8). Similar results were found after additional adjustment for the number of affected joints with osteophyte grade ≥ 2 (data not shown). A dose-response relationship for disability was seen in EOA regarding the number of joints involved. If persons had ≥2 erosions in the radiographic hand OA population, the adjusted OR was increased to 3.6 (95%CI 1.2 to 10.6) (Table 3). The same pattern was found in the extensive radiographic HOA population (data not shown).

EOA and possible risk factors

Manual occupation and EOA in the general population were inversely associated after adjustment for age and sex (adjusted OR 0.57, 95%CI 0.34 to 0.95). The same associations remained in the radiographic OA population (adjusted OR 0.59, 95%CI 0.35 to 0.99). Obesity (body mass index > 30 kg/m2) was positively associated with EOA in the general population (adjusted OR 1.86, 95%CI 1.14 to 3.05). Obesity was also associated with mild radiographic OA in the general population (adjusted OR 1.33 (95%CI 1.06 to 1.66).

Table 4: Differences in HAQ questions of the hand between persons with and without EOA in the general population (n= 3294, excluding persons with rheumatoid arthritis, Parkinson´s disease and stroke).

HAQ ≥ grade 1 Are you able to …	Subjects without EOA, n=3200	Subjects with EOA, n=94*	Mean difference of % (95%CI)
Open a new milk carton?	7.8 (235)	20.4 (19)	12.6 (4.4 to 20.9)
Open jars, which have been previously opened?	3.6 (107)	10.6 (10)	7.0 (0.8 to 13.3)
Hold a pen or a pencil?	2.8 (82)	8.5 (8)	5.7 (0.1 to 11.4)
Turn taps on and off?	3.4 (103)	9.6 (9)	6.1 (0.2 to 12.1)
Cut your meat, and lift a full cup or glass to your mouth?	1.9 (57)	6.5 (6)	4.5 (-0.5 to 9.5)
Dress yourself, including handling of closures?	4.3 (133)	6.4 (6)	2.1 (-2.9 to 7.1)
Open car doors?	1.6 (50)	2.2 (2)	0.6 (-2.4 to 3.6)
Comb your hair/do your own make-up?	1.2 (37)	1.1 (1)	-0.1 (-2.2 to 2.1)

Radiographic HOA = at least one joint (DIPJ, PIPJ, IPJ or 1st CMCJ) with KL-grade ≥ 2.
Results are shown as % (n).
* = Two (out of 96) persons with EOA had stroke in the past and therefore were excluded in the analyses
CMCJ = carpometacarpal joint, DIPJ = distal interphalangeal joint, EOA = erosive hand osteoarthritis, HAQ = Stanford Health Assessment Questionnaire, HOA = hand osteoarthritis, IPJ = interphalangeal joint, KL = Kellgren and Lawrence, PIPJ = proximal interphalangeal joint, 95%CI= 95% confidence interval.

DISCUSSION

For the first time, a prevalence for EOA in the middle-aged general population is calculated, being 2.8%. In radiographic and symptomatic HOA a prevalence of 5.0% and 10.2% was seen, respectively. Participants with EOA had substantially more pain and disability than with non-erosive OA in both the general and radiographic HOA populations. A large sample of hand radiographs and clinical data of the general population gave the unique opportunity to investigate the prevalence of EOA, both in the general population as in participants with radiographic HOA and pain. These results are in line with an Italian study in 200 symptomatic HOA subjects (aged ≥ 40 years), where 7% of individuals had EOA[7,24].

Pain and disability were more frequent in EOA than in non-erosive OA in the general and radiographic HOA population. This is in line with an earlier study showing that patients with EOA in secondary care report more pain and disability than patients with nodal HOA[25]. We reported earlier that patients from secondary care with EOA experienced more pain and functional limitations than patients with non-erosive OA. But patients with EOA had also more nodes and concluded that the higher burden in these patients was only partly associated to erosive disease itself[9]. We could not investigate whether nodes also contributed to a higher burden, but adjustments for the number of affected joints with osteophyte grade ≥ 2 in the analyses for pain and disability yielded similar results.

The presence of one single erosion contributes to more pain than subjects without erosions. This is an important finding since ≥2 erosions are often proposed as a cut-off value for the definition of EOA[7], suggesting that the prevalence of erosions is infrequent and that even the presence of one single erosion has clinical consequences.

Although participants with EOA reported more pain and disability than those without, the majority of participants with EOA (60%) did not report pain or disability.

They may have had pain in the past, but had no pain at the time of data collection. The source of pain in OA is largely unknown, but inflammation probably plays a role and this can fluctuate[26]. If no signs of inflammation were present, people may be free from pain at the moment of participation. Another explanation might be that participants become used to pain and adapt their way of life. No information about assistive devices was acquired in this study. It might be that a large numbers of participants with EOA who did not report disability had access to these devices.

It was remarkable that erosions in 1st CMCJs, as described by the OARSI scoring method[15], were seen as well. This finding implicates that EOA in HOA is not an exclusive finding in interphalangeal joints, but can also occur in 1st CMCJs. Owing to the design of the study and the methods by which samples were drawn, the prevalence of EOA in 1st CMCJs is not known in this study. Further investigations into erosions in 1st CMCJs will be needed, to determine the prevalence of EOA in thumb bases and to evaluate the effect on clinical burden.

It is unknown, why some patients with OA develop EOA and others do not and we investigated potential risk factors for EOA development. We expected that manual occupation might be a positive risk factor for EOA, since earlier studies had shown that nodal HOA is associated with strenuous manual labor, like cotton picking[27]. However an inverse association was found. An explanation for this finding might be that subjects with EOA do not choose a manual occupation. Further investigations are needed to confirm this result.

Another potential risk factor for EOA is obesity. An association between obesity with EOA in the general population was seen. Radiographic HOA in itself was also associated with obesity, but with a lower effect size. These findings are in line with the results on obesity and HOA reported by a recent systematic review[28]. The association between obesity and HOA suggests underlying systemic mechanisms. People who are overweight, have more adipose tissue that can produce more cytokines, which contribute to low-grade inflammation[29].

Several genetic factors are known to be associated with EOA[30]. Stern *et al*. showed an association of EOA with single nucleotide polymorphisms (SNPs) of genes coding for IL-1 (IL1A-889 and IL1B 5810) compared to non-erosive HOA[31], but these findings need further replication. In addition, further investigations in the future are needed to find more genetic variants involved in EOA.

Several limitations should be mentioned. Despite the high response rate of participants, no information about EOA is known for the people who did not participate. The prevalence could fluctuate if non-participants had more or less EOA than those who participated. It is unlikely, however, that EOA, a phenotype that can only be determined by radiography, influenced people to participate. Second, not all participants with normal or minimal abnormalities on hand radiographs were scored for erosions. This was done for economic and feasibility reasons. With the sampling algorithm used in this study, we aimed to determine a precise estimation of the prevalence in an efficient way. From these (near) normal groups of participants we took large samples to be sure that no potential erosions were missed and think that our prevalences are good estimates of the general population. Furthermore, no

information about pain in the individual joint and no longitudinal data are available. Although specific information was derived on RA, no such information about psoriatic arthritis was derived at the time of data collection.

Clinicians should be aware of EOA. Within patients with symptomatic HOA more than 10% had erosions. EOA has a substantial impact on the clinical burden compared to non-erosive HOA. It is a step forward to acknowledge the clinical burden in these patients, although more specific outcome measurements for hand pain and function should be investigated. If these outcome measures can be determined, lowering disease activity of EOA should be the next aim in the future.

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Supplementary table S1: Prevalence* of erosive hand osteoarthritis in several subpopulations of the general population, stratified for sex and age categories.

Prevalence EOA, ♂ (n=1509)	All ages	55-64 years	65-74 years	75-84 years	> 85 years
General population	2.2 (1.5-3.1) 33/1509	2.0 (1.1-3.3) 15/742	2.3 (1.3-3.8) 14/608	2.7 (0.7-6.7) 4/150	0 0/9
Mild radiographic HOA**	4.4 (3.1-6.2) 33/744	5.0 (2.8-8.1) 15/301	4.1 (2.3-6.8) 14/342	4.2 (1.2-10.4) 4/95	0 0/6
Extensive radiographic HOA***	7.7 (4.9-11.5) 22/285	13.1 (6.7-22.2) 11/84	6.0 (2.8-11.2) 9/149	4.1 (0.5-14.0) 2/49	0 0/3
Hand pain	6.0 (2.6-11.5) 8/133	2.9 (0.3-10.1) 2/69	10.9 (4.1-22.2) 6/55	0 0/9	0 0/0
Symptomatic HOA****	9.6 (4.3-18.1) 8/83	5.3 (0.6-17.8) 2/38	16.2 (6.2-32.0) 6/37	0 0/8	0 0/0
Prevalence EOA, ♀ (n=1921)	**All ages**	**55-64 years**	**65-74 years**	**75-84 years**	**> 85 years**
General population	3.3 (2.5-4.2) 63/1921	1.7 (1.0-2.8) 16/939	5.1 (3.6-6.9) 37/731	3.9 (1.8-7.2) 9/232	5.3 (0.1-26.0) 1/19
Mild radiographic HOA**	5.4 (4.2-6.8) 63/1172	3.4 (1.9-5.4) 16/476	7.4 (5.3-10.1) 37/500	4.9 (2.3-9.1) 9/183	7.7 (0.2-36.0) 1/13
Extensive radiographic HOA***	8.2 (6.2-10.6) 52/637	5.7 (2.9-10.0) 11/193	10.9 (7.4-14.4) 34/312	5.6 (2.3-11.2) 7/125	0 0/7
Hand pain	7.2 (4.9-10.1) 30/418	4.2 (1.8-8.1) 8/191	10.4 (6.0-14.9) 19/182	7.5 (1.6-20.4) 3/40	0 0/5
Symptomatic HOA****	10.4 (6.9-13.9) 30/288	7.1 (3.1-13.5) 8/113	13.8 (8.0-19.5) 19/138	9.1 (1.9-24.3) 3/33	0 0/4

*= in % (95% confidence interval), no. of erosive persons/all.
= defined as having at least one joint with Kellgren and Lawrence-grade≥ 2 in DIPJ, PIPJs, IPJs, or 1st CMCJ *= presence of Kellgren and Lawrence-grade ≥ 2 in two out of three groups of hand joints (DIPJs/IPJs, PIPJs and 1st CMCJs) of each hand.
****= persons with hand pain and signs of radiographic hand OA,
EOA= erosive hand osteoarthritis,
HOA= hand osteoarthritis.

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