fortune Journals

Review Article

CARDIOLOGY AND CARDIOVASCULAR MEDICINE

ISSN: 2572-9292

Cardiovascular Risk Profile in Dupuytren's Disease: A Systematic Review and Meta-Analysis

Sylvain Mathieu[1*], Bruno Pereira[2], Frédéric Dutheil[3], Anne Tournadre[1], Martin Soubrier[1]

Abstract

Objective: Patients with Dupuytren's disease (DD) have a higher cardiovascular (CV) risk. It is difficult to know if this excess is linked to genetic factors or to a higher frequency of CV risk factors such as diabetes. We aim to assess the cardiovascular profile of DD patients by a meta-analysis on their CV risk factors and the country where the study was done.

Methods: We performed a SLR up to June 2023. Differences between DD patients and controls were expressed by standardized mean differences using inverse of variance method or odds ratio by Mantel-Haenzel method.

Results: We obtained 79 references, which corresponded to 114,446 DD patients and 2,597,950 controls. We found a higher risk of CV death (OR=1.33 [95%CI:1.07-1.66]) in DD compared with controls. DD Patients were more often diabetics (OR=4.06 [95% CI:3.07-5.37]). In 43 studies, incidence of DD was found in 15.5% of diabetic patients (11.9-19.5%). DD patients were older, more often men, smokers or alcohol drinkers. Levels of blood pressure, total cholesterol or triglycerides were not different in DD and controls. The risk of obesity was significantly lower in DD. The country where the study was done had no impact on these results.

Conclusion: We found a higher CV risk in DD that seemed not to be linked to genetic factors but rather to CV risk factors. Assessment of cardiovascular risk is important in DD patients, with especially search of diabetes or alcohol consumption but also other cardiovascular risk factors that might thereafter be well-controlled.

Keywords: Dupuytren's disease; Cardiovascular risk, Meta-analysis

Background

Dupuytren's disease (DD), characterized by contracture of the fourth and fifth fingers of the hand, is a common disease [1-3], but probably still underestimated. Some patients are completely asymptomatic or hesitate to see their general practitioners because they can considered DD to be shameful due to the supposed frequent association with alcohol consumption [4]. It is true that alcohol intake is a risk factor of occurrence of DD but is not the only one [5,6]. Male patients are at higher risk of DD compared with women [6], although sex predisposition might decrease with age [7]. Grazina et al point out that etiology of DD is still not well known [8]. Heredity has been proposed to be related to the pathogenesis of DD with an autosomal dominant pattern of inherence [9,10]. Diabetes is also recognized to highly increase prevalence of DD. The prevalence of DD is higher in a population of people with diabetes, especially type 1 diabetes [11]. Smoking is another factor that was reported to increase the risk of DD [12]. In summary, patients

Affiliation:

[1]Rheumatology Department, Clermont-Ferrand University Hospital, 58 Rue Montalembert, FR 63003, Clermont-Ferrand, France

[2]Biostatistics unit (Clinical Research Direction), University Hospital of Clermont-Ferrand (CHU), Clermont-Ferrand, France

[3]CNRS, LaPSCo, Physiological and Psychosocial Stress, CHU Clermont-Ferrand, University Hospital of Clermont-Ferrand, Occupational and Preventive Medicine, WittyFit, Université Clermont Auvergne, Clermont-Ferrand, France

***Corresponding authors:**
Sylvain Mathieu, Rheumatology Department, Clermont-Ferrand University Hospital, 58 Rue Montalembert, FR 63003, Clermont-Ferrand, France.

Citation: Sylvain Mathieu, Bruno Pereira, Frédéric Dutheil, Anne Tournadre, Martin Soubrier. Cardiovascular Risk Profile in Dupuytren's Disease: A Systematic Review and Meta-Analysis. Cardiology and Cardiovascular Medicine. 8 (2024): 440-454.

Received: September 19, 2024
Accepted: September 26, 2024
Published: October 14, 2024

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

with DD are more often men, smokers, diabetics and alcohol consumers and therefore might have a higher incidence of cardiovascular (CV) morbidity or mortality. However, few studies are assessed this CV risk and information are lacking on other cardiovascular risk factors (smoking, hypertension, dyslipidemia) in DD patients. Here we performed a meta-analysis to increase the statistical power and accuracy of the available data regarding DD and cardiovascular risk. Our aims were to provide a more accurate assessment of risk of developing cardiovascular events and of CV risk profile in patients with DD.

Methods

Literature search: We searched PubMed, Embase and the Cochrane Library to find reports of interest published since 9th June 2023. All observational or case/control studies monitoring death, cardiovascular events such as myocardial infarction (MI) or stroke or cardiovascular risk factors in DD patients were included. The following search terms were used: "(Dupuytren[tiab] AND (cardiovascular OR myocardial OR stroke OR atherosclerosis OR lipid OR diabetes OR glycemia))". Our search involved articles, or at least abstracts, published in English or French. A hand-search of references was also carried out. We collected data from the electronic abstract databases of the annual scientific meetings of European League Against Rheumatism and American College of Rheumatology from 2009 to 2023 using the term ("Dupuytren").

Trial selection: Two of us (SM and AT) selected potentially relevant articles after reading the title, keywords, abstract and then full-text. Doubts in articles selection were resolved by consensus with other authors.

Inclusion criteria for the full text were: study population of patients with DD; observational and case/control studies; articles published in English or French before June 2023; data giving the number of patients smokers, diabetics, obese or dead especially in case of cardiovascular events or mean and standard deviation of lipid profile parameters, blood pressure, body mass index. The exclusion criteria were: commentary or discussion papers; case reports and studies including fewer than five patients; no data about cardiovascular risk or profile; not DD patients; full-text not available; data not usable for statistical analysis (no standard deviation or no interquartile range).

Data extraction: One reviewer (SM), extracted all data using a standardized data abstraction form. For all extracted data, a central value (mean or median) and variability (standard deviation or interquartile range) or the number of patients with events of interest were obtained.

Study location: For each included study, we extracted the country where patients were included and identified the study as a high or low frequency of DD according to the worldwide distribution of DD [13-16]. For example, studies realized in United Kingdom, USA, Scandinavia, India, Japan or Ethiopia are at high prevalence of DD, although studies in France, Turkey, Taiwan, Chile, or Colombia are considered as a low DD prevalence study.

General patients' characteristics: For each article, we collected, when available, the age and sex of DD patients and controls, the number or percentage of men, smokers, alcohol users and diabetic. In both group, we extracted the number of patients or controls treated for hypertension or dyslipidemia and those having obesity defined by BMI higher than 30.

Extraction of cardiovascular events: In studies, we extracted the number of MI and strokes, both fatal and non-fatal. We also recorded the length of follow-up of the DD patients or controls. We verified that there was no overlap between the included articles and therefore, no event was counted more than once.

Extraction of cardiovascular risk factors: In case/control studies, we collected the recognized cardiovascular risk factors: systolic and diastolic blood pressure, glycaemia, smoking status, lipid profile (total cholesterol, low density lipoprotein (LDL) cholesterol, high density lipoprotein (HDL) cholesterol, triglycerides), BMI.

Quality of assessment: The two forms of Newcastle-Ottawa Scale (NOS) were used, one for case control studies and one for cohort studies, to check the quality of articles [17].

Statistical analysis: Continuous variables were expressed as weighted mean ± standard deviation (SD). Incidences of diabetics or smokers or men in the DD and control populations were calculated by metaanalysis of proportions (inverse of the variance method). The Mantel-Haenszel procedure was used to determine the odds ratio (OR) of tobacco use, alcohol consumption and other cardiovascular risk factors between DD and controls. This method provided a common odds ratio estimate and 95% confidence interval. For age, blood pressure, total cholesterol (continuous variables), the differences between DD patients and controls were expressed by standardized mean difference (SMD) using inverse of variance method: moderate 0.2-0.8, large > 0.8. Statistical heterogeneity between results was assessed by examining forest plots, confidence intervals and using I^2, which is the most common metric for measuring the magnitude of between-study heterogeneity and is easily interpretable. I^2 values range between 0% and 100% and are typically considered low for <25%, modest for 25-50%, and high for >50%. This statistical method generally assumes heterogeneity when the p-value of the I^2 test is <0.05. Random effects models were used if heterogeneity; otherwise we used a fixed effect model. When sample size was sufficient, meta-regressions were used to study the relationships between our outcome variables (cardiovascular risk factors) and clinically relevant parameters such as the low or high prevalence of DD

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

in the countries where patients were included. Type I-error was fixed at α==0.05. All the items required in the PRISMA checklist were filled in this study. This statistical analysis was conducted using Review Manager software (version 5.0) produced by the Cochrane Collaboration and Stata software (v14, StataCorp., College Station, TX, USA).

Results

Eligible studies: Figure 1 shows the flow chart of publications identified by the literature search and those finally retained. A total of 1,002 citations was obtained after research in the data basis. After reading the title, abstract and the full-text, we obtained 79 eligible studies for a total of 114,446 patients with DD. (Figure 1).

Study characteristics: Of the 79 publications, 11 were abstracts, 39 were case/controls studies, 25 were cross-sectional and 4 were longitudinal studies (Supplementary Table 1). Two studies assessed respectively the risk of death and of cardiovascular death in DD patients and controls. Sixty-four studies gave the CV characteristics (gender, tobacco and alcohol use, diabetes, hypertension, dyslipidaemia, body mass index) of DD patients. Twenty-eight studies allowed comparison between DD patients and controls on CV risk profile. The methodological quality of the included studies was pretty good (supplementary Figures 1-3). Forty-one studies (51.9%) were performed in countries with a high prevalence of DD such as United Kingdom, USA, Scandinavia, India, Japan and Ethiopia. The 38 other studies were considered as studies realized in countries with a low prevalence of DD (France, Turkey, Taiwan, Chile, Colombia…) according to the worldwide distribution of DD patients.

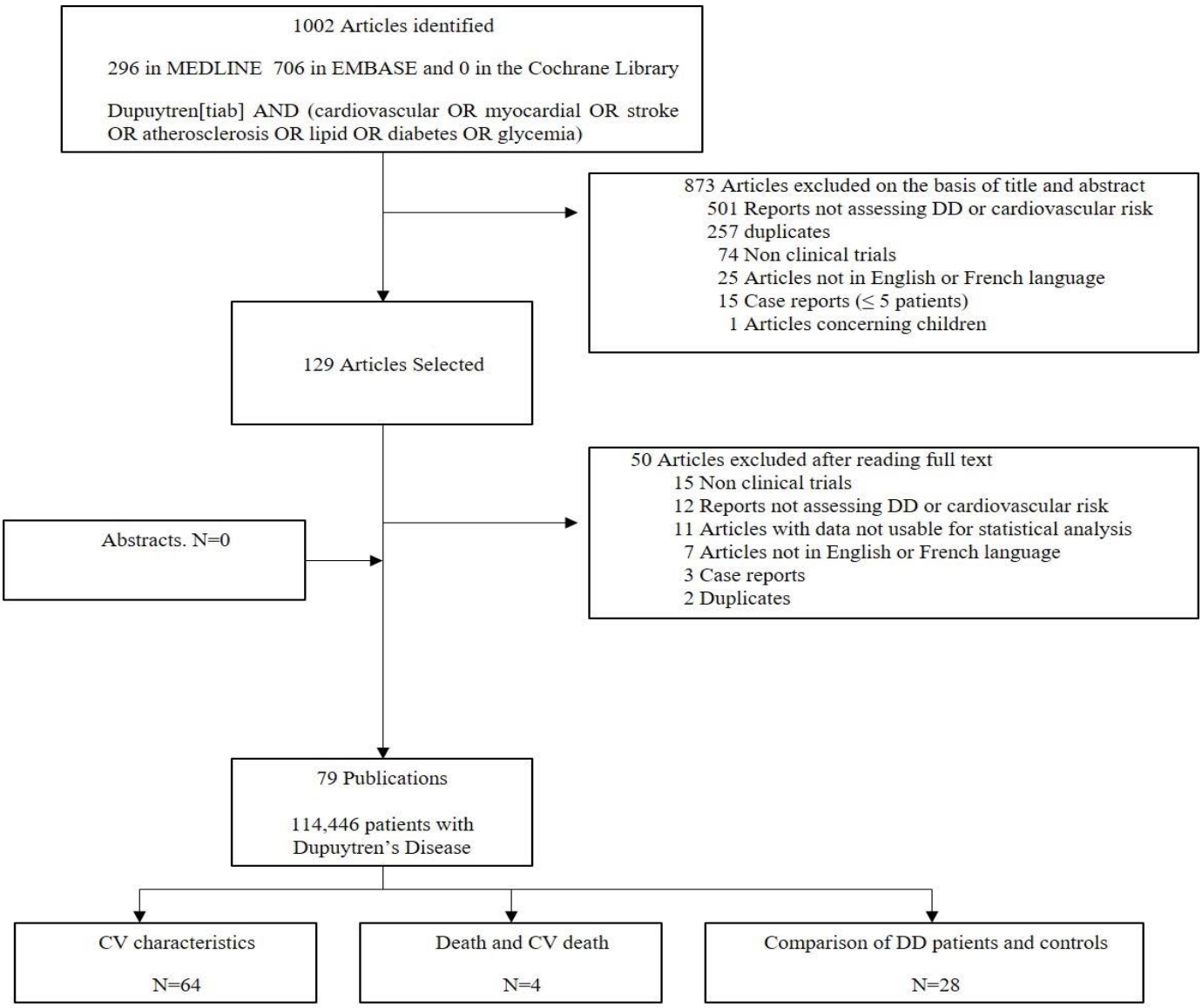


Figure 1: Flowchart of Manuscript selection.

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

Characteristics of DD patients: The weighted mean age was 63.7 ± 11.2 years (n=32,229), 68.9 % (IC95%: 61.8%-75.7%) of DD patients were men (n=40,324), 37.8 % (IC95%: 28.2%-50.0%) were smokers (n=12,960) and 46.2% (IC95%: 35.3%-57.2%) had alcohol consumption (n=12,852). More than one third of DD patients were manual workers (36.4% (IC95%: 17.7%-57.6%). Nearly 50% of DD patients reported hypertension (46.1% (IC95%: 34.6%-57.8%) (n=21,170) and 29.6% (IC95%: 21.9%-38.0%) dyslipidaemia (n=21,124). In all the 44 studies giving data on diabetes and DD, 15.5% (IC95%: 11.9%-19.5%) of diabetics patients (n=108,807) had DD disease and 43.9% (IC95%: 37.4%-50.5%) of DD patients (n=52,532) were found diabetics.

Risk of death: In three studies, 8,026 deaths were reported in DD patients (n=17,192) over mean follow-up of 24 years: incidence 56.2% [IC95%: 29.1%-81.4%] i.e. 2.3/100 pyrs. In controls incidence of death over 21 years (561 deaths in 1474 controls) was 50.2% [IC95%: 3.5%-96.6%]. Two studies assessed the risk of death in DD compared with controls and meta-analysis of these 2 studies found a higher risk in DD patients (OR=1.72 [IC95%: 1.37-2.16]). By the same way, DD patients had a 33% higher risk of death from cardiovascular disease (Figure 2) compared with controls.

Comparison of CV risk profile: Twenty-eight case/control studies for diabetes distinguished DD patients (n=19,705) and controls (n=2,054,798). Table 1 and Figure 3 show the comparison of characteristics between DD patients and controls. DD patients were older, more often men and alcohol drinkers.

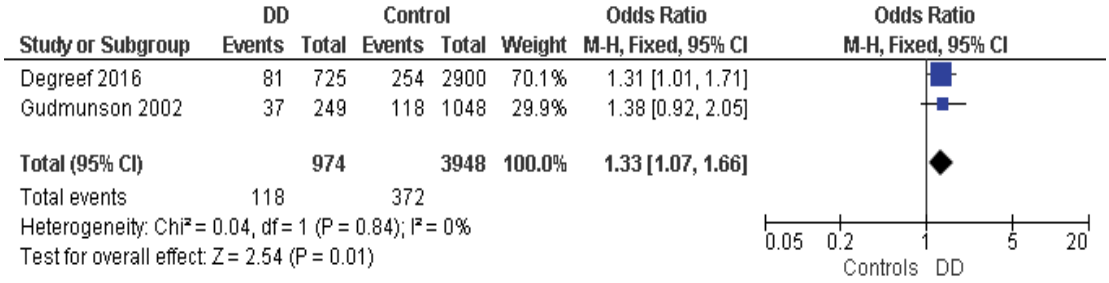
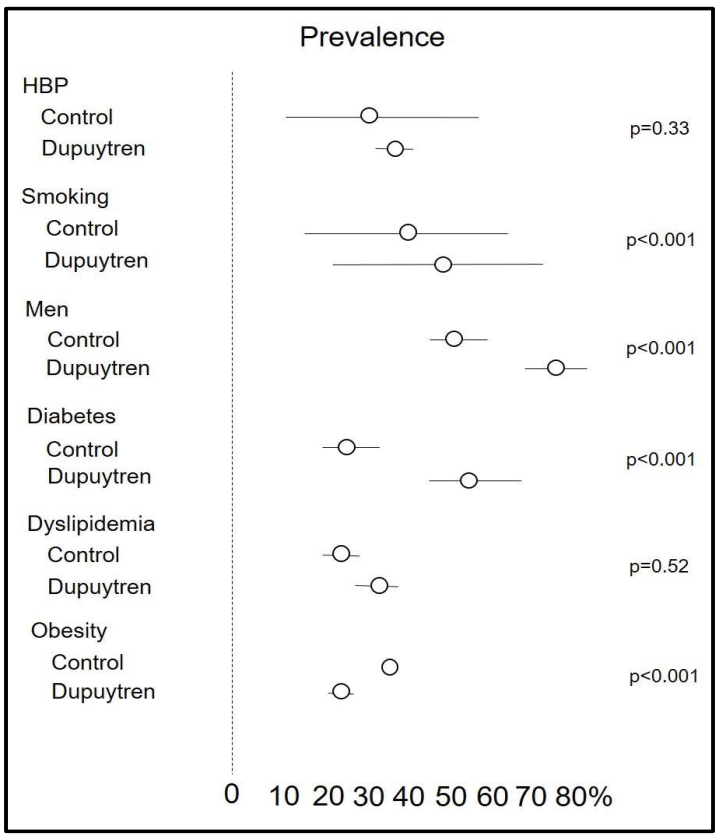


Figure 2: Forest plot for the risk of cardiovascular death between DD and controls.



HBP= high blood pressure

Figure 3: Comparison of prevalence of cardiovascular risk factors between DD patients and controls.

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

The percentage of smokers was also significantly higher in DD patients compared with controls. On the contrary, DD patients had not more hypertension or high total cholesterol compared with controls. Levels of triglycerides was not different in DD patients and controls. Surprisingly, DD patients were significantly less obese. Metaregression found that the country where the study was located and where DD patients and controls were included had no significant impact on the cardiovascular risk factors (Table 2).

Table 1: Comparison of characteristics between DD patients and controls.

Characteristics	N	DD patients		Controls		p-value	Odds ratio [95%CI] Fixed or random effects	I^2
		n total	Metaproportion (95%CI) or weighted mean ± SD	n total	Metaproportion or weighted mean			
Male, %	8	15,224	77.0 (65.0-87.0)	2,038,702	52.0 (45.0-58.0)	<0.001	OR= 2.80 [1.87, 4.18]	71%
Smokers, %	6	527	50.0 (22.0-78.0)	2,278	40.0 (16.0-66.0)	<0.001	OR= 1.58 [1.23, 2.01]	52%
Alcohol drinkers, %	6	528	49.0 (31.0-67.0)	2,868	21.0 (9.0-36.0)	<0.001	OR= 3.91 [2.31, 6.64]	66%
Obesity (BMI>30), %	2	15,224	26.0(26.0-28.0)	2,035,539	35.0 (35.0-35.0)	<0.001	OR=0.71 [0.69-0.74]	0%
Diabetics, %	25	18,239	56.0 (45.0-67.0)	2,166,497	27.0 (19.0-36.0)	<0.001	OR=4.06 [3.07-5.37]	90%
High BP, %	3	857	38.0 (32.0-44.0)	4,654	31.0 (10.0-57.0)	0.33	OR=1.60 [0.62-4.12]	91%
Dyslipidemia, %	2	782	31.0 (28.0-34.0)	4,579	26.0 (25.0-28.0)	0.52	OR=1.41 [0.49-4.07]	93%
Age, years,	8	15,548	63.6 ± 11.1	2,040,409	47.7 ± 17.4	<0.001	SMD= 1.13 [0.59,1.66]	99%
Systolic BP, mm,	3	334	140.5 ± 21.9	3,100	138.5 ± 20.3	0.07	SMD=0.11 [-0.01,0.22]	0%
Diastolic BP, mm,	2	277	87.0 ± 10.1	1,421	86.5 ± 10.2	0.28	SMD=-0.07 [-0.20,0.06]	0%
Total Cholesterol, g/l,	3	357	2.29 ± 0.39	2,761	2.14 ± 0.40	0.62	SMD=0.09 [-0.28,0.46]	83%
Triglycerides, g/l,	4	400	1.07 ± 0.66	1,473	1.21 ± 0.72	0.40	SMD=0.11 [-0.21, 0.43]	70%

N= number of studies; n= number of patients; SD= standard deviation; CI= confidence interval; mm= millimetres; g/l= gramm per litre; BP= blood pressure; BMI= body mass index; DD= Dupuytren disease.

Table 2: Comparison of cardiovascular risk factors between DD patients and controls depending the country frequency of DD.

	Countries with a high prevalence of DD					Countries with a low prevalence of DD					Comparison of OR
	DD patients		Controls		OR [95% CI]	DD patients		Controls		OR [95% CI]	
Characteristics	n total N	Metaproportion (95% CI)	n total N	Metaproportion (95% CI)		n total N=	Metaproportion (95% CI)	n total N=	Metaproportion (95% CI)		
Male, %	n=15,037 N=5	74.0 (60.0-86.0)	n=2,038, 179 N=5	44.0 (38.0-49.0)	3.67 [2.03; 6.64]	n=187 N=3	81 (66.0-92.0)	n=523 N=3	70 (55.0-83.0)	1.73 [1.07; 2.80]	p=0.07
Smokers, %	n=430 N=4	47 (10.0-86.0)	n=1,788 N=4	35 (5.0-74.0)	1.88 [0.94 ; 3.75]	n=97 N=2	58 (48.0-68.0)	n=490 N=2	44 (39.0-48.0)	1.28 [0.80 ; 2.05]	p=0.40
Alcohol drinkers, %	n=167 N=3	51 (19.0-83.0)	n=537 N=3	16 (1.0-43.0)	7.2 [2.10 ; 24.6]	n=361 N=3	47 (24.0-71.0)	n=2,331 N=3	26 (4.0-58.0)	2.82 [2.14 ; 3.72]	p=0.22
Diabetics, %	n=17,406 N=14	47 (37.0-58.0)	n=2,045, 078 N=14	25 (19.0-32.0)	3.15 [2.42 ; 4.10]	n=833 N=10	69 (40.0-92.0)	n=121, 419 N=10	30 (10.0-55.0)	8.64 [3.75 ; 19.9]	p=0.23

N= number of studies; n=number total of DD patients or controls; OR= odds ratio

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

Discussion

In this meta-analysis, we found an increased incidence of death and especially of death from cardiovascular origin of 33% in patients with DD. This higher CV risk seemed to be due to a worse cardiovascular profile. DD patients were more often male, smokers and were older with a higher consumption of alcohol, as already reported. Diabetes was found 4-fold more often in DD patients. However, other recognized cardiovascular risk factors were not increased in DD patients in this meta-analysis. We found no difference in level of cholesterol and in blood pressure. Therefore, as diabetes is a well-known higher risk factor of CV mortality and morbidity, we could hypothesize that DD without diabetes might have a lower CV risk, maybe the same CV risk than controls matched for age, sex and alcohol intake. Unfortunately, no study has already be designed like this to answer this interesting question.

Body mass index was lower in DD patients compared with controls and we found no difference in triglycerides levels. This is quite surprising because we could attempt that if there is a higher consumption of alcohol and a higher frequency of diabetes in DD patients, these patients could also have a more frequent prevalence of metabolic syndrome characterized by obesity and higher level of triglycerides [18]. These results might be explained by a higher activity at work in patients with DD patients. A manual work was often reported in DD patients that can be very physical with heavy or repetitive handwork [19-21]. In five studies of this meta-analysis (data not shown), DD patients had a manual work 2-fold more often than controls.

We found a higher frequency of tobacco use in DD patients compared with controls in this meta-analysis, which is in accordance to other references that reported a higher DD risk in smokers [5,22]. Proportion of smokers is important in our study with 50% in DD population and especially 40% in controls in the 6 case-controls studies. These percentages are very important compared to the general population in Europe ou in France respectively 26% and 32% in 2015 [23]. This may suggest that the controls in our meta-analysis are not really healthy controls as those in the general population.

DD is associated with diabetes and alcohol consumption that play an important role in the physiopathology of Dupuytren's disease. Management of CV risk in DD patients with an assessment of 10 year CV risk using SCORE (Systematic Coronary Risk Estimation) calculation or ASCVD (Atherosclerotic Cardiovascular Disease) risk for example seems important in global evaluation of patients with DD, especially those with diabetes. SCORE calculation using gender, level of cholesterol total and HDL, systolic blood pressure, tobacco use gives an estimation of global CV risk at 10 years and indication to start healthy lifestyle and/or statins to reach the target of LDL-cholesterol [24-27]. A good control of diabetes with a low glycated hemoglobin was reported to permit to decrease CV risk [28,29]. Moreno et al. [30] reported that hemoglobin glycated was an independent predictor of flow mediated dilation, a non invasive marker of endothelial dysfunction in atheroma [30]. A good control of diabetes seems also interesting to decrease the prevalence of DD. Ganesan et al. [31] found that the prevalence of DD varied depending on HbA1c levels. The prevalence was of 0.463% in patients having levels within the diabetic range, while lower prevalence of 0.392% and 0.416% were found in patients with prediabetes or uncontrolled diabetes, respectively [31]. Kang et al. [32] confirmed that diabetes and poor glycemic controls are major risk factors for DD, which present an opportunity for prevention [32]. By the same way, discussion on alcohol consumption are important in everyday management of DD, by general practitioners for example. Alcohol consumption and cardiovascular risk is still debated [33]. Dose of alcohol intake seems important. It is well known that chronic heavy drinking occasions detrimentally impact on most major cardiovascular diseases but the cardiovascular benefits of low-moderate alcohol consumption are still being questioned and perhaps might have been overestimated [34]. Less is best could be the good message given to DD patients on alcohol consumption.

We found no impact on CV risk factors results between DD patients and controls of the country where the study was realized. DD patients were more often men, diabetic and alcohol users whether the study took place in a country with a high or low frequency of DD and differences between OR were not significantly different. No difference was also found between countries for the impact of smoking on CV risk factors between DD and controls. These results mean that the ethnic origin of DD patients or genetic factors seem not to have a significant role in the excess CV risk found in DD. Therefore, the country where DD patients come from should not be taken into account in the assessment of CV risk. All DD patients are concerned by the research and treatment of CV risk factors.

Our study has some limitations. First, the number of studies assessing CV events occurrence in DD included in this meta-analysis is low. Association between diabetes and DD is well-known with many references in the medical literature. But consequences of diabetes such as occurrence of myocardial infarctions or strokes are not sufficiently studied in DD population. The two included studies represented nearly 1000 DD patients and 4000 controls. This was insufficient to draw strong conclusions on CV risk in DD but it is however not negligible. Another limitation is related to the publication bias. We cannot exclude that some investigations were not published because of insufficient interesting results or insufficient included patients. However, we searched relevant abstracts in European and American congresses, and trial registries, such as PROSPERO (international prospective register of systematic reviews), and found no other references.

Conclusion

DD patients have higher CV risk most likely due to a higher frequency of established independent CV risk factors including diabetes. This study does not provide evidence of a significant role of genetic factors or the country of origin of DD patients. The issue of CV risk evaluation, especially the search of diabetes, tobacco and alcohol use, should be more addressed in the management of DD patients during medical consultation. All cardiovascular risk factors should be assessed and targeted in DD patients, whatever the country they come from. This point is even more important as the incidence of DD is increasing [35].

Funding: This study did not receive any financial support.

Data Availability Statement:

Data are available from the corresponding author upon reasonable request.

Conflict of Interest: Authors declare no conflict of interest. Sylvain Mathieu has received personal fees from Bristol Myers Squibb, Pfizer, Abbvie, Novartis, Roche, Chugai, Merck, Sharp, and Dohme, Tilman but not related to the submitted work. Anne Tournadre has received personal fees from Abbvie, Lilly, Novartis, Fresenius-Kabi, Pfizer, Sanofi, Janssen, MSD, but not related to the submitted work. Other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Dibenedetti DB, Nguyen D, Zografos L, et al. Prevalence, incidence, and treatments of Dupuytren's disease in the United States: results from a population-based study. Hand (N Y) 6 (2011): 149-58.
2. Zerajic D, Finsen V. Dupuytren's disease in Bosnia and Herzegovina. An epidemiological study. BMC Musculoskelet Disord 5 (2004): 10.
3. Gudmundsson KG, Arngrimsson R, Sigfusson N, et al. Epidemiology of Dupuytren's disease: clinical, serological, and social assessment. The Reykjavik Study. J Clin Epidemiol 53 (2000): 291-6.
4. Turesson C, Kvist J, Krevers B. Experiences of men living with Dupuytren's disease-Consequences of the disease for hand function and daily activities. J Hand Ther 30 (2019).
5. Hindocha S. Risk Factors, Disease Associations, and Dupuytren Diathesis. Hand Clin 34 (2018): 307-314.
6. Calandruccio JH. Dupuytren contracture. In: Azar FM, Beaty JH, Canale ST, eds. Campbell's Operative Orthopaedics. St Louis, MO: Elsevier (2017): 3734-3749.
7. Rodrigues JN, Becker GW, Ball C, et al. Surgery for Dupuytren's contracture of the fingers. Cochrane Database Syst Rev 9 (2015): CD010143.
8. Grazina R, Teixeira S, Ramos R, et al. Dupuytren's disease: where do we stand? EFORT Open Rev 4 (2019): 63-69.
9. Larsen S, Krogsgaard DG, Aagaard Larsen L, et al. Genetic and environmental influences in Dupuytren's disease: a study of 30,330 Danish twin pairs. J Hand Surg Eur 40 (2015): 171-6.
10. Jónsson T, Gudmundsson KG, Bjarnadóttir K, et al. Association of HLA-DRB1*01 with Dupuytren's disease. Scand J Rheumatol 42 (2013): 45-7.
11. Broekstra DC, Groen H, Molenkamp S, et al. A Systematic Review and Meta-Analysis on the Strength and Consistency of the Associations between Dupuytren Disease and Diabetes Mellitus, Liver Disease, and Epilepsy. Plast Reconstr Surg 141 (2018): 367e-379e.
12. Godtfredsen NS, Lucht H, Prescott E, et al. A prospective study linked both alcohol and tobacco to Dupuytren's disease. J Clin Epidemiol 57 (2004): 858-63.
13. Riesmeijer S, Werker P, Nolte I. Ethnic differences in prevalence of Dupuytren disease can partly be explained by known genetic risk variants. Eur J Hum Genet 27 (2019): 1876-84.
14. Nunn A, Schreuder F. Dupuytren's contracture: emerging insight into a Viking disease. Hand Surg 19 (2014): 481-90.
15. Coulibaly N, Doumbia M, Dembele B, et al. Dupuytren's disease: a reality in Black Africa. Hand Surg Rehabil 39 (2020): 448-53.
16. Salari N, Heydari M, Hassanabadi M, et al. The worldwide prevalence of the Dupuytren disease : a comprehensive systematic review and meta-analysis. J Orthop Surg Res 15 (2020): 495.
17. Wells GA, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. Google Scholar (2017).
18. Ramchurn N, Mashamba C, Leitch E, et al. Upper limb musculoskeletal abnormalities and poor metabolic control in diabetes. Eur J Intern Med 20 (2009): 718-21.
19. Descatha A, Bodin J, Ha C, et al. Heavy manual work, exposure to vibration and Dupuytren's disease? Results of a surveillance program for musculoskeletal disorders. Occup Environ Med 69 (2012): 296-9.
20. Haines A, Levis C, Goldsmith CH, et al. Dupuytren's contracture and handwork: A case-control study. Am J Ind Med 60 (2017): 724-733.
21. Van den Berge B, Wiberg A, Werker P, et al. Dupuytren's disease is a work-related disorder: results of a population-

based cohort study. Occup Environ Med 80 (2023): 137-145.

22. Shih B, Bayat A. Scientific understanding and clinical management of Dupuytren disease. Nat Rev Rheumatol 6 (2010): 715-26.

23. Eurobarometre. https://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_429_sum_en.pdf

24. Mortensen MB, Nordestgaard BG, Afzal S, et al. ACC/AHA guidelines superior to ESC/EAS guidelines for primary prevention with statins in non-diabetic Europeans: the Copenhagen General Population Study. Eur Heart J 38 (2017): 586-594.

25. Lloyd-Jones DM, Braun LT, Ndumele CE, et al. Use of Risk Assessment Tools to Guide Decision-Making in the Primary Prevention of Atherosclerotic Cardiovascular Disease: A Special Report from the American Heart Association and American College of Cardiology. J Am Coll Cardiol 73 (2019): 3153-3167.

26. Mortensen MB, Nordestgaard BG. 2019 vs. 2016 ESC/EAS statin guidelines for primary prevention of atherosclerotic cardiovascular disease. Eur Heart J (2020).

27. Grundy SM, Stone NJ. Guideline Writing Committee for the 2018 Cholesterol Guidelines. 2018 Cholesterol Clinical Practice Guidelines: Synopsis of the 2018 American Heart Association/American College of Cardiology/Multisociety Cholesterol Guideline. Ann Intern Med 170 (2019): 779-783.

28. Dell'Oro R, Maloberti A, Nicoli F, et al. Long-term Saxagliptin Treatment Improves Endothelial Function but not Pulse Wave Velocity and Intima-Media Thickness in Type 2 Diabetic Patients. High Blood Press Cardiovasc Prev 24 (2017): 393-400.

29. Kajikawa M, Maruhashi T, Hidaka T, et al. Effect of Saxagliptin on Endothelial Function in Patients with Type 2 Diabetes: A Prospective Multicenter Study. Sci Rep 9 (2019):10206.

30. Moreno B, de Faria AP, Ritter AMV, et al. Glycated hemoglobin correlates with arterial stiffness and endothelial dysfunction in patients with resistant hypertension and uncontrolled diabetes mellitus. J Clin Hypertens (Greenwich) 20 (2018): 910-917.

31. Ganesan S, Tantone R, Komatsu D, et al. The prevalence of Dupuytren's disease in patients with diabetes mellitus. Commun Med (Lond) 3 (2023): 96.

32. Kang Y, Stewart M, Patel M, et al. Modifiable risk factors for prevention in Dupuytren's disease: A UK biobank case-control study. Plast Reconstr Surg (2023).

33. Rehm J, Roerecke M. Cardiovascular effects of alcohol consumption. Trends Cardiovascular Med 27 (2017): 534-8.

34. Chiva-Blanch G, Badimon L. Benefits and Risks of Moderate Alcohol Consumption on Cardiovascular Disease: Current Findings and Controversies. Nutrients 30 (2019): 12.

35. Broekstra D, Kuo R, Burn E, et al. Dupuytren disease: prevalence, incidence, and lifetime risk of surgical intervention. A population-based cohort analysis. Plast Reconstr Surg 151 (2023): 581-591.

36. Agrawal R, Gothwal S, Tantia P, et al. Prevalence of rheumatologic manifestations in diabetic population from North-West India. J Assoc Pysicians India 62 (2014): 788-92.

37. Akyol A, Kiylioglu N, Copcu E, et al. Is diabetes mellitus type 2 a risk factor for Dupuytren's contracture in the Mediterranean region? Plast Reconstr Surg 117 (2006): 2105-6.

38. Ardic F, Soyupek F, Kahraman Y, et al. The musculoskeletal complications seen in type II diabetics: Predominance of hand involvement. Clin Rheumatol 22 (2003): 229-233.

39. Arkkila PE, Koskinen PJ, Kantola IM, et al. Dupuytren's disease in type I diabetic subjects: investigation of biochemical markers of type III and I collagen. Clin Exp Rheumatol 18 (2000): 215-9.

40. Aydeniz A, Gursoy S, Guney E. Which musculoskeletal complications are most frequently seen in type 2 diabetes mellitus? J Int Med Res 36 (2008): 505-511.

41. Bergaoui N, Dibej K, el May M. Association of cheiroarthropathy and Dupuytren's disease in diabetes mellitus. Rev Rhum Mal Osteoartic 58 (1991): 179-81.

42. Bergenudd H, Lindgärde F, Nilsson B. Prevaence of Dupuytren's contracture and its correlation with degenerative changes of the hands end feet and with criteria of general health. J Hand Surg 18B (2013): 254-7.

43. Bhavsar S, Nimigan A, Hackam DG, et al. Keloid scarring, but not Dupuytren's contracture, is associated with unexplained carotid atherosclerosis. Clin Invest Med 32 (2009): E95-102.

44. Bradlow A, Mowat AG. Dupuytren's contracture and alcohol. Ann Rheum Dis 45 (1986): 304-7.

45. Lucas G, Brichet A, Cazenave N, et al. La maladie de Dupuytren est principalement d'origine professionnelle. Arch Mal Prof Med Trav 63 (2002): 495.

46. Burke FD, Proud G, Lawson IJ, et al. An assessment of the effects of exposure to vibration, smoking, alcohol and diabetes on the prevalence of Dupuytren's disease in 97,537 miners. J Hand Surg Eur 32 (2007): 400-6.

47. Cagliero E, Apruzzese W, Perlmutter GS, et al.

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

Musculoskeletal disorders of the hand and shoulder in patients with diabetes mellitus. Am J Med 112 (2002): 487-90.

48. Carvallo A, Ordonez ME, Garcia H, et al. Adult non-insulin-dependent diabetic: limitation of articular mobility and soft tissue involvement. Rev Med Chil 119 (1991): 1016-21.

49. Cederlund RI, Thomsen N, Thrainsdottir S, et al. Hand disorders, hand function, and activities of daily living in elderly men with type 2 diabetes. J Diabetes Complications 23 (2009): 32-39.

50. Chammas M, Bousquet P, Renard E, et al. Dupuytren's disease, carpal tunnel syndrome, trigger finger, and diabetes mellitus. J Hand Surg Am 20 (1995): 109-14.

51. Degreef I, Steeno P, De Smet L. A survey of clinical manifestations and risk factors in women with Dupuytren's disease. Acta Orthop Belg 74 (2008): 456-60.

52. Degreef I. Comorbidity in Dupuytren disease. Acta Orthop Belg 82 (2016): 643-648.

53. Descatha A, Carton M, Mediouni Z, et al. Association among work exposure, alcohol intake, smoking and Dupuytren's disease in a large cohort study (GAZEL). BMJ Open 4 (2014): e004214.

54. Deshpande G, Muthhadotti G. Clinical profile of rheumatological manifestations in type 2 diabetes mellitus. Indian J Endocrinol Metab 21 (2017): S17-S18.

55. Eadington DW, Patrick AW, Collier A, et al. Limited joint mobility, Dupuytren's contracture and retinopathy in type 1 diabetes: association with cigarette smoking. Diabet Med 6 (1989): 152-7.

56. Eadington DW, Patrick AW, Frier BM. Association between connective tissue changes and smoking habit in type 2 diabetes and in non-diabetic humans. Diabetes Res Clin Pract 11 (1991): 121-5.

57. Gamstedt A, Holm-Glad J, Ohlson C, et al. Hand abnormalities are strongly associated with the duration of diabetes mellitus. J Intern Med 234 (1993): 189-93.

58. Gebereegziabher A, Baraki A, Kebede Y, et al. Dupuytren's contracture in Ethiopia. J Hand Surg Eur 42 (2017): 26-28.

59. Geoghegan JM, Forbes J, Clark DI, et al. Dupuytren's disease risk factors. J Hand Surg Br 29 (2004): 423-6.

60. Gudmundsson KG, Arngrímsson R, Sigfússon N, et al. Increased total mortality and cancer mortality in men with Dupuytren's disease: a 15-year follow-up study. J Clin Epidemiol 55 (2002): 5-10.

61. Gunther O, Miosga R. Dupuytren's contracture as a late complication of diabetes. Z Gesamte Inn Med Sep 27 (1972): 777-82.

62. Gutefeldt K, Hedman C, Thyberg I, et al. Upper extremity impairments in type 1 diabetes with long duration; common problems with great impact on daily life. Disabil Rehabil 41 (2019): 633-40.

63. Hacquebord JH, Chiu VY, Harness NG. The Risk of Dupuytren Diagnosis in Obese Individuals. J Hand Surg Am 42 (2017): 149-155.

64. Heathcote J, Cote H, Noble J. Dupuytren's disease and diabetes mellitus. Lancet 1 (1981): 1420.

65. Henao-Ruiz J, Ospina Vargas D, Idarraga Lopez D, et al. Dupuytren's contracture. Study of 33 cases in Colombia. Rev Colomb Reumatol 26 (2019): 140-4.

66. Hnanicek J, Cimburova M, Putova I, et al. Lack of association of iron metabolism and Dupuytren's disease. J Eur Acad Dermatol Venereol 22 (2008): 476-80.

67. Hou WH, Li CY, Chen LH, et al. Prevalence of hand syndromes among patients with diabetes mellitus in Taiwan: A population-based study. J Diabetes 9 (2017): 622-627.

68. Hou WH, Li CY, Chen LH, et al. Medical claims-based case-control study of temporal relationship between clinical visits for hand syndromes and subsequent diabetes diagnosis: Implications for identifying patients with undiagnosed type 2 diabetes mellitus. BMJ Open 6 (2016): 10.

69. Kalsoom A. Iftikhar S, Islam F, et al. Epidemiology of Dupuytren's and Sociodemographic Factors Related to it Among Chronic Diabetic Patients. Pak J Med Health Sci 17 (2023): 20-3.

70. Kidwai SS, Wahid L, Siddiqi S, et al. Upper limb musculoskeletal abnormalities in type 2 diabetic patients in low socioeconomic strata in Pakistan. BMC Res Notes 6 (2016): 16.

71. Kovacs D, Demian L, Babes A. Prevalence and risk of Dupuytren disease in patients with diabetes versus non-diabetic patients. Rom J Diabetes Nutr Metab Dis 19 (2012): 373-380.

72. Kumari N, Usmani F. An observational assessment of the most common rheumatological manifestations in patients with type 2 diabetes. Eur J Mol Clin Med 7 (2020): 9028-33.

73. Kuo R, Prieto-Alhambra D, Furniss D. Dupuytren Disease Predicts Increased Cancer and Cardiovascular Mortality: A Large Study in Primary Care in the United Kingdom. Hand 11 (2016).

74. Larkin JG, Frier BM. Limited joint mobility and

Dupuytren's contracture in diabetic, hypertensive, and normal populations. Br Med J (Clin Res Ed) 292 (1986): 1494.

75. Larkin ME, Barnie A, Braffett BH, et al. Musculoskeletal complications in type 1 diabetes. Diabetes Care 37 (2014): 1863-9.

76. Lee KH, Kim JH, Lee CH, et al. The Epidemiology of Dupuytren's Disease in Korea: a Nationwide Population-based Study. J Korean Med Sci 33 (2018): e204.

77. Loos B, Puschkin V, Horch RE. 50 years experience with Dupuytren's contracture in the Erlangen University Hospital--a retrospective analysis of 2919 operated hands from 1956 to 2006. BMC Musculoskelet Disord 8 (2007): 60.

78. Lucas G, Brichet A, Roquelaure Y, et al. Dupuytren's disease: personal factors and occupational exposure. Am J Ind Med 51 (2008): 9-15.

79. Macaulay D, Ivanova J, Birnbaum H, et al. Direct and indirect costs associated with Dupuytren's contracture. J Med Econ 15 (2012): 664-71.

80. Majjad A, Errahali Y, Toufik H, et al. Musculoskeletal Disorders in Patients with Diabetes Mellitus: A Cross-Sectional Study. Intl. J. Rheumatol 2018 (2018): 1687.

81. Mansur HG, Oliveira ER, Goncalves CB. Epidemiological analysis of patients with Dupuytren's disease. Rev Bras Ortop 53 (2017): 10-14.

82. Mikkelsen OA1, Høyeraal HM, Sandvik L. Increased mortality in Dupuytren's disease. J Hand Surg Br 24 (1999): 515-8.

83. Mohammed Y, Zainel A, Wahab S. Musculoskeletal hand manifestations in patients with diabetes mellitus. Indian J Public Health Res Dev 10 (2019): 4992-7.

84. Morelli I, Fraschini G, Banfi A. Dupuytren's disease: Predicting factors and associated conditions. A single center questionnaire-based case- control study. Arch Bone Jt Surg 5 (2017): 384-91.

85. Mouanaa H, Jguirim M, Arfa A, et al. Dupuytren's contracture: 15 years of experience with 36 cases. Abstract EULAR 2017. Ann Rheum Dis (2017).

86. Mustafa K, Khader Y, Bsoul A, et al. Musculoskeletal disorders of the hand in type 2 diabetes mellitus: prevalence and its associated factors. Int J Rheum Dis 19 (2016): 730-5.

87. Noble J, Heathcote JG, Cohen H. Diabetes mellitus in the aetiology of Dupuytren's disease. J Bone Joint Surg Br 66 (1984): 322-5.

88. Ouedraogo D, Tieno H, Ouedraogo L, et al. Rheumatologic manifestations in Black African patients affected by diabetes mellitus. Med Mal Metab 3 (2009): 520-3.

89. Pal B, Griffiths ID, Anderson J, et al. Association of limited joint mobility with Dupuytren's contracture in diabetes mellitus. J Rheumatol 14 (1987): 582-5.

90. Picard S, Vasilevski D, Fagherazzi G. Distribution of highly prevalent musculoskeletal disorders and their association with diabetes complications in a population of 140 individuals with type 1 diabetes: A retrospective study in a French diabetes center. Clin Diabetes 38 (2020): 181-7.

91. Raje Y, Cracknell G, Davoren P. Frequency of hand and shoulder symptoms in patients with Type 1 diabetes. Diabet Med 32 (2015): 968-71.

92. Rabinowitz JL, Ostermann L Jr, Bora FW, et al. Lipid composition and de novo lipid biosynthesis of human palmar fat in Dupuytren's disease. Lipids 18 (1983): 371-4.

93. Ravid M, Dinai Y, Sohar E. Dupuytren's disease in diabetes mellitus. Acta Diabetol Lat 14 (1977): 170-4.

94. Ravindran Rajendran S, Bhansali A, Walia R, et al. Prevalence and pattern of hand soft-tissue changes in type 2 diabetes mellitus. Diabetes Metab 37 (2011): 312-7.

95. Rebelo JS, Ferreira JB, Vilao MC, et al. Dupuytren's disease. Analysisof a 10 year caseload. Acta Med Port 5 (1992): 463-6.

96. Redmond CL. Bain GI, Laslett LL, et al. Hand syndromes associated with diabetes: Impairments and obesity predict disability. J Rheumatol 36 (2009): 2766-71.

97. Renard E, Jacques D, Chammas M, et al. Increased prevalence of soft tissue hand lesions in type 1 and type 2 diabetes mellitus: various entities and associated significance. Diabete Metab 20 (1994): 513-21.

98. Ruiz JE, Vargas DO, Lopez DA, et al. Dupuytren's contracture. Study of 33 cases in Colombia. Rev Colomb Reumatol 26 (2019): 140-144.

99. Sanderson PL, Morris MA, Stanley JK, et al. Lipids and Dupuytren's disease. J Bone Joint Surg Br 74 (1992): 923-7.

100. Sasaki N, Uesato R, Yamauchi T, et al. Epidemiology of Dupuytren's Disease in Japanese General Population. J Hand Surg Asian Pac 26 (2021): 229.

101. Savaş S, Köroğlu BK, Koyuncuoğlu HR, et al. The effects of the diabetes related soft tissue hand lesions and the reduced hand strength on functional disability of hand in type 2 diabetic patients. Diabetes Res Clin Pract 77 (2007): 77-83.

102. Spring M, Fleck H, Cohen BD. Dupuytren's contracture. Warning of diabetes? N Y State J Med 70 (1970): 1037-41.

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

103. Stradner F, Ulreich A, Pfeiffer K. Dupuytren's plamar contraction as an attendant disease of diabetes mellitus. Wien Med Wochenschr 137 (1987): 89-92.

104. Tajika T, Kobayashi T, Kaneko T, et al. Epidemiological study for personal risk factors and quality of life related to Dupuytren's disease in a mountain village of Japan. J Orthop Sci 19 (2014): 64-70.

105. Toufik H, Ghassem M, Djossou J, et al. Musculoskeletal disorders in type 1 and 2 diabetic patients: Prevalence and association with microvascular complications of diabete. Ann Rheum Dis 78 (2019): 540.

106. Vitry G, Alland A, Galindo A, et al. Diabetes and Dupuytren's disease. Evolutive study of the connective tissue. Rev Fr Endocrinol Clin Nutr Metab 20 (1979): 91-9.

107. Weinstein AL, Haddock NT, Sharma S. Dupuytren's disease in the Hispanic population: a 10-year retrospective review. Plast Reconstr Surg 128 (2011): 1251-6.

108. Wilbrand S, Ekbom A, Gerdin B. A cohort study linked increased mortality in patients treated surgically for Dupuytren's contracture. J Clin Epidemiol 58 (2005): 68-74.

109. Yeh CC, Huang KF, Ho CH, et al. Epidemiological profile of Dupuytren's disease in Taiwan (Ethnic Chinese): a nationwide population-based study. BMC Musculoskelet Disord 16 (2015): 20.

110. Youssef A, Shabana A, Senna M, et al. Musculoskeletal manifestations of diabetes mellitus in a cohort of Egyptians. Ann Rheum Dis 74 (2015): 1004-5.

111. Zabihiyeganeh M, Ghorbanpoor S, Jahed A, et al. Frequency of upper limb musculoskeletal manifestations in 188 type 2 diabetic patients, referring to diabetes clinic of Firouzgar hospital 2011. J Babol Univ Med Sci 16 (2014): 90-105.

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

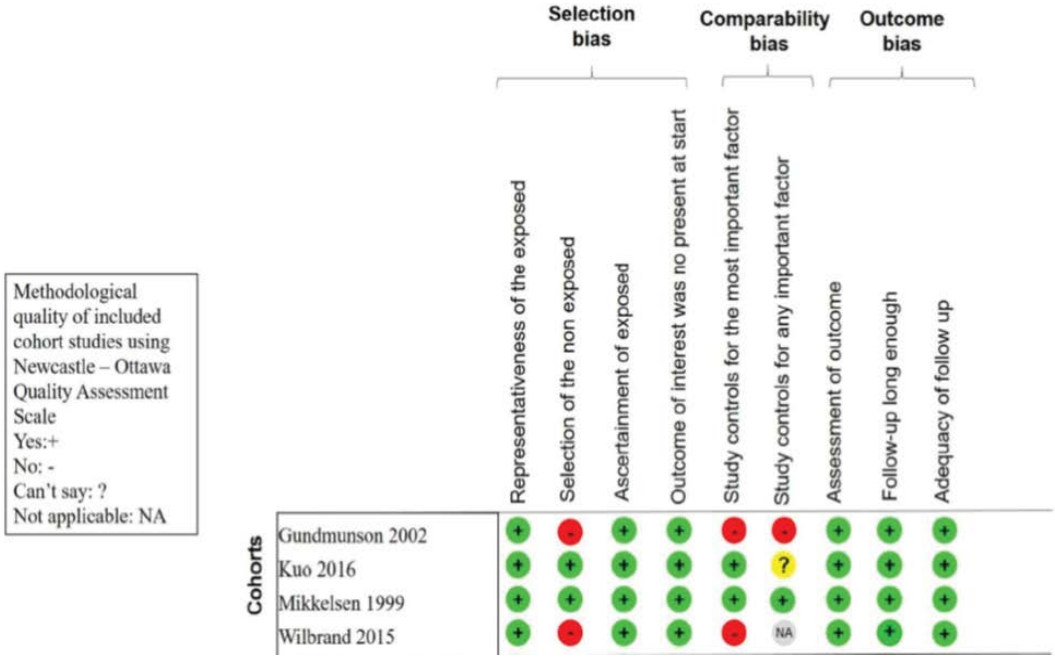
SUPPLEMENTARY FILES

Table 1: Characteristics of the included publications.

Authors	Reference	Number of participants			Outcome measures for meta-analysis
		Total	DD patients	Controls	
Agrawal	J Associ Physicians Ind 2014 [36]	5732	415	5317	Diabetes
Akyol	2006 [37]	628	14	614	Diabetes
Ardic	Clin Rheum 2003 [38]	115	18	97	Diabetes
Arkkila	Clin Exp Rheum 2000 [39]	28	9	19	Age
Aydeniz	J Int Med Res 2008 [40]	203	17	186	Diabetes
Bergaoui	Rev Rhum Mal Osteoartic 1991 [41]	380	37	343	Diabetes
Bergenuud	J Hand Surg 1993 [42]	574	36	538	Gender
Bhavsar	Clin Invest Med 2016 [43]	1736	57	1679	Gender, diabetes, age
Bradlow	ARD 1986 [44]	153	64	89	Gender, alcohol
Brichet. Lucas	Arch. Mal. Prof. Med. Trav 2002 [45]	3025	216	2809	Diabetes
Burke	J Hand Surg Eur Vol. 2007 [46]	7935	7935	0	Smoking, alcohol, diabetes
Cagliero	Am J Med 2002 [47]	300	35	265	Diabetes
Carvallo	Rev Med Chil 1991. Abstract [48]	200	31	169	Diabetes
Cederlung	J Diab Compl 2009 [49]	58	14	44	Diabetes
Chammas	J Hand Surg 1995 [50]	240	49	191	Diabetes
Degreef	Acta Orthop Belg 2016 [51]	3625	725	2900	CV death
Degreef	Acta Orthop Belg 2008 [52]	65	65	0	Gender, smoking, alcohol, dyslipidemia, diabetes
Descatha	BMJ Open 2014 [53]	839	839	0	Smoking, alcohol, diabetes
Deshpande	Indian J Endocrinol Metab 2017. Abstract [54]	333	17	316	Diabetes
Eadington	Diab Res 1991 [55]	370	78	292	Diabetes
Eadington	Diabet Med. 1989 [56]	416	122	294	Diabetes
Gamstedt	J Intern Med 1993 [57]	100	16	84	Diabetes
Gebereegziabher	J Hand Surg Eur Vol 2017 [58]	150	75	75	Gender, smoking, alcohol, dyslipidemia, hypertension
Geoghegan	J Hand Surg Br. 2004 [59]	2463	821	1642	Diabetes, BMI
Godtfredsen	[12]	7254	772	6482	Gender, smoking, alcohol
Gudmunson	[3] and JCE 2002 [60]	1297	249	1048	Age, gender, smoking, death, CV death
Gunther	1972 [61]	2000	123	1877	Diabetes
Gutefeldt	Disabil Rehabil 2019 [62]	1481	266	1215	Diabetes
Hacquebord	J Hand Surg 2017 [63]	2E+06	14844	2E+06	Gender, age, diabetes, BMI
Heathcote	1981 [64]	546	86	460	Diabetes
Henao Ruiz	Rev Colomb Reumatol 2019 Abstract [65]	33	33	0	Diabetes
Hnanicek	JEADV 2018 [66]	123	90	33	Age, gender, alcohol
Hou	J Diab 2017 [67]	114186	4	114182	Diabetes
Hou	BMJ Open 2016 [68]	201348	33	201315	Diabetes
Kalsoom	Pak J Med Health Sci 2023 [69]	424	38	386	Gender, smoking
Kidwai	BMC Res Notes 2013 [70]	413	2	411	Diabetes
Kovacs	Rom J Diabetes Nutr Metab Dis. 2012;19:373–380 [71]	384	83	301	Diabetes
Kumari	Eur J Mol Clin Med 2020. Abstract [72]	120	2	118	Diabetes
Kuo	Hand [73]	253152	42192	210960	Death
Larkin	Br Med J (Clin Res Ed). 1986 [74]	382	101	281	Diabetes
Larkin	Diabetes Care 2014 [75]	1217	105	1112	Diabetes
Lee	JKMS 2018 [76]	16630	16630	0	Hypertension, dyslipidemia, diabetes
Loos	BMC Musc Dis 2007 [77]	2919	2919	0	Gender, diabetes
Lucas	Am J Industr Med 2008 [78]	2406	212	2194	Age, alcohol, diabetes
Macaulay	J Med Econ 2012 [79]	2812	1406	1406	Diabetes
Majjad	Int J Rheumatol 2018 [80]	376	2	374	Diabetes
Mansur	RBO 2018 [81]	58	58	0	Gender, smoking, alcohol, hypertension, dyslipidemia, diabetes
Mikkelsen	J Hand Surg 1999 [82]	852	426	426	Death

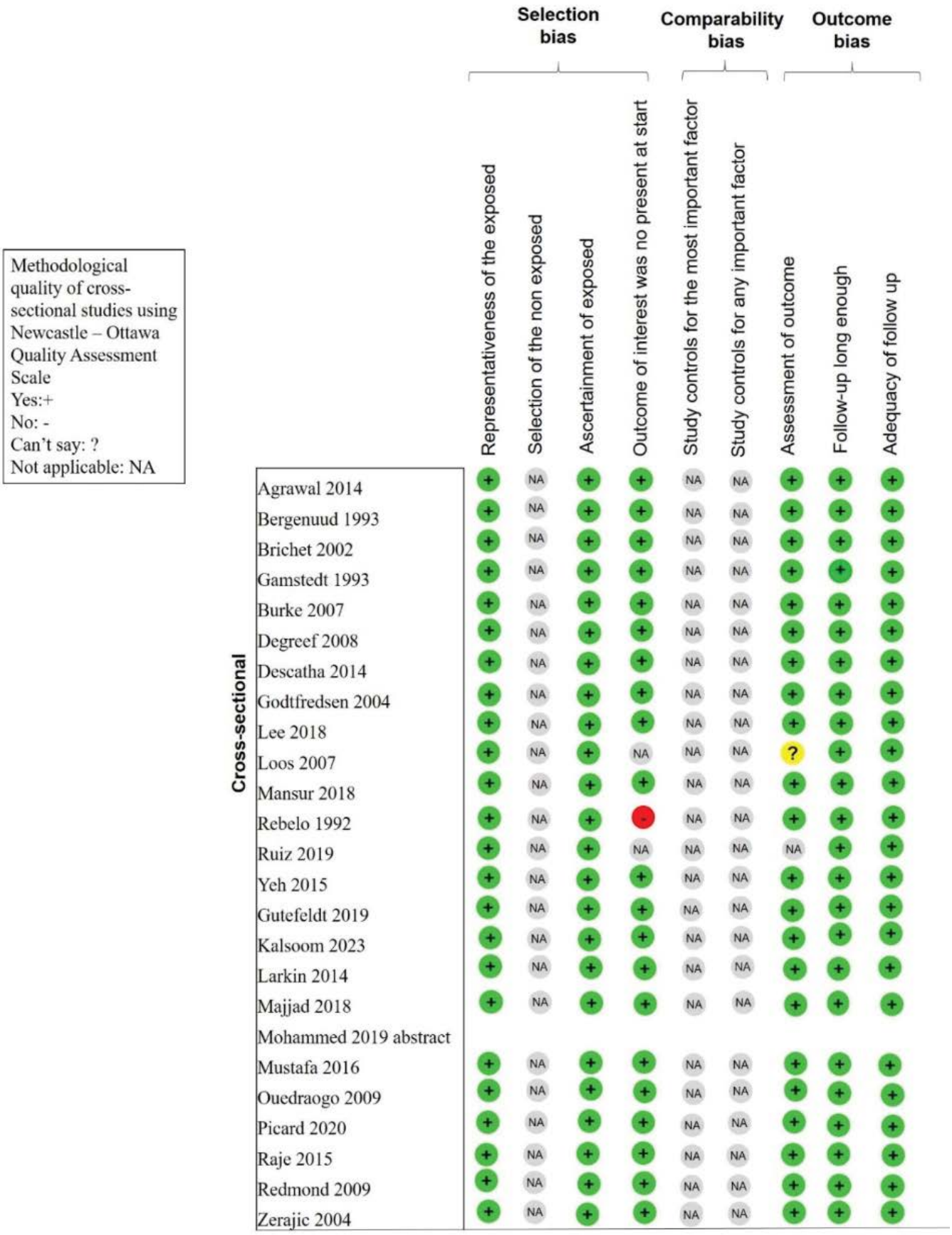
Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405

Mohammed	Indian J Public Health Res Dev 2019 [83]	505	43	462	Diabetes
Morelli	Arch Bone Jt Surg 2017 [84]	163	59	104	Gender, smoking, alcohol
Mouanaa	Abstract EULAR 2017 [85]	36	36	0	Smoking, alcohol, hypertension, diabetes
Mustafa	Int J Rheum Dis 2012 [86]	1000	186	814	Gender, smoking, alcohol, dyslipidemia
Noble	J Bone J Surg 1984 [87]	300	92	218	Diabetes
Ouedraogo	Med Mal Metabol 2009 [88]	660	1	659	Diabetes
Pal	J Rheum 1987 [89]	184	28	156	Diabetes
Picard	Clin Diabetes 2020 [90]	140	4	136	Diabetes
Raje	Diabet Med 2015 [91]	210	11	199	Diabetes
Ravid	Acta Diabetol Lat. 1977;14:170–174. [92]	2355	178	2177	Diabetes
Ravindran	Diab Met 2011 [93]	818	292	526	Diabetes
Rabinowitz	Lipids 1983 [94]	90	72	18	Dyslipidemia
Rebelo	Acta Medica Portuguese 1992 [95]	110	110	0	Gender, alcohol, diabetes
Redmond	J Rheum 2009 [96]	60	16	44	Gender
Renard	Diabete Med 1994 [97]	240	59	181	Diabetes
Ruiz	Rev Colomb Reumatol 2019 [98]	33	33	0	Smoking, hypertension, dyslipidemia, diabetes
Sanderson	Lipids 1992 [99]	85	51	34	Dyslipidemia
Sasaki	J Hand Surg Asian Pac Vol 2021 [100]	1123	44	1079	Gender
Savas	Diab ResClin Pract 2007 [101]	104	13	91	Diabetes
Spring	1970 [102]	900	110	790	Diabetes
Stradner	Wien. Med. Wochenschr 1987. Abstract [103]	100	42	58	Diabetes
Tajika	J Orthop Sci 2014 [104]	401	28	373	Age, gender, smoking, alcohol, diabetes
Toufik	Ann Rheum Dis 2019. Abstract [105]	376	2	374	Diabetes
Vitry	Rev. Fr. Endocrinol. Clin. Nutr. Metab. 1979. Abstract [106]	320	122	198	Diabetes
Weinstein	Plast Reconstr Surg 2011 [107]	2349	2349	0	Smoking, alcohol, hypertension, dyslipidemia
Wilbrand	JCE 2005 [108]	16517	16517	0	Gender, death
Yeh	BMC Musculo Dis 2015 [109]	1078	1078	0	Gender, alcohol, hypertension, dyslipidemia, diabetes
Youssef	Ann Rheum Dis 2015 Abstract [110]	200	1	199	Diabetes
Zabihiyeganeh	J Babol Univ Med Sci 2014. Abstract [111]	188	38	150	Diabetes
Zerajic	BMC Musculoskelet Disord [2]	1204	304	900	Gender, diabetes



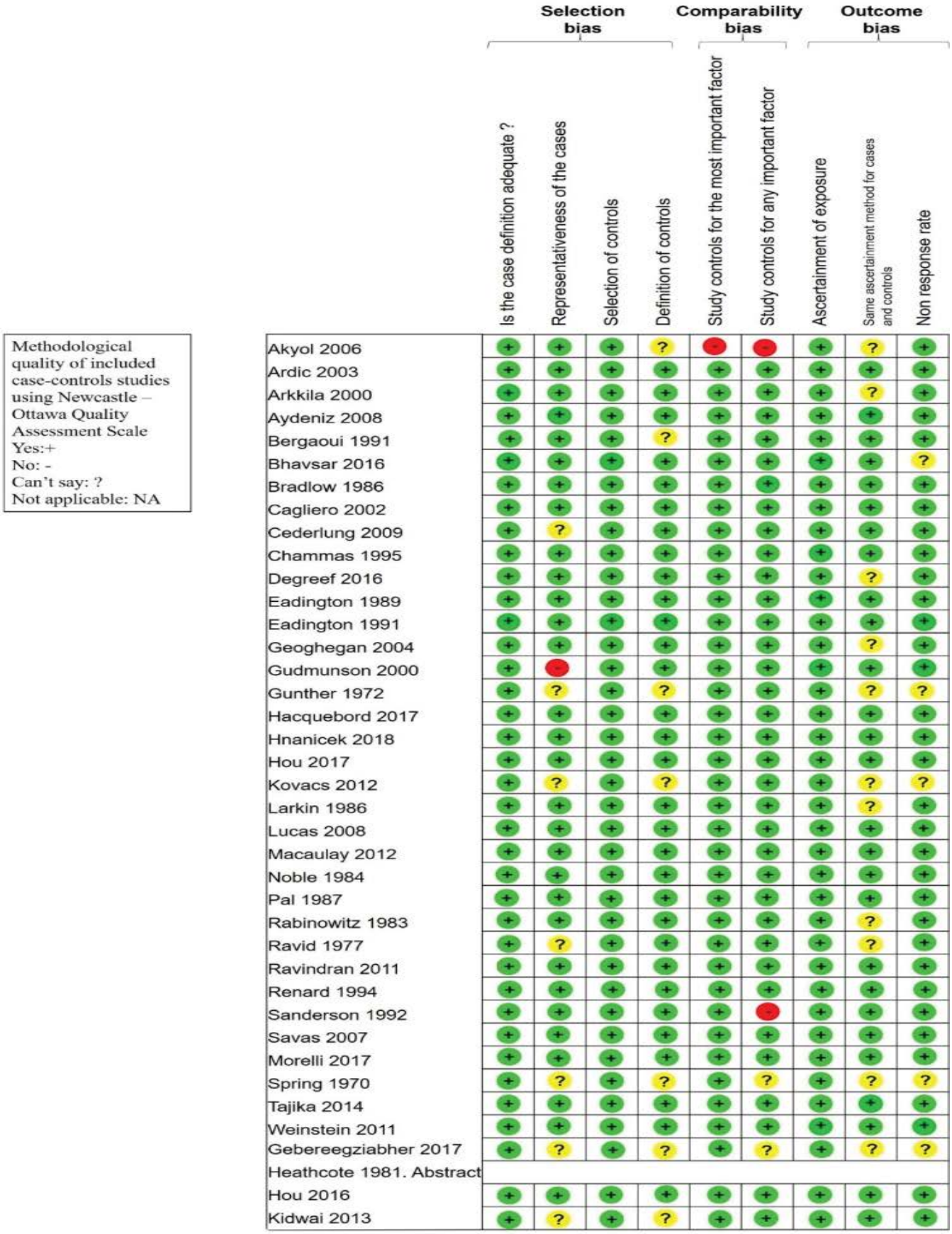
Supplementary Figure 1: Quality of cohort studies.

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405



Supplementary Figure 2: Quality of cross-sectional studies.

Mayana SK, et al., Cardiol Cardiovasc Med 2024
DOI:10.26502/fccm.92920405



Supplementary Figure 3: Quality of case-controls studies.