

Sarcopenia in Systemic Sclerosis: Prevalence and Impact - A Systematic Review

and Meta-analysis

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Table S1 Search strategy by Medline via Ovid SP

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1. exp Scleroderma, Systemic/
 2. ((Systemic or general* or diffus* or progress* or Limit*) adj3 sclerosis).mp.
 3. scleroderm*.tw.
 4. SSc.tw.
 5. 1 or 2 or 3 or 4
 6. exp muscular atrophy/
 7. (sarcopen* or myopen* or dynapon* or amyotroph* or myoatroph* or myophagis* or myodegenerat*).mp.
 8. ((muscle or muscular) adj5 (atroph* or wast* or weak* or loss* or mass or degenerat*)).ti,ab.
 9. 6 or 7 or 8
 10. 5 and 9
 11. exp animals/ not humans.sh.
 12. 10 not 11
-

Table S2 Search strategy by Embase via Ovid SP

-
1. exp systemic sclerosis/
 2. ((Systemic or general* or diffus* or progress* or Limit*) adj3 sclerosis).mp.
 3. scleroderm*.tw.
 4. SSc.tw.
 5. 1 or 2 or 3 or 4
 6. exp muscle atrophy/
 7. (sarcopen* or myopen* or dynapon* or amyotroph* or myoatroph* or myophagis* or myodegenerat*).mp.
 8. ((muscle or muscular) adj5 (atroph* or wast* or weak* or loss* or mass or degenerat*)).ti,ab.
 9. 6 or 7 or 8
 10. 5 and 9
 11. exp animal/
 12. human/
 13. 11 not 12
 14. 10 not 13
-

Table S3 Search strategy by Web of Science

Topic= (((Systemic or general* or diffus* or progress* or Limit*) near/3 sclerosis)
or sclerodem or ssc) and (sarcopen* or myopen* or dynapon* or amyotroph* or
myoatroph* or myophagis* or myodegenerat* or ((muscle or muscular) near/5
(atroph* or wast* or weak* or loss* or mass or degenerat*)))

Table S4 Search strategy by Cochrane Central Register of Controlled Trials via

Ovid SP

-
1. exp Scleroderma, Systemic/
 2. ((Systemic or general* or diffus* or progress* or Limit*) adj3 sclerosis).mp.
 3. scleroderm*.tw.
 4. SSc.tw.
 5. 1 or 2 or 3 or 4
 6. exp muscular atrophy/
 7. (sarcopen* or myopen* or dynapon* or amyotroph* or myoatroph* or myophagis* or myodegenerat*).mp.
 8. ((muscle or muscular) adj5 (atroph* or wast* or weak* or loss* or mass or degenerat*)).ti,ab.
 9. 6 or 7 or 8
 10. 5 and 9
-

Table S5 The reasons for the exclusion of full-text articles

Study	Reason for the exclusion
Norman (2014)	Repeated study
Siebert (2014)	Repeated study
Caimmi (2017)	Repeated study
March (2017)	Repeated study
Doerfler (2017)	Intervention study
Paolino (2018)	Repeated study
Radic (2018)	Not reported sarcopenia prevalence data in SSc patients
Remolina (2019)	Repeated study
Sari (2019)	Repeated study
Veronica (2019)	Repeated study
Hax (2020)	Repeated study
Santo (2020)	Repeated study
Sangaroon (2020)	Repeated study
Peterson (2020)	Not reported sarcopenia prevalence data in SSc patients
Efremova (2021)	Repeated study
Sorokina (2022)	Not reported sarcopenia prevalence data in SSc patients

Table S6 Characteristics of the included studies

First author and year	Country	Study design	Sample size	Mean age(years)	Female, n	Disease subtype	Disease duration (years)	SSc diagnostic criteria	Sarcopenia diagnostic criteria	Criteria (assessment method of detecting sarcopenia)	Prevalence of sarcopenia	
											Total,n(%)	Diffuse,n(%)
Caimmi (2018)	Italy	Cross-sectional study	140	64	118	limited 97 diffuse 43	12.8	2013 ACR/EULAR	SMI	LMM (DXA)	29(20.7%)	11(7.9%)
Siebert (2018)	Germany	Cross-sectional study	129	60	118	-	7	2013 ACR/EULAR	EWGSOP (2010)	LMM (BIA) LMS (HGS)	29(22.5%)	-
Corallo (2019)	Italy	Cross-sectional study	62	62	54	limited 50 diffuse 12	8	2013 ACR/EULAR	EWGSOP (2010)	LMM (DXA)	26(42%)	4(6.4%)
Rincon (2019)	Argentina	Cross-sectional study	27	52.5	20	limited 16 diffuse 11	7.8	2013 ACR/EULAR	EWGSOP (2010)	LMM (DXA) LMS (HGS) LPP (4mGS)	9(33.3%)	3(11.1%)
Paolino (2020)	Italy	Retrospective cohort study	43	64.1	36	-	10.2	2013 ACR/EULAR	EWGSOP (2010)	LMM (DXA)	10(23.3%)	-
Hax (2021)	Brazil	Cross-sectional study	94	60.5	87	-	12.5	2013 ACR/EULAR	EWGSOP (2019)	LMM (DXA) LMS (HGS) LPP (SPPB)	15(15.9%)	-
Sari (2021)	Turkey	Cross-sectional	93	52.6	86	-	10.7	1980ACR	EWGSOP	LMM (BIA)	10(10.7%)	-

First author and year	Country	Study design	Sample size	Mean age(years)	Female, n	Disease subtype	Disease duration (years)	SSc diagnostic criteria	Sarcopenia diagnostic criteria	Criteria (assessment method of detecting sarcopenia)	Prevalence of sarcopenia	
											Total,n(%)	Diffuse,n(%)
Efremova (2022)	Russia	Cross-sectional study	47	53.9	47	limited 29 diffuse 18	6	2013 ACR/EULAR	(2010)	LMS (HGS)	10(21.3%)	6(12.8%)
										LMM (DXA)		
									EWGSOP (2019)	LMS (HGS and Chair rising test)		
Sangaroon (2022)	Thailand	Cross-sectional study	180	58.8	119	limited 86 diffuse 94	6.2	-		LPP (GS and SPPB)	41(22.8%)	30(16.7%)
									AWGS (2019)	LMM(DXA)		
										LMS(HGS) LPP(GS)		

ACR, American College of Rheumatology; EULAR, European League against Rheumatology classification criteria; SMI, Skeletal Muscle Mass Index; EWGSOP, European Working Group on Sarcopenia in Old People; HGS, hand grip strength; 4mGS, 4 m gait speed; SPPB, Short Physical Performance Battery; GS, gait speed; AWGS, Asian Working Group for Sarcopenia.

Table S7 ARHQ Methodology Checklist for Cross-Sectional Study

Study	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Total Score
Caimmi (2018)	Yes	Yes	Yes	Yes	Unclear	Yes	No	No	Unclear	Yes	No	6
Siegert (2018)	Yes	Yes	Unclear	Yes	Unclear	Yes	No	No	No	Yes	No	5
Corallo (2019)	Yes	Yes	Yes	Yes	Unclear	Yes	No	No	No	Yes	No	6
Rincon (2019)	Yes	Yes	Unclear	Unclear	Unclear	Yes	No	No	No	Yes	No	4
Hax (2021)	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	No	Yes	Yes	No	8
Sari (2021)	Yes	Yes	Yes	Yes	Unclear	Yes	No	No	No	Yes	No	6
Efremova (2022)	Unclear	Yes	Unclear	Unclear	Unclear	Yes	No	No	No	Yes	No	3
Sangaroon (2022)	Yes	Yes	Yes	Yes	Unclear	Yes	No	No	No	Yes	No	6

Item 1. Define the source of information (survey, record review)

Item 2. List inclusion and exclusion criteria for exposed and unexposed subjects (cases and controls) or refer to previous publications

Item 3. Indicate time period used for identifying patients

Item 4. Indicate whether or not subjects were consecutive if not population-based

Item 5. Indicate if evaluators of subjective components of study were masked to other aspects of the status of the participants

Item 6. Describe any assessments undertaken for quality assurance purposes (e.g., test/retest of primary outcome measurements)

Item 7. Explain any patient exclusions from analysis

Item 8. Describe how confounding was assessed and/or controlled

Item 9. If applicable, explain how missing data were handled in the analysis

Item 10. Summarize patient response rates and completeness of data collection

Item 11. Clarify what follow-up, if any, was expected and the percentage of patients for which incomplete data or follow-up was obtained

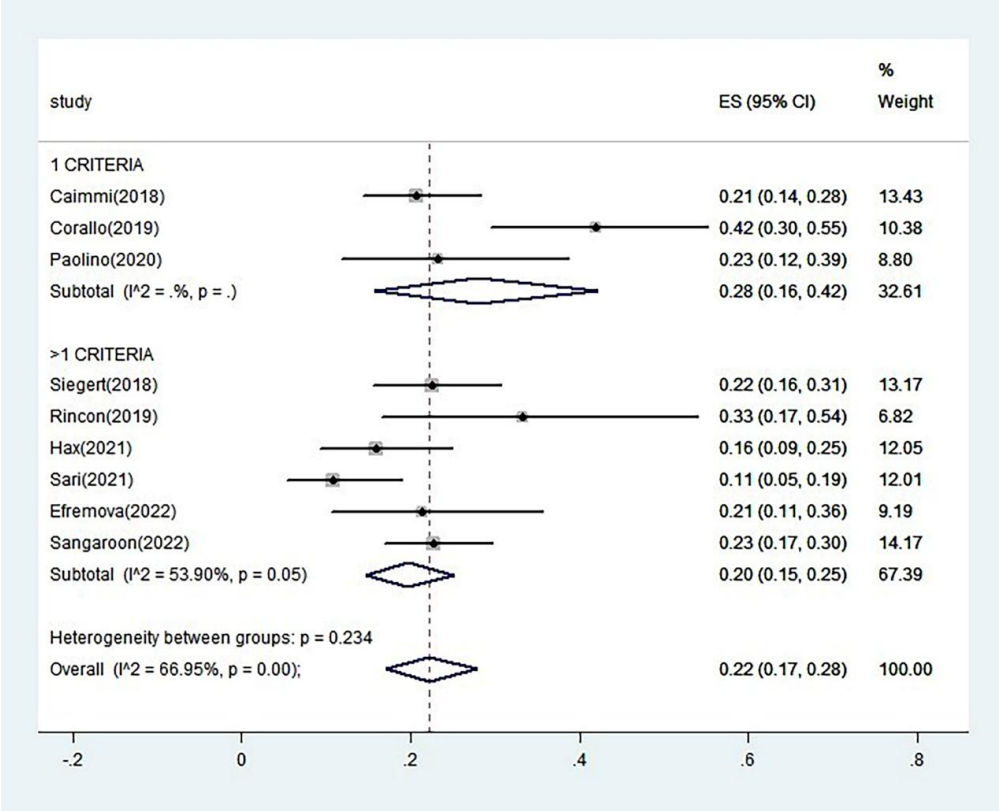
Table S8 Newcastle-Ottawa Scale for Cohort study

Study	Selection				Comparability	Outcome			Total Score
	Representativeness of the exposed cohort	Selection of the non-exposed cohort	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study	Comparability of cohorts on the basis of the design or analysis	Assessment of outcome	Was follow-up long enough for outcomes to occur	Adequacy of follow up of cohorts	
Paolino (2020)	0	1	1	0	1	1	0	0	4

Table S9 Meta-regression analyses of sarcopenia prevalence

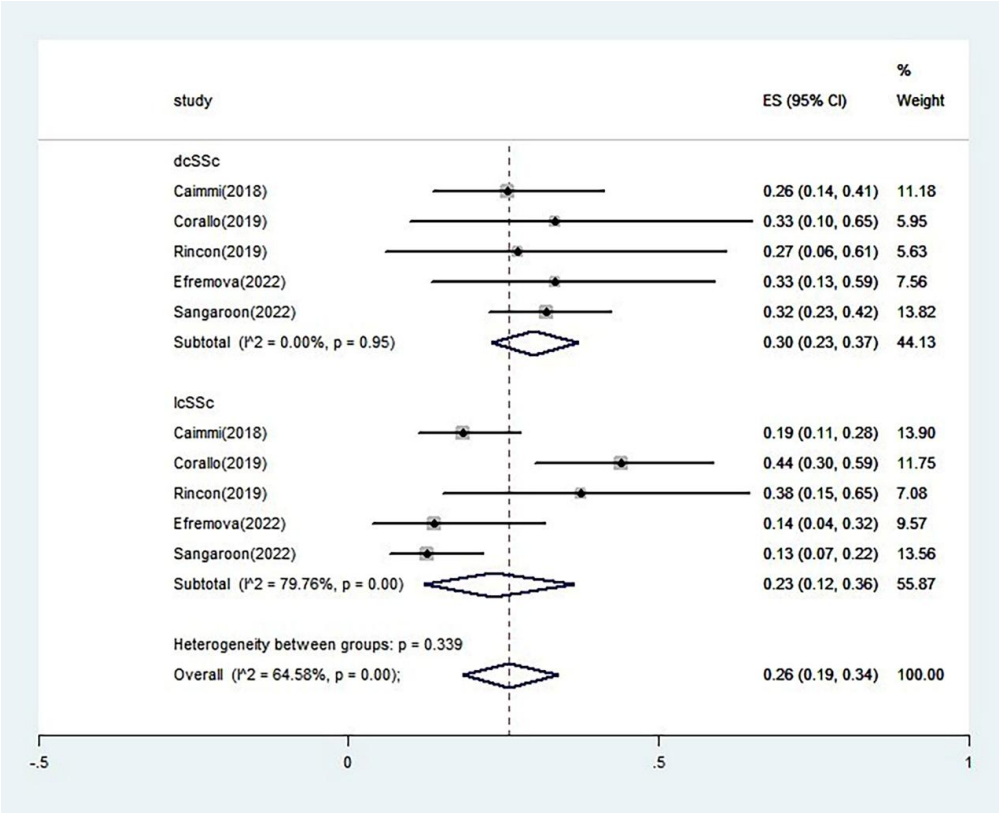
Variables	Coefficient	SE	P value	CI-Lower	CI-Upper
Sample size	-0.0022	0.0026	0.424	-0.0083	0.0039
Average age	0.0210	0.0319	0.532	-0.0545	0.0965
Proportion of female	-1.0603	1.3233	0.449	-4.1893	2.0687
Duration of SSc	-0.0606	0.0488	0.255	-0.1760	0.0549

Figure S1 Prevalence of sarcopenia by criteria



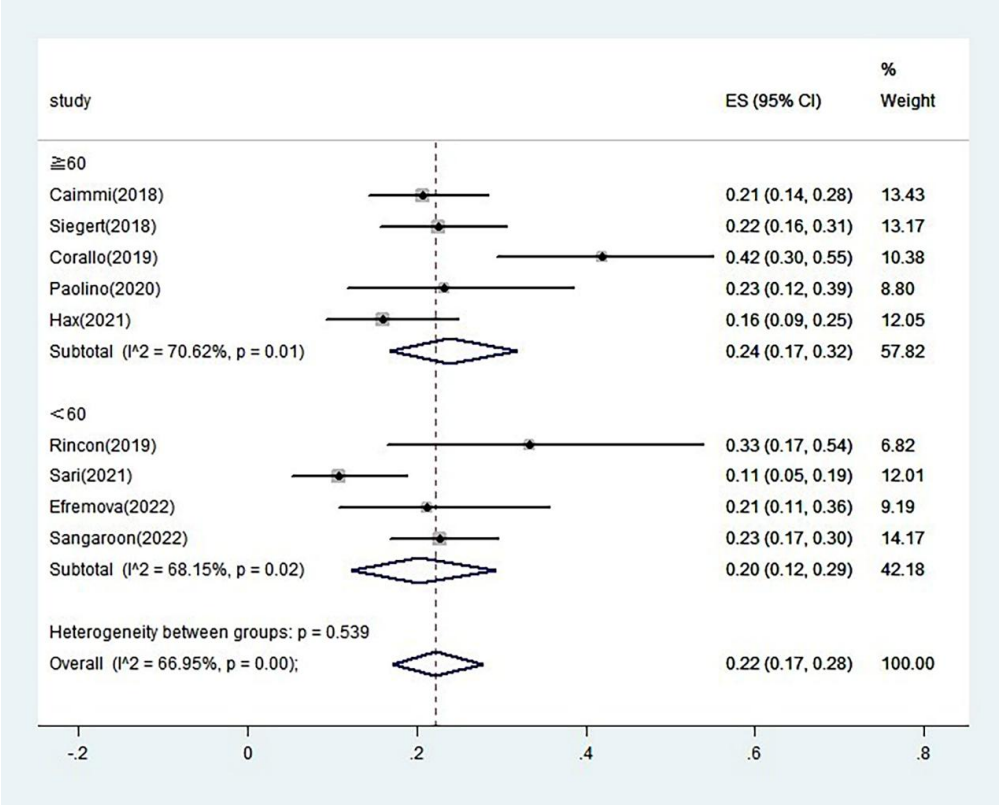
ES = effect size (prevalence); $I^2 = I^2$ heterogeneity statistic. A random effects model was used for analysis, and there was no significant difference between subgroups ($P = 0.234$).

Figure S2 Prevalence of sarcopenia by disease subtype



ES = effect size (prevalence); I² = I² heterogeneity statistic. The random effects model was used for the analysis, and there was no significant difference between the subgroups (P = 0.339).

Figure S3 Prevalence of sarcopenia by mean age



ES = effect size (prevalence); $I^2 = I^2$ heterogeneity statistic. The random effects model was used for the analysis, and there was no significant difference between the subgroups ($P = 0.539$).

Figure S4 Sensitivity analysis

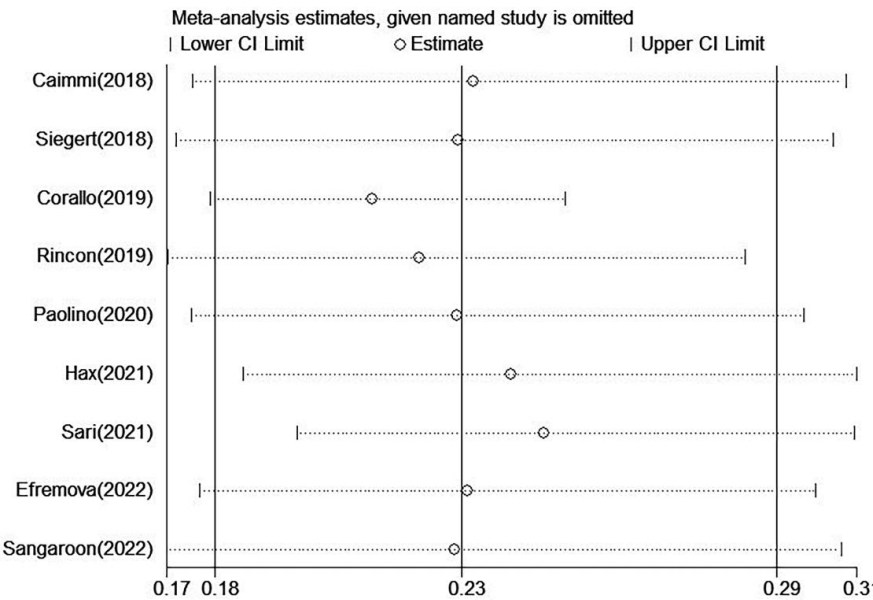


Figure S5 Egger’s test for publication bias

