

Table S1 – Characteristics and results of studies assessing the association of muscle mass and the presence of NAFLD

Authors	Country	Study type	Setting and population (size)	Male (%)	Age (y), mean $\pm$ SD or median (IQR) or % by age group	Diagnosis of NAFLD	Assesment of muscle mass		Association or risk measure	Confounder adjustment
							Method	Parameter		
Tsien et al., 2012	United States	Cross-sectional	Patient with NAFLD on LB and controls (n=131)	NR	NR	LB	CT	TPA	Non-NAFLD (n=57) vs. NAFLD <sup>a</sup> (n=74): 29.4 $\pm$ 7.5 vs. 26.7 $\pm$ 8.9	NA
Choi et al., 2013	South Korea	Cross-sectional	Women with T2DM (n=1926)	NA	58 $\pm$ 12	US	BIA	SMM/weight (Q1)	AOR 2.25 (1.66 - 3.04)	age, HbA1C, WC, TG, SBP and HDL-C
Moon et al., 2013	South Korea	Cross-sectional	Routine health evaluation (n=9565)	55.3%	46.8 $\pm$ 10.6 <sup>a</sup>	FLI	BIA	SMM/weight, SMM/VFA	SMM/weight: FLI <20 (n=2821) 43.2 $\pm$ 3.9, FLI 20-59 (n=4896) 40.2 $\pm$ 4.0, FLI $\geq$ 60 (n=1848) 38.2 $\pm$ 4.4; p<0.001 SMM/weight: r=-0.56, p<0.001 SMM/VFA: r=-0.41, p<0.001 SMM/VFA Q4: AOR 0.037 (0.029-0.049)	Age, sex, TC, LDL-c, DM, HT, hsCRP


Hong et al., 2014	South Korea	Cross-sectional	Survey of healthy volunteers, ≥20y (Korean Sarcopenic Obesity Study) (n=452)	36.9%	Sarcope nic: 60 (52-67) Non-sarcope nic: 51 (38-61)	CT	DXA	SMM/weight (Q1)	OR 5.88 (2.33-14.84), AOR 5.16 (1.63-16.33)	age, sex, smoking, physical activity, HOMA-IR, hsCRP, 25[OH]D levels
Issa et al., 2014	United States	Cross-sectional	Patients with NASH on LB and controls (n=75)	NR	NR	LB	CT (L4)	TPA	Non-NAFLD (n=25) vs. NAFLD <sup>a</sup> (n=50): 29.3±0.88 vs. 22.05±2.9	NR
Lee et al., 2015	South Korea	Cross-sectional	Nationally representative survey (KNHANES 2008-2011), ≥20y (n=15132)	37.1%	50.6±16.6 <sup>a</sup>	HSI (>36), CNS <sup>b</sup> (≥40), LFS (≥-0.640)	DXA	ASM/weight (<32.2% ♂, 25.5% ♀)	HSI: AOR 1.18 (1.03-1.34) CNS: AOR 1.19 (1.02-1.39) LFS: AOR 1.22 (1.09-1.36)	age, sex, regular exercise, HOMA-IR, smoking, and HT
Hashimoto et al., 2016	Japan	Cross-sectional	Patients with T2DM (n=145)	54.5%	65.5±11.6 <sup>a</sup>	CAP (>237.8)	DXA	SMM/weight	per incremental 1% SMM/weight: ♂ AOR 0.80 (0.64-0.97), ♀ AOR 0.97 (0.81-1.14)	age, BMI, smoking, TG/HDL-c ratio, HbA1c, GGT
Kim et al., 2016a	South Korea	Cross-sectional	Nationally representative survey (KNHANES 2010-2011), ≥19y (n=3739)	31.7%	45.2±2.6 <sup>a</sup>	FLI (≥60)	DXA	ASM/weight	♂ OR 1.49 (1.38-1.61), AOR 1.35 (1.17-1.54) ♀ OR 1.47 (1.35-1.60), AOR 1.36 (1.18-1.55)	age, smoking, alcohol drinking, regular exercise, WBC, HOMA-IR, 25[OH]D, number of metabolic syndrome components, DM, HT; and total energy intake, carbohydrate

										intake. fat intake (energy %) in ♂
Kim et al., 2016c	South Korea	Cross-sectional	Patients with NAFLD on LB and controls (n=229)	52.0%	NR	LB	BIA	ASM/weight	NAFLD (n=179) vs. non-NAFLD (n=50): lower, ♂ p=0.002, ♀ p<0.001	
Poggiogalle et al., 2016	Italy	Cross-sectional	Patients with obesity, 18-65y (n=420)	19.0%	45.70±13.9 <sup>a</sup>	FLI	DXA	TrFM/ASM	r = 0.221, p <0.001	age, BMI, total FM, FFM, truncal FM, ISI
Shen and Liangpunsakul, 2016	United States	Cross-sectional	Nationally representative survey (NHANES 1988-1994), 20-74y (n=9985)	NR	NR	US	BIA	SMM/height <sup>2</sup> (≤10.75% ♂, ≤6.75 ♀)	OR 0.73 (0.66-0.81), AOR 1.00 (0.79 - 1.27)	NR
Kallwitz et al., 2017	United States	Cross-sectional	Nationally representative survey (NHANES 1999-2014) (n=7183)	Sarcopenic: 88.6% Non-sarcopenic: 90.7%	Sarcopenic: 56.7±0.84 Non-sarcopenic: 43.02±0.38	FLI, NFLS	NR	ASM/BMI	Every 1SD decrease FLI: AOR 4.34 (3.48-5.41); LFS: AOR 4.56 (3.40-6.12)	NR
Koo et al., 2017	South Korea	Cross-sectional	Patients with radiologic evidence of hepatic steatosis, ≥18y (Boramae NAFLD registry) (n=309)	46.9%	53±14	LB	BIA	ASM/weight (<29.0% ♂, <22.9% ♀) ASM/BMI (<0.789 ♂, <0.512 ♀)	ASM/weight: OR 3.82 (1.58-9.25), AOR 1.53 (0.50-4.65) ASM/BMI: OR 2.76 (1.13-6.75), AOR 1.27 (0.41-3.95)	age, sex, BMI, smoking, HT, DM, TC, TG, HDL-c, ALT, hsCRP and HOMA-IR

Peng et al., 2017	United States	Cross-sectional	Nationally representative survey (NHANES 1988-1994), 60-75y (n=2551)	48.6%	66.71 (mean)	US	BIA	SMM/weight (<37.0% ♂, <28% ♀) SMM/height <sup>2</sup> (<10.76 ♂, <6.75 ♀):	SMM/weight: mild steatosis OR 1.33 (1.05-1.69), AOR 1.41 (1.09-1.83); moderate steatosis OR 2.15 (1.71-2.69), AOR 2.22 (1.74-1.83); severe steatosis OR 2.33 (1.73-3.14), AOR 2.30 (1.67-3.17) SMM/height <sup>2</sup> : mild steatosis OR 0.74 (0.58-0.93), AOR 0.63 (0.48-0.83); moderate steatosis OR 0.58 (0.47-0.71), AOR 0.52 (0.41-0.67); severe steatosis OR 0.49 (0.37-0.64), AOR 0.44 (0.32-0.61)	age, sex, race/ethnicity, TC, 25[OH]D, HbA1c, CRP, UA, physical activity, smoking
Rachakonda et al., 2017	United States	Longitudinal	Patients with obesity class II or III (RENEW clinical trial) (n=129; undergoing lifestyle intervention 52)	11.6%	47.6 (41.7-52.0)	CT	DXA (or air displacement plethymography if	FFM FFM/height <sup>2</sup> FFM/weight MMA MMA/height <sup>2</sup> MMA/weight	NAFLD (n=58) vs. non-NAFLD (n=71) at baseline FFM: 61.7 (58.8-64.5) vs. 54.5	NA

							body weight >136 kg) CT		(53.0-56.0), p<0.001; FFM/height <sup>2</sup> : 22.2 (21.6-22.8) vs. 20.2 (19.8-20.6), p<0.01; FFM/weight (%): 49.1 (47.7-50.4) vs. 48.4 (47.4-49.4);), p=0.420; MMA: 149.3 (140.7-158.0) vs. 131.5 (126.2-136.8), p=0.001; MMA/height <sup>2</sup> 53.3 (51.1-55.5) vs. 48.8 (47.0-50.6), p=0.002; MMA/weight 1.2 (1.1-1.2) vs. 1.2 (1.1-1.2), p=0.833 resolved NAFLD (n=20) vs. persistent NAFLD (n=32): NS	
Choe et al., 2018a	South Korea	Cross-sectional	Routine health evaluation (n=1828)	61.3%	54.9±9.5	US	CT (L3)	SMA (cm <sup>2</sup> )/BMI (<8.37 ♂, 7.47 ♀)	AOR 1.51 (1.15-1.99)	age, sex, WC, SBP, FPG, TG, HDL-c, smoking
Choe et al., 2018b	South Korea	Cross-sectional	Patients with T2DM (n=5507)	50.9%	56.8±10.8	US	Physical examination	WCR (T3)	AOR 1.56 (1.31-1.86)	age, sex, BMI, HT, duration of DM, exercise status,

										smoking and alcohol history, HbA1c, TC, TG, SITT, medication history for DM and dyslipidemia
Kim et al., 2018	South Korea	Longitudinal	Routine health evaluation, $\geq 20$ y, (n=15567: non-NAFLD 12624, non-NAFLD and BIA at follow-up 10534, NAFLD 2943)	54.7%	51.4 $\pm$ 8.3	HSI ( $>36.0$ ; resolution of NAFLD $<30$ )	BIA	ASM/weight ASM/BMI	NAFLD at follow-up ASM/weight: T3 AHR 0.44 (0.38-0.51); per percent increase: AHR 0.86 (0.83-0.88) ASM/BMI: T3 AHR 0.47 (0.42-0.54) $\Delta$ ASM/weight: T3 AHR 0.69 (0.59-0.82); per percent increase: AHR 0.84 (0.79-0.90) $\Delta$ ASM/BMI: T3 AHR 0.77 (0.65-0.90) Resolution of NAFLD ASM/weight: AHR 2.09 (1.02-4.28); per percent increase AHR 1.25 (1.10-1.42)	age, sex, WC, DM, HT, smoking, exercise; and baseline ASM/weight for $\Delta$ ASM/weight; and baseline ASM/BMI for $\Delta$ ASM/BMI

									ASM/BMI: AHR 2.50 (1.39-4.49) $\Delta$ ASM/weight: AHR 4.17 (1.90-6.17); per percent increase AHR 1.99 (1.53-2.59) $\Delta$ ASM/BMI: AHR 3.04 (1.46-6.37)	
Kwanten et al., 2018	Belgium	Cross-sectionse ctional	Obese patients (n=196)	NR	NR	LB	BIA CT	Muscle mass <sup>c</sup> /weight (<2SD below reference)	NAFLD (n=162) vs. non-NAFLD (n=34): 32.4% vs. 25.9%	NA
Yerragorla et al., 2018	United States	Cross-sectional	Patients with NAFLD on LB and controls (n=166)	48.8%	47±13	LB	CT (L3)	SMA (mm <sup>2</sup> )	NAFLD (n=83) vs. controls (n=83) Psoas: right 616±294 vs. 858±257, left 643±299 vs. 835±277 Paraspinal: right 3260±931 vs. 4030±865, left 3318±925 vs. 3927±820 p<0.001 for all	NA
Alferink et al., 2019	The Netherlands	Cross-sectional	Health survey, european, ≥45y (The Rotterdam Study) (n=4609)	43.0%	69.3±9.2	US	DXA	ASM/weight ASM/height <sup>2</sup>	ASM/height <sup>2</sup> Normal weight:  AOR 0.63 (0.39-1.02),	age, study cohorts, weight, height, HOMA-IR, TG, AGR

									<p>♀ AOR 0.48 (0.29-0.80);  Overweight: ♂ AOR 0.92 (0.76–1.12), ♀ AOR 1.08 (0.87–1.33)  ASM/weight  Normal weight: ♂ AOR 0.90 (0.80-1.01), ♀ AOR 0.84 (0.75-0.95);  Overweight: ♂ AOR 0.97 (0.92–1.03), ♀ AOR 1.00 (0.94–1.06)</p>	
Chen et al., 2019	United States	Cross-sectional	Health survey (Framingham Heart Study Offspring and Generation 3 subcohorts) (n=2249)	48.6%	58.5±11.8	CT	DXA	ASM/weight	<p>♂ <math>\beta</math> –0.0106, <math>p&lt;0.05</math>; ♀ <math>\beta</math> –0.0038, NS  NAFLD vs. non-NAFLD: 26.1 vs. 27.4%, <math>p&lt;0.0001</math></p>	Age, age <sup>2</sup> , physical activity index, cohort, central fat index, lower extremity fat index, muscle steatosis
Chung et al., 2019	South Korea	Cross-sectional	Routine health evaluation (n=5989)	57.3%	53.2±9.4	US	BIA	ASM/weight	<p>ASM/weight &lt;29 ♂, &lt;22.9 ♀:  AOR 1.37 (1.02–1.85)  ASM/weight Q1:  AOR 1.29 (1.21–1.38)</p>	age, sex, smoking, VFA, HT, DM, TC, LDL-c, HDL-c, TG
Debroy et al., 2019	Italy	Cross-sectional	Men living with HIV (Modena HIV Metabolic Cohort)	NA	56.8±5.9	CT	DXA	ASM/height <sup>2</sup>	NAFLD (n=57) vs. non-NAFLD (n=112):	NA



			(n=169)						7.72±1.22 vs. 8.01±0.81, NS	
Gan et al., 2019	China	Cross-sectional	Health survey, 18-80y (Lanxi cohort) (n=3536)	28.7%	52.8±13.1 <sup>a</sup>	US	DXA	ASM/weight (<28.64% ♂, <24.12% ♀)	AOR 2.57 (2.03-3.25)	HGS/weight, age, sex, residence area, smoking, physical activity, height, ALT, TG, LDL-c, TC, HbA1c, UA, HT, DM, hsCRP, HOMA-IR, current medications
Gerber et al., 2019	United States	Cross-sectional	Nationally representative surveys (NHANES 1996-2006), ≥20y (n=6416)	48.5%	45.3 (0.4)	US-FLI	DXA	ASM/BMI (<0.789 ♂, <0.512 ♀)	NAFLD (n=1972) vs. non-NAFLD (n=4444): 17.0% vs. 7.1%, p<0.001 After adjustment, p<0.05	age, sex, and race
Hsing et al., 2019	China	Cross-sectional	Health survey (WELL China cohort), 18-80y, 2 districts (n=3589)	29.3%	<50 y: 41.3%, 50-65 y: 37.9%, >65 y: 20.8%	FLI (≥60)	DXA	ASM/weight (≥29.1% ♂, ≥25.1% ♀)	OR 0.2 (0.1-0.2), AOR 0.1 (0.07-0.13)	age, sex, income, smoking, ALT, HOMA-IR, AFR
Lee et al., 2019	South Korea	Longitudinal	Routine health evaluations, ≥ 18y, without NAFLD at baseline, 10-year follow-up (n=4398)	49.4%	46.3±8.3	US	BIA	ΔASM ΔASM/weight (T3)	NAFLD (n=591) vs. non-NAFLD (n=3807): ΔASM/weight -2.24 (-3.51- -0.97) vs. -1.07 (-2.44-0.32) ΔASM ♀ OR 1.67 (1.18-2.36), AOR	age, smoking, DM, HT, use of lipid-lowering drugs, ΔBMI, ΔWC, ΔSBP, ΔHbA1c, ΔTG, ΔLDL-c, ΔHDL-c, ΔAST, ΔALT, ΔGGT, ΔUA, ΔTSH and ΔFT4

									2.10 (1.38-3.18); ♂ OR 0.80 (0.60-1.05), AOR 1.61 (1.15-2.26); non-obese: OR 0.95 (0.75-1.22), AOR 1.81 (1.34- 2.45); obese: OR 0.96 (0.63-1.47), AOR 1.91 (1.11- 3.31)	
Oshida et al., 2019	Japan	Cross- sectional	Outpatients followed for lifestyle-related liver diseases (n=253)	46.6%	<30y: 21.7%, 31-60y: 41.9%, >60y: 36.4%	US	BIA	ASM/BMI ASM/height <sup>2</sup>	NAFLD (n=153) vs. non-NAFLD (n=100) ASM/BMI: <31y 0.68 vs. 0.93, 31-60y 0.76 vs. 0.85, >60y 0.70 vs. 0.78, p<0.01 ASM/height <sup>2</sup> : <31y 21.8 vs. 19.5, 31-60y 21.7 vs. 17.8, >60 18.1 vs. 16.2, p<0.01;	NA
Seo et al., 2019	South Korea	Cross- sectional	Patients with MetS, 30-64y (Seoul Metabolic Syndrome Cohort) (n=4210)	51.3%	57.4±10. 8	US	BIA	ASM/weight (<29.0% ♂, <22.9% ♀) ASM/BMI (<0.789 ♂, <0.512 ♀)	ASM/weight: ♂ AOR 1.58 (1.15- 2.17), ♀ AOR 0.97 (0.71-1.38) ASM/BMI: ♂ AOR 1.41 (1.02- 1.94), ♀ AOR 1.06 (0.75-1.52)	age, BMI, WC, SBP and DBP, HbA1c, TG (log scale), HDL-c, hsCRP, SITT, use of sulphonylurea, thiazolidinedione, insulin

Su et al., 2019	China	Cross-sectional	Patients with T2DM, 40-75y (n=445)	53.0%	59.4±9.5 <sup>a</sup>	US	BIA	ASM/VFA (T1)	♂ OR 4.27(2.12-8.61), AOR 2.83 (0.55-8.43), ♀ OR 3.43 (1.70-6.91), AOR 3.43 (1.41-8.74)	age, DM duration, BMI, WC, SBP, DBP, HbA1c, smoking, alcohol, ALT, AST, TC, TG, HDL-c, LDL-c, medication for DM and dyslipidemia
Wijarnpreecha et al., 2019	United States	Cross-sectional	Nationally representative surveys (NHANES 1988-1994), 20-74y (n=11325)	47.1%	42.7 (mean)	US	BIA	SMM/weight (<37.0% in ♂, <28.0% in ♀)	Total population: OR 2.31 (2.01-2.64), AOR 1.24 (1.04-1.48) Fasting participants (n=5591): OR 2.29 (1.86-2.83), AOR 1.21 (0.95-1.54)	age, sex, ethnicity, BMI, economic status, DM, smoking, HT, TC, antihyperlipidemia medication, sedentary physical activity, 25[OH]D deficiency, CRP; and HOMA-IR in fasting participants
Zhang et al., 2019	China	Cross-sectional	Post-menopausal women in an outpatient clinic, 50-65y (n=96)	NA	59.7±3.6 <sup>a</sup>	<sup>1</sup> H MRS	DXA	ASM/weight SMM/weight	ASM/weight: r=-0.42, p=0.009; SMM/weight: r=-0.28, p<0.001	HOMA-IR
Hyun Kim et al., 2020	South Korea	Cross-sectional	Patients with CLD (n=2168)	61.3%	54.4±12.7	US	BIA	ASM/BMI (<0.789 ♂, <0.521 ♀)	NAFLD (n=957) vs. CHB (n=911): 12.9 vs. 6.6%	NA
Tanaka et al., 2020	Japan	Cross-sectional	Routine health evaluation (Nishimura Health Survey) (n=632)	55.85%	50.6±11.1 <sup>a</sup>	US	CT (L3)	SMA (cm <sup>2</sup> )/BMI	Per 1.0 cm <sup>2</sup> /kg/m <sup>2</sup> increase: ♂ AOR 0.59 (0.38-0.89), ♀ AOR 0.50 (0.20-1.24)	age, smoking, exercise, ALT, GGT, TG, HDL-c, SBP, FPG, VFA, and medication for HT, dyslipidaemia and DM

<sup>a</sup>calculated by authors, <sup>b</sup>uric acid was not used due to unavailable data, <sup>c</sup>not specified if ASM or SMM; ♂ – male, ♀ – female, <sup>1</sup>H-MRS – single-voxel proton magnetic resonance spectroscopy, 25[OH]D – 25-hydroxyvitamin D, AFR – android fat ratio, AGR – android-fat-to-ginoid-fat ratio, AHR – adjusted hazard ratio, ALT – alanine aminotransferase, AOR – adjusted odds ratio, ASM – appendicular skeletal muscle mass (kg), AST – aspartate aminotransferase, BIA – bioelectrical impedance analysis, BMI – body mass index (kg/m<sup>2</sup>), CAP – controlled attenuation parameter, CHB – chronic hepatitis B, CLD – chronic liver disease, CNS – comprehensive NAFLD score, CRP – C-reactive protein, CT – computed tomography, DBP – diastolic blood pressure, DM – diabetes mellitus, DXA – dual-energy X-ray absorptiometry, FFM – fat-free mass (kg), FLI – Fatty Liver Index, FM – fat mass (kg), FPG – fasting plasma glucose, FT4 – free thyroxine, GGT – gamma-glutamyltransferase, HbA1c – glycated hemoglobin, HDL-c – high-density lipoprotein cholesterol, HGS – handgrip strength, HIV – human immunodeficiency viruses, HOMA-IR – homeostasis model of insulin resistance, hsCRP – high sensitivity C-reactive protein, HSI – Hepatic Steatosis Index, HT – hypertension, IQR – interquartile range, ISI – insulin sensitivity index, KNHANES – Korean National Health and Nutrition Examination Survey, L3 – third lumbar vertebrae, LB – liver biopsy, LDL-c – low-density lipoprotein cholesterol, LFS – liver fat score, MMA – midhigh muscle area (cm<sup>2</sup>), MetS – metabolic syndrome, NA – not applicable, NAFLD – non-alcoholic fatty liver disease, NFLS – NAFLD Liver Fat Score, NHANES – National Health and Nutrition Examination Survey, NS – non-significant, NR – not reported, OR – odds ratio, Q1 – lowest quartile, Q4 – highest quartile, SBP – systolic blood pressure, SD – standard deviation, SITT – short insulin tolerance test, SMA – skeletal muscle area, SMM – skeletal muscle mass, T1 – lowest tercile, T2DM – type 2 diabetes mellitus, T3 – highest tercile, TC – total cholesterol, TG – triglycerides, TPA – total psoas muscle area (cm<sup>2</sup>), TrFM – truncal fat mass (kg), TSH – thyroid-stimulating hormone, UA – uric acid, US – ultrasound, US-FLI – U.S. Fatty liver index, VFA – visceral fat area (cm<sup>2</sup>), WBC – white cell blood count, WC – waist circumference, WCR – waist-to-calf ratio, y – years

Table S2 – Characteristics and results of studies assessing the association of muscle strength and/or performance and the presence of NAFLD

Authors	Country	Study type	Setting and population (size)	Male (%)	Age (y), mean±SD or median (IQR) or % by age group	Diagnosis of NAFLD	Assesment of muscle strength or performance		Association or risk measure	Confounder adjustment
							Method	Parameter		
Peng et al., 2017	United States	Cross-sectional	Nationally representative survey (NHANES 1988-1994), 60-75y (n=2551)	48.6%	66.71 (mean)	US	Physical examination	Gait speed (<0.8)	Mild steatosis OR 1.29 (1.01-1.65), AOR 1.12 (0.86-1.45); moderate steatosis OR 1.32 (1.07-1.64), AOR 1.17 (0.92-1.47); severe OR 1.15 (0.88-1.50), AOR 0.94 (0.70-1.25)	age, sex, race/ethnicity, TC, 25[OH]D, HbA1c, CRP, UA, physical activity, smoking
Lee, 2018	South Korea	Cross-sectional	Nationally representative surveys (KNHANES 2014-2015), 19-80y (n=8001)	44.5%	49.9±16.4	HSI (>36.0)	Dynamometer	HGS/BMI	1SD decrease: AOR 1.47 (1.35–1.60) Q1: AOR 2.43 (2.05–2.88)	age, sex, education, physical activity, alcohol use, smoking, treatment of illness (CVD, DM, HT, dyslipidemia, cirrhosis, or arthritis), BMI, MetS
Alferink et al., 2019	The Netherlands	Cross-sectional	Health survey, european, ≥45y (The Rotterdam Study) (n=4609)	43.0%	69.3±9.2	US	DXA	HGS Gait speed	NAFLD (n=1623) vs non-NAFLD (n=2986)	age, study cohorts, weight, height, HOMA-IR, TG, AGR

									<p>HGS: normal weight ♀ 20.9±5.1 vs. 21.8±6.0 p=0.176, ♂ 33.0±9.2 vs. 35.4±8.5 p=0.036; overweight: ♀ 21.61±5.66 vs. 21.77±5.75 p=0.553, ♂ 36.7±9.1 vs. 36.8±8.9) p=0.841 Gait speed: normal weight ♀ 1.21 (1.08, 1.31) vs. 1.24 (1.11, 1.36) p=0.994, ♂ 1.27 (1.13, 1.38) vs. 1.26 (1.11, 1.40) p=0.727; overweight: ♀ 1.15 (1.02, 1.27) vs. 1.17 (1.03, 1.28) p=0.570, ♂ 1.23 (1.09, 1.34) vs. 1.24 (1.09, 1.35) p=0.990</p>	
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Chen et al., 2019	United States	Cross-sectional	Health survey (Framingham Heart Study Offspring and Generation 3 subcohorts) (n=2249)	48.6%	58.5±11.8	CT	Dynamometer	HGS KES	NAFLD (n=1613) vs. non-NAFLD (n=636) HGS: ♂ 44.5±9.6 vs. 45.8±9.2, p=0.032; ♀ 26.0±6.6 vs. 26.5±6.0, p=0.25 KES: ♂ 28.1±9.0 vs. 28.3±8.5, p=0.68; ♀ 21.9±7.6 vs. 23.1±7.6, p=0.25	NA
Cruz et al., 2019	Brazil	Cross-sectional	Patients with US (n=102)	36.3%	45.3±13.1	US	Dynamometer	EFS/BMI KES/BMI	Inverse relationship EFS/BMI: p=0.009 KES/BMI: p=0.006	Age, sex
Debroy et al., 2019	Italy	Cross-sectional	Men living with HIV (Modena HIV Metabolic Cohort) (n=169)	NA	56.8±5.9	CT	Dynamometer	HGS/weight	<25th percentile: AOR 2.47 (1.01-6.19), 25-50th percentile: AOR 3.05 (1.27-7.61)	age, height, metabolic syndrome, nadir CD4+, intensive smoking, moderate smoking, exposure do PI, NRTI, NNRTI, INSTI
Gan et al., 2019	China	Cross-sectional	Health survey, 18-80y from Lanxi city, Zhejiang Province, China (Lanxi cohort)	28.7%	52.8±13.1 <sup>a</sup>	US	Dynamometer	HGS/weight (<51.26% ♂, <35.38% ♀)	AOR 1.47 (1.21-1.80)	ASM/weight, age, sex, residence area, smoking, physical activity, height, ALT,

			(n=3536)							TG, LDL-c, TC, HbA1c, UA, HT, DM, hsCRP, HOMA-IR, current medications
Kim et al., 2019	South Korea	Cross-sectional	Nationally representative surveys (KNHANES 2014-2015), post-menopausal ♀ and ≥50y ♂ (n=4103)	46.2%	61.7±8.8 <sup>a</sup>	HSI (per unit increase)	Dynamo meter	HGS (♂ <28.9, ♀ <16.8)	♂ AOR 1.17 (1.07–1.28), ♀ AOR 1.11 (1.02–1.20)	age, weight, SBP, smoking, resistance exercise, TC, TG, HbA1c, ALT
Oshida et al., 2019	Japan	Cross-sectional	Outpatients followed for lifestyle-related liver diseases (n=253)	46.6%	<30: 21.7%, 31-60: 41.9%, >60: 36.4%	US	Dynamo meter	HGS KES	NAFLD (n=153) vs. non-NAFLD (n=100) HGS: <30y 31.7 vs. 35.6, 31-60y 34.2 vs. 31.4, >60y 29.2 vs. 27.0, NS KES <30y 56.0 vs. 80.5 p<0.01, 31-60y 53.8 vs. 75.2 p<0.01, >60y 51.9 vs. 57.5 NS	NA
Zhang et al., 2019	China	Cross-sectional	Post-menopausal women in an outpatient clinic, 50–65y (n=96)	NA	59.7±3.6 <sup>a</sup>	<sup>1</sup> H MRS	Dynanometer chair	HGS/weight KES/weight EFS/weight	HGS/weight: r=-0.20, p=0.061 KES/weight: r=-0.24, p=0.022 EFS/weight: NS	HOMA-IR
Hao et al., 2020	China	Cross-sectional	Health survey (Multi-center Application)	NA	36.56±8.93	US	Dynamo meter	HGS/weight	OR 0.171 (0.106-0.275), AOR 0.642 (0.503-0.842)	body fat percentage, BMI, SBP, DBP, TC, HDL-c, TG, VO2max >30 mL/kg <sup>-1</sup> ·min <sup>-1</sup>



			Research on Fitness Test and Exercise Management project of China Health Foundation), 20-60y, male (n=1126)							
Kang et al., 2020	South Korea	Cross-sectional	Nationally representative survey (KNHANES 2014-2016), 20-79y (n=14861)	42.4%	45.6±0.2	HSI (>36.0)	Dynamo meter	HGS/BMI (Q1)	OR 3.62 (3.25-4.03), AOR 1.92 (1.61-2.29)	Age, sex, obesity, DM, HT, dyslipidaemia, HOMA-IR, elevated hs-CRP level
Park et al., 2020	South Korea	Cross-sectional	Nationally representative surveys (KNHANES 2015), ≥19y (n=3922)	41.9%	♂ 45.0 (0.5) ♀ 46.9 (0.5)	LFS (>-0.640)	Dynamo meter	HGS/BMI (Q4)	♂ OR 0.19 (0.13-0.27), AOR 0.23 (0.15-0.35); ♀ OR 0.08 (0.05-0.13), AOR 0.20 (0.11, 0.34)	Age, alcohol consumption, smoking, DM, HT, dyslipidemia, CHD, CVD, physical activity, TyG, CRP

<sup>a</sup> Calculated by authors; ♂ – male, ♀ – female, <sup>1</sup>H-MRS – single-voxel proton magnetic resonance spectroscopy, 25[OH]D – 25-hydroxyvitamin D, AGR – android-fat-to-ginoid-fat ratio, ALT – alanine aminotransferase, AOR – adjusted odds ratio, BMI – body mass index (kg/m<sup>2</sup>), CHD – coronary heart disease, CVD – cerebrovascular disease, CRP - C-reactive protein, CT - computed tomography, DBP – diastolic blood pressure, DM – diabetes mellitus, DXA – dual-energy x-ray absorptiometry, EFS – elbow flexors strength (kg), HbA1c – glycated hemoglobin, HDL-c – high-density lipoprotein cholesterol, HGS – handgrip strength (kg), HIV – human immunodeficiency viruses, HOMA-IR – homeostasis model of insulin resistance, hsCRP – high sensitivity C-reactive protein, HIS – hepatic steatosis index, HT – hypertension, INSTI – integrase strand transfer inhibitor, IQR – interquartile range, KES – knee extension strength (kg), KNHANES – Korean National Health and Nutrition Examination Survey, LDL-c – low-density lipoprotein cholesterol, LFS – liver fat score, MetS – metabolic syndrome, NA – not applicable, NAFLD – non-alcoholic fatty liver disease, NNRTI – non-nucleoside reverse transcriptase inhibitors, NRTI – nucleoside reverse transcriptase inhibitors, NS – non-significant, NR – not reported, OR – odds ratio, PI – protease inhibitor, Q1 – lowest quartile, Q4 – highest quartile, SBP – systolic blood pressure, SD – standard deviation, TC – total cholesterol, TG – triglycerides, TyG – triglycerides and glucose index, UA – uric acid, US – ultrasound, VO2max – maximal oxygen uptake, y – years

Table S3 – Characteristics and results of studies assessing the association of muscle mass and severity of NAFLD (ordered by variable of assesment of muscle mass, and sample size)

Authors	Country	Study type	Setting and population (size)	Male (%)	Age (y), mean±SD or median (IQR)	Assesment of NAFLD severity	Assesment of muscle mass		Association or risk measure	Confounder adjustment
							Method	Parameter		
Tsien et al., 2012	United States	Cross-sectional	Patient with NAFLD on LB (n=74)	NR	NR	LB	CT	TPA	Steatosis (n=19) vs. NASH (n=42) vs. Cirrhosis (n=13): 30.4±9.9 vs. 26.5±8.5 vs. 22.2±6.4	NA
Issa et al., 2014	United States	Cross-sectional	Patients with NASH on LB (n=50)	NR	NR	LB	CT	TPA at L4	NASH (n=25) vs. Cirrhosis (n=25): 24.8±0.8 vs. 19.3±0.93, p<0.001	NR
Lee et al., 2015	South Korea	Cross-sectional	Nationally representative survey (KNHANES 2008-2011), ≥20y, NAFLD diagnosed by HSI/CNS/LFS (n=NR)	NR	NR	BARD (≥2), FIB-4 (≥2.67)	DXA	ASM/weight (<32.2% ♂, 25.5% ♀)	Sarcopenic (n=NR) vs. non-sarcopenic (n=NR) BARD: 60% vs. 45%, p <0.001 FIB-4: 22% vs. 14%, p <0.001.	NA
Yamaguchi et al., 2015	Japan	Cross-sectional	Patients with NAFLD (CAP>240) (n=64)	NR	NR	LSM (≥9.0)	BIA	SMM/weight	Lower SMM/weight ♂ p=0.01, ♀ p=0.003	NR
Joo et al., 2016	South Korea	Cross-sectional	Patients with NAFLD on LB (n=223)	53.4%	52.24±14.87	LB	DXA	ASM/weight	♂ decreased p<0.001, ♀ NS	NR

Kim et al., 2016c	South Korea	Cross-sectional	Patients with NAFLD on LB (n=179)	NR	NR	LB (NASH)	BIA	ASM/weight	Q1: ♂ AOR 4.258 (1.273-14.246), ♀ NS	age, MetS, FM, HOMA-IR
Lee et al., 2016	South Korea	Cross-sectional	Nationally representative survey, ≥20y (KNHANES 2008-2011) with NAFLD (LFS≥-0.640) (n=2761)	44.9%	55.8±14.3	NFS <sup>c</sup> (Q4), FIB-4 (≥2.67), Forns index <sup>d</sup> (Q4)	DXA	ASM/BMI	NFS: AOR 0.67 (0.49-0.91) FIB-4: AOR 0.73 (0.53-0.99) Forns Index: AOR 0.79 (0.54-1.15)	age, age x ASM/BMI, sex, BMI, WC, HOMA-IR, FPG, TC, TG, AST, ALT, DM, HT, exercise, smoking, eGFR, drinking, residence, history of CVD, CHD, COPD and malignancy
Kallwitz et al., 2017	United States	Cross-sectional	Nationally representative survey (NHANES 1999-2014), NAFLD (HSI, FLI, LFS) (n=NR)	NR	NR	NFS	NR	ASM/BMI	Every 1SD decrease: NFS AOR 4.58 (3.04-6.91)	NR
Koo et al., 2017	South Korea	Cross-sectional	Patients with radiologic evidence of hepatic steatosis and LB, ≥ 18y (Boramae NAFLD registry) (n=240)	48.8%	53.4±14.4 <sup>a</sup>	LB, LSM	BIA	ASM/weight (<29% ♂, <22.9% ♀) ASM/BMI (<0.789 ♂, <0.512 ♀)	NASH ASM/weight: OR 2.46 (1.35-4.48), AOR 2.30 (1.08-4.93); ASM/BMI: OR 2.16 (1.13-4.14), AOR 2.33 (1.02-5.34) F≥2 ASM/weight: OR 2.01 (1.12-3.61), AOR 2.05 (1.01-4.16); ASM/BMI: OR 2.86 (1.49-	age, sex, BMI, smoking, HT, DM, TG, HOMA-IR; and TC, HDL-c, ALT and hsCRP for NASH; and platelet and albumin for fibrosis

									5.35), AOR 2.24 (1.06-4.73)	
Osaka et al., 2017	Japan	Cross-sectional	Patients with T2DM, NAFLD on US (n=185)	56.2%	63.9±12.3 <sup>a</sup>	LSM	BIA	SMM/weight	$\beta=-0.34$ , $p<0.001$ LSM $\geq F2$ (7.6kPa), per incremental 1% of SMM/weight: AOR 0.66 (0.53-0.80)	age, sex, insulin treatment, HbA1c, AST, ALT, platelet, ferritin, hyaluronic acid and type IV collagen 7S
Peng et al., 2017	United States	Cross-sectional	Nationally representative survey (NHANES 1988-1994), 60-75y, NAFLD on abdominal US (n=2551)	48.6%	66.71 (mean)	US	BIA	SMM/weight (<37.0% ♂, <28% ♀) SMM/height <sup>2</sup> (<10.76 ♂, <6.75 ♀)	SMM/weight: mild steatosis OR 1.33 (1.05-1.69), AOR 1.41 (1.09-1.83); moderate steatosis OR 2.15 (1.71-2.69), AOR 2.22 (1.74-1.83); severe steatosis OR 2.33 (1.73-3.14), AOR 2.30 (1.67-3.17) SMM/height <sup>2</sup> : mild steatosis OR 0.74 (0.58-0.93), AOR 0.63 (0.48-0.83); moderate steatosis OR 0.58 (0.47-0.71), AOR 0.52 (0.41-0.67); severe	age, sex, race/ethnicity, TC, 25[OH]D, HbA1c, CRP, UA, physical activity, smoking

									steatosis OR 0.49 (0.37-0.64), AOR 0.44 (0.32-0.61)	
Petta et al., 2017	Italy	Cross-sectional	Patients with NAFLD on LB (n=225)	62.7%	48.3±13.4	LB	BIA	ASM/weight (<37% ♂, <28% ♀)	G3 steatosis: AOR 2.02 (1.06-3.83) Ballooning: AOR 1.28 (0.51-3.17) NASH: 0.98 (0.39-2.45) F≥3: AOR 1.76 (1.03-3.73)	G3 steatosis: visceral obesity Ballooning: sex, visceral obesity, FPG>100/DM NASH: sex, age>50, HT, visceral obesity, FPG>100/DM F≥3: age>50, HOMA-IR, HT, NASH, use of Angiotensin-converting enzyme inhibitors/angiotensin e II receptor blockers, metformin, calcium channel blockers and statins
Choe et al., 2018b	South Korea	Cross-sectional	Patients with T2DM and NAFLD on abdominal US (n=2555)	50.9%	56.0±10.4	FIB-4	Physical examination	WCR (T3)	AOR 8.62 (1.39-53.36)	age, sex, BMI, HT, duration of DM, exercise status, smoking and alcohol history, HbA1c, TC, TG, Kitt, and medication history for DM and dyslipidemia
Kapuria et al., 2018	United States	Cross-sectional	Patients with NAFLD on LB (n=60)	58%	45.8±13	LB	CT	TPA/height <sup>2</sup>	Advanced steatosis: 619 vs. 454,	Age, sex, HOMA-IR, weight

									p=0.006; AOR NR, p=0.009 Fibrosis: NS NASH: NS	
Kwanten et al., 2018	Belgium	Cross-section	Obese patients with NAFLD on LB (n=162)	NR	NR	LB	BIA CT	Muscle mass <sup>b</sup> /weight (<2SD below reference)	NAFL (n=39) vs. <F2 (n=94) vs. ≥F2 (n=29): 23.1% vs. 24.5% vs. 34.5%	NA
Shida et al., 2018	Japan	Cross-sectional	Patients with NAFLD (US and elevated ALT) (n=337)	58.4%	NR	CAP (≥260), LSM (≥12)	BIA	SMM/VFA (Q1)	CAP: OR 1.89 (0.78–4.54), AOR 4.33 (1.35–13.8) LSM: OR 3.64 (0.81–16.4), AOR 7.83 (1.46–41.9)	age, sex and HOMA-IR
Alferink et al., 2019	The Netherlands	Cross-sectional	Health survey, european, ≥45y (The Rotterdam Study) with NAFLD on US and data on LSM (n=1126)	47.9%	NR	LSM (≥8.0kPa)	DXA	ASM/height <sup>2</sup>	♂ AOR 1.03 (0.65–1.61), ♀ AOR 0.48 (0.25–0.92)	age, study cohorts, weight, height, HOMA-IR, TG, AGR
Chung et al., 2019	South Korea	Cross-sectional	Routine health evaluation, NAFLD on US (n=3699)	NR	NR	US (severe steatosis)	BIA	ASM/weight	ASM/weight <29 ♂, <22.9 ♀: AOR 1.62 (1.28–2.05) ASM/weight Q1: AOR 1.33 (1.25–1.41)	age, sex, smoking, VFA, HT, DM, TC, LDL-c, HDL-c, TG
Kang et al., 2019	South Korea	Cross-sectional	Routine health evaluation, ≥ 20y with NAFLD on abdominal US	52.85%	47.9±11.7	NFS, FIB-4	BIA	ASM/weight (<29% in ♂, <22.9% in ♀)	NFS ≥-1.455: ASM/weight OR 2.72 (2.29–3.23), AOR 1.64 (1.34–	sex, HT, obesity, TC, TG, HDL-c, hsCRP; and FPG for NFS; and

			(n=10711)					ASM/BMI ( $<0.789$ in ♂, $<0.512$ in ♀)	1.99); ASM/BMI OR 3.00 (2.48- 3.61), AOR 2.01 (1.63-2.46) NFS $\geq 0.676$ : ASM/weight OR 3.98 (1.95-7.44), AOR 2.68 (1.28- 5.59); ASM/BMI OR 4.46 (2.12- 8.51), AOR 3.12 (1.51-6.46) FIB-4 $>1.30$ : ASM/weight OR 1.52 (1.25-1.84), AOR 1.26 (1.03- 1.54); ASM/BMI OR 2.39 (1.96- 2.90), AOR 2.00 (1.63-2.45) FIB-4 $>2.67$ : ASM/weight OR 2.04 (1.14-3.40), AOR 1.58 (0.87- 2.85); ASM/BMI OR 2.20 (1.17- 3.77), AOR 1.62 (0.86-2.98)	DM, albumin, GGT for FIB-4
Mizuno et al., 2019	Japan	Longitudi nal	Patients with histological diagnosis of NAFLD on LB (n=219; 12 months follow-up 139)	46.7%	58 (17- 84)	LB $\Delta$ ALT (decreas e)	BIA	SMM/height <sup>2</sup> SMM/FM	At baseline Simple steatosis vs. NASH SMM/height <sup>2</sup> : 7.29 (4.89- 10.07) vs. 7.29	At baseline: NA At follow-up: age, HT, hyperlipidemia, DM, GGT, platelet count, fibrosis stage, NAS

									(4.86-10.43), p=0.689; SMM/FM 0.88 (0.25-3.76) vs. 0.72 (0.38-1.70), p=0.015 Fibrosis stage NS At follow-up ΔALT: SMM/FM ♂ AHR 10.99 (1.437-83.33), ♀ AHR 6.849 (1.443-32.26)	
Seko et al., 2019	Japan	Longitudi nal	Patients with NAFLD on LB (n= 156 at baseline; n=121 at 12 months follow-up)	47.4% (43.0% follow- up)	57.5 (17–84) [56 (17– 79) for follow- up]	LB ΔALT (decreas e >30%)	BIA	ASM/BMI ASM/FM ASM/height <sup>2</sup>	At baseline F<2: ASM/height <sup>2</sup> p=0.157, ASM/BMI p=0.008 ASM/FM p=0.047; NAS<6: ASM/height <sup>2</sup> p=0.097, ASM/BMI p=0.019 ASM/FM p=0.035 At follow-up, ΔALT: ΔASM/BMI AOR 1.354 (0.362- 5.066);	At baseline: none At follow-up: age, sex, platelet count, fibrosis, NAS, ΔASM/BMI, ΔASM/FM



									$\Delta$ ASM/FM AOR 7.406 (1.796– 30.54)	
Seo et al., 2019	South Korea	Cross- sectional	Patients with MetS, 30-64y (Seoul Metabolic Syndrome Cohort), NAFLD on US (n=1278)	51.3%	55.8±11. 0 <sup>a</sup>	US	BIA	ASM/weight (<29% ♂, <22.9% ♀) ASM/BMI (<0.789 ♂, <0.512 ♀)	Sarcopenic vs. non-sarcopenic Moderate-to- severe NAFLD: ♂ (n=676) 87.8% <sup>a</sup> vs. (n=1484) 72.4% <sup>a</sup> , ♀ (n=564) 77.3% <sup>a</sup> vs. (n=1486) 69.2% <sup>a</sup>	NA
Shida et al., 2019	Japan	Longitudi- nal	Patients with NAFLD on abdominal US (n=92)	39.1%	55.5±14. 3	$\Delta$ LSM, $\Delta$ CAP	BIA	$\Delta$ SMM/VFA	Worsened (n=32) vs. stable (n=46) vs. improved (n=14) $\Delta$ SMM/VFA $\Delta$ LSM: 1.3 vs. 0.6 vs. 0.9, NS $\Delta$ CAP: 27.9 vs. 1.0 vs. -20, p<0.01	NA
Wijarnpreech a et al., 2019	United States	Cross- sectional	Nationally representative surveys (NHANES 1988-1994), 20-74y, NAFLD on US (n=4188)	47.1%	45.4±0.4 3	NFS	BIA	SMM/weight (<37% in ♂, <28% in ♀)	NFS>0.676: OR 5.20 (3.20-8.44), AOR 1.79 (1.18- 2.72) NFS>0.12 in patients aged ≥65 years: OR 4.57 (3.19- 6.54), AOR 1.74 (1.22-2.48)	age, sex, ethnicity, WC, DM, smoking, HT, TC, sedentary physical activity, 25[OH]D deficiency

Hyun Kim et al., 2020	South Korea	Cross-sectional	Patients with NAFLD on US (n=957)	60.1%	51.4±14.2	CAP, LSM	BIA	ASM/BMI (<0.789 ♂, <0.521 ♀)	Sarcopenic (n=123) vs. non-sarcopenic (n=834): CAP 309.5±39.6 vs. 307.9±40.2, p=0.680; LSM 8.4±6.0 vs. 6.6±3.5, p=0.001	NA
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<sup>a</sup> Calculated by authors, <sup>b</sup> not specified if ASM or SMM, <sup>c</sup> serum albumin was not used due to lack of data, <sup>d</sup> only 1969 subjects were analyzed due to missing GGT values; ♂ – male, ♀ – female, 25[OH]D – 25-hydroxyvitamin D, AGR – android-fat-to-ginoid-fat ratio, AHR – adjusted hazard ratio, ALT – alanine aminotransferase, AOR – adjusted odds ratio, ASM – appendicular skeletal muscle mass (kg), AST – aspartate aminotransferase, BARD – BARD score, BIA – bioelectrical impedance analysis, BMI – body mass index (kg/m<sup>2</sup>), CAP – controlled attenuation parameter, CHD – coronary heart disease, CNS – comprehensive NAFLD score, COPD – chronic obstructive pulmonary disease, CRP – C-reactive protein, CT – computed tomography, CVD – cerebrovascular disease, DM – diabetes mellitus, DXA – dual-energy X-ray absorptiometry, eGFR – estimated glomerular filtration rate, F – fibrosis grade, FIB-4 – fibrosis-4 index, FM – fat mass (kg), FLI – Fatty Liver Index, FPG – fasting plasma glucose, G3 – grade 3, GGT – gamma-glutamyltransferase, HbA1c – glycated hemoglobin, HDL-c – high-density lipoprotein cholesterol, HOMA-IR – homeostasis model of insulin resistance, hsCRP – high sensitivity C-reactive protein, HSI – hepatic steatosis index, HT – hypertension, IQR – interquartile range, KNHANES – Korean National Health and Nutrition Examination Survey, L4 – 4<sup>th</sup> lumbar vertebrae, LB – liver biopsy, LDL-c – low-density lipoprotein cholesterol, LFS – liver fat score, LSM – liver stiffness, MetS – metabolic syndrome, NA – not applicable, NAFL – non-alcoholic fatty liver, NAFLD – non-alcoholic fatty liver disease, NAS – NAFLD activity score, NASH – non-alcoholic steatohepatitis, NFS – NAFLD fibrosis score, NHANES – National Health and Nutrition Examination Survey, NS – non-significant, NR – not reported, OR – odds ratio, Q1 – lowest quartile, Q4 – highest quartile, SD – standard deviation, SMM – skeletal muscle mass, T2DM – type 2 diabetes mellitus, T3 – highest tercile, TC – total cholesterol, TG – triglycerides, TPA – total psoas muscle area (cm<sup>2</sup>), UA – uric acid, US – ultrasound, VFA – visceral fat area (cm<sup>2</sup>), WC – waist circumference, WCR – waist-to-calf ratio, y – years

Table S4 – Characteristics and results of studies assessing the association of muscle strength and/or performance and severity of NAFLD

Authors	Country	Study type	Setting and population (size)	Male (%)	Age (y), mean±SD or median (IQR)	Assessment of NAFLD severity	Assessment of muscle strength or performance		Association or risk measure	Confounder adjustment
							Method	Parameter		
Peng et al., 2017	United States	Cross-sectional	Nationally representative survey (NHANES 1988-1994), 60-75y (n=2551)	48.6%	66.71 (mean)	US	Physical examination	Gait speed	Mild steatosis OR 1.29 (1.01-1.65), AOR 1.12 (0.86-1.45); moderate steatosis OR 1.32 (1.07-1.64), AOR 1.17 (0.92-1.47); severe OR 1.15 (0.88-1.50), AOR 0.94 (0.70-1.25)	age, sex, race/ethnicity, TC, 25[OH]D, HbA1c, CRP, UA, physical activity, smoking
Cruz et al., 2019	Brazil	Cross-sectional	Patients with NAFLD on US (n=59)	NR	NR	US	Dynamometer	EFS/BMI KES/BMI	Grade 1 vs. Grade 2 vs. Grade 3 EFS/BMI: ♂ 2.70±0.55 vs. 2.59±0.62 vs. 2.12±0.25, ♀ 3.12±0.80 vs. 2.20±0.60 vs. 1.67±0.46; p=0.028 KES/BMI: ♂ 3.93±1.05 vs.	NA

									4.01±0.91 vs. 2.29±0.63, ♂ 3.06±1.44 vs. 2.90±1.10 vs. 2.30±0.77; p=0.013	
Kang et al., 2020	South Korea	Cross-sectional	Nationally representative survey (KNHANES 2014-2016), 35-65y, HSI>36 (n=2029)	42.4%	45.6±0.2	FIB-4 ≥1.30, BARD ≥2	Dynamo meter	HGS/BMI (Q1)	FIB-4: OR 1.66 (1.01-2.49), AOR 1.35 (0.75-2.45) BARD: OR 1.81 (1.30-2.51), AOR 1.68 (1.07-2.62)	Age, sex, obesity, DM, HT, dyslipidaemia, HOMA-IR, elevated hs-CRP level
Park et al., 2020	South Korea	Cross-sectional	Nationally representative surveys (KNHANES 2015), ≥19y, NAFLD (LFS >-0.640) (n=946)	NR	♂ 45.0 (0.5) ♀ 46.9 (0.5)	FIB-4, NFS	Dynamo meter	HGS/BMI	FIB-4: Q1 1.38 vs. Q4 0.92, p<0.05 NFS: Q1 vs. Q4 p<0.001	NA

25[OH]D – 25-hydroxyvitamin D, AOR – adjusted odds ratio, BMI – body mass index (kg/m<sup>2</sup>), CRP - C-reactive protein, EFS – elbow flexors strength (kg), FIB-4 – Fibrosis-4 Index for Liver Fibrosis, HbA1c – glycated hemoglobin, HGS – handgrip strength (kg), HSI – hepatic steatosis index, IQR – interquartile range, IR – insulin resistance, KES – knee extension strength (kg), KNHANES – Korean National Health and Nutrition Examination Survey, LFS – liver fat score, NA – not applicable, NAFLD – non-alcoholic fatty liver disease, NFS – NAFLD fibrosis score, NHANES – National Health and Nutrition Examination Survey, NR – not reported, OR – odds ratio, Q1 – lowest quartile, Q4 – highest quartile, SD – standard deviation, TC – total cholesterol, UA – uric acid, US – ultrasound, y – years

Table 5 – Characteristics and results of studies assessing the association of sarcopenia and presence or severity of NAFLD

Authors	Country	Study type	Setting and population (size)	Male (%)	Age (y), mean $\pm$ SD or median (IQR)	Diagnosis of NAFLD	Definition of sarcopenia	Association or risk measure	Confounder adjustment
Peng et al., 2017	United States	Cross-sectional	Nationally representative survey (NHANES 1988-1994), 60-75y (n=2551)	48.6%	66.71 (mean)	US	SMM/weight (BIA) $<37.0$ ♂, $<28$ ♀ or SMM/height <sup>2</sup> (BIA) $<10.76$ in ♂, $<6.75$ in ♀ or SMM/BMI (BIA) $<0.99$ ♂, $<0.58$ ♀ or SMM (BIA) $<26.51$ ♂, $<16.14$ ♀ and Gait speed $\leq 0.08$	SMM/weight: mild steatosis OR 1.44 (1.13-1.83), AOR 1.43 (1.11-1.86); moderate steatosis OR 1.94 (1.57-2.39), AOR 1.88 (1.50-2.37); severe steatosis OR 1.67 (1.27-2.18), AOR 1.52 (1.14-2.04) SMM/height <sup>2</sup> : mild steatosis OR 1.05 (0.82-1.36), AOR 0.92 (0.70-1.21); moderate steatosis OR 0.79 (0.62-0.99), AOR 0.72 (0.56-0.92); severe steatosis OR 0.68 (0.50-0.93),	age, sex, race/ethnicity, TC, 25[OH]D, HbA1c, CRP, UA, physical activity, smoking

								<p>AOR 0.64 (0.46-0.90)</p> <p>SMM/BMI: mild steatosis AOR 1.67(1.22-2.29), moderate steatosis AOR 1.99 (1.51-2.62), severe steatosis AOR 1.77 (1.25-2.50)</p> <p>SMM: mild steatosis AOR 1.00 (0.72-1.38), moderate steatosis AOR 0.64 (0.46-0.89), severe steatosis AOR 0.78(0.52-1.18)</p>	
Zhai et al., 2018	China	Cross-sectional	Inpatients, >60y (n=494)	43.7%	71.28 (mean)	US	<p>ASM/height<sup>2</sup> (DXA) &lt;7.0 ♂, &lt;5.4 ♀</p> <p>HGS &lt;26 ♂, &lt;18 ♀</p> <p>gait speed &lt;0.8</p>	<p>R=-0.15, p=0.001</p>	age, sex, BMI, HT, DM, HbA1c, high UA hematic disease, hs-CRP, ALT, AST, TC, TG, LDL-c, HDL-c
Alferink et al., 2019	The Netherlands	Cross-sectional	Health survey, european, ≥45y (The Rotterdam Study) (n=4609)	43.0%	69.3±9.2	US	<p>ASM/height<sup>2</sup> (DXA) ≤7.25 ♂, ≤5.67 ♀</p> <p>and</p> <p>HGS ♂ ≤29 kg for BMI ≤24 kg/m<sup>2</sup>, ≤30 kg for BMI 24.1-28 kg/m<sup>2</sup>, ≤32 kg for BMI &gt;28 kg/m<sup>2</sup>; ♀ ≤17 kg for BMI ≤23 kg/m<sup>2</sup>, ≤17.3 kg for BMI 23.1-26 kg/m<sup>2</sup>,</p>	<p>Normal weight: ♂ AOR 2.20 (0.94-5.13), ♀ AOR 1.23 (0.49-3.07)</p> <p>Overweight: ♂ AOR 1.88 (0.95-3.72), ♀ AOR 0.57 (0.14-2.41)</p>	age, study cohorts, weight, height, HOMA-IR, TG, AGR

							≤18 kg for BMI 26.1-29 kg/m <sup>2</sup> , ≤21 kg for BMI >29 kg/m <sup>2</sup> or Gait speed ♂ <0.65 if height ≤173 cm, <0.76 if height >173 cm; ♀ <0.65 if height ≤159 cm, <0.76 if height >159 cm		
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25[OH]D – 25-hydroxyvitamin D, AGR – android-fat-to-ginoid-fat ratio, ALT – alanine aminotransferase, AOR – adjusted odds ratio, ASM – appendicular skeletal muscle mass (kg), AST – aspartate aminotransferase, BIA – bioelectrical impedance analysis, BMI – body mass index (kg/m<sup>2</sup>), CRP - C-reactive protein, DM – diabetes mellitus, DXA – dual-energy X-ray absorptiometry, HbA1c – glycated hemoglobin, HDL-c – high-density lipoprotein cholesterol, HGS – handgrip strength, hsCRP – high sensitivity C-reactive protein, HOMA-IR – homeostasis model of insulin resistance, HT – hypertension, IQR – interquartile range, LDL-c – low-density lipoprotein cholesterol, NAFLD – non-alcoholic fatty liver disease, NHANES – National Health and Nutrition Examination Survey, OR – odds ratio, SD – standard deviation, SMM – skeletal muscle mass, TC – total cholesterol, TG – triglycerides, UA – uric acid, US – ultrasound, y – years