Table S1 – Main characterstics of observational studies included in the meta-analysis (n=33).

Author, Year	PMID	Country	Study design	Follow-up (years)	Sample size (n)	Patients with NAFLD (n)	NAFLD diagnosis	Incident cases of diabetes (n)	Diagnosis of diabetes	Covariate adjustment(s)	Main findings	NOS scale
Okamoto M et al. 2003	12587609	Japan	Retrospective	10	840 (mean age 43 years, BMI 23 kg/m^2, 57% men)	120	Ultrasonography	82	Fasting glucose >6.1 mmol/l or HbA1c ≥6.5%	Age, sex, BMI, family history of diabetes, fasting glucose, HbA1c, alcohol intake, frequency of check-ups, changes of BMI during follow-up	NAFLD was not independently associated with incident diabetes (aHR 1.83, 95% CI 0.90-3.50)	6
Shibata M et al. 2007	17666460	Japan	Retrospective	4	3189 (mean age 48 years, BMI 23 kg/m^2, 100% men)	802	Ultrasonography	109	Fasting glucose ≥7.0 mmol/L or 2-hour post-load glucose ≥11.1 mmol/L	Age, BMI, smoking, blood pressure, physical activity, follow-up duration, presence of metabolic syndrome	NAFLD was independently associated with incident diabetes both in the entire cohort (aHR 5.50, 95% CI 3.6–8.5) and in the nested case-control analysis (aHR 4.60, 95% CI 3.0–6.9)	4
Kim CH et al. 2008	18346164	South Korea	Retrospective	5	5372 (mean age 48 years, BMI 25 kg/m^2, 68% men)	1790	Ultrasonography	234	Fasting glucose ≥7.0 mmol/L, clinical history, or drug treatment	Age, sex, BMI, family history of diabetes, smoking, fasting glucose, HDL-cholesterol, triglycerides, serum ALT	NAFLD was independently associated with incident diabetes (aHR 1.51, 95% CI 1.04-2.2). In addition, moderate/severe NAFLD had higher risk of incident diabetes than mild NAFLD	8
Bae JC et al. 2011	21278140	South Korea	Retrospective	5	7849 (mean age 44 years, BMI 24 kg/m^2, 69% men)	2292	Ultrasonography	435	fasting glucose ≥7.0 mmol/L or HbA1c ≥6.5%	Age, sex, BMI, triglycerides, HDL-cholesterol, systolic blood pressure, smoking, physical activity, alcohol intake, IFG status	NAFLD was independently associated with incident diabetes (aHR 1.33, 95% CI 1.10-1.70)	8
Sung KC et al. 2012	22338098	South Korea	Retrospective	5	12853 (mean age	3555	Ultrasonography	223	Fasting glucose ≥7.0	Age, sex, BMI, educational	NAFLD was independently	7

					42 years, BMI 25 kg/m^2, 72% men)				mmol/L, clinical history, or drug treatment	status, smoking, physical activity, alcohol intake, HOMA-IR, triglycerides, serum ALT	associated with incident diabetes (aOR 2.42, 95% CI 1.70-3.40)	
Park SK et al. 2012	23213066	South Korea	Prospective	5	25232 (mean age 42 years, BMI 24 kg/m^2, 100% men)	8831	Ultrasonography	2108	Fasting glucose ≥7.0 mmol/L, previous history, or drug treatment	Age, waist circumference, HDL-cholesterol, triglycerides, systolic blood pressure, C-reactive protein, HOMA-IR, creatinine, family history of diabetes, physical activity, metabolic syndrome	The aHRs for incident diabetes were increased in mild steatosis (1.09, 95% CI 0.8–1.5) and in moderate/severe steatosis (1.73, 95% CI 1.0–3.0) vs. no-steatosis	8
Kasturiratne A et al. 2013	22989165	Sri Lanka	Retrospective	3	2276 (mean age 52 years, BMI 25 kg/m^2, 41% men)	926	Ultrasonography	242	Fasting glucose ≥7.0 mmol/L, previous history, or drug treatment	Age, sex, BMI, waist circumference, family history of diabetes, hypertension, serum ALT, dyslipidemia, IFG status	NAFLD was independently associated with incident diabetes (aHR 1.64, 95% CI 1.20-2.20)	6
Choi JH et al. 2013	23398788	South Korea	Retrospective	4	7849 (mean age 45 years, BMI 25 kg/m^2, 69% men)	2276	Ultrasonography	435	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or drug treatment	Age, sex, BMI, systolic blood pressure, triglycerides, HDL-cholesterol, IFG status, physical activity, smoking, alcohol intake	NAFLD and elevated ALT was independently associated with incident diabetes (aHR 1.64, 95% CI 1.30-2.10)	8
Chang Y et al. 2013	24100261	South Korea	Retrospective	5	38291 (mean age 37 years, BMI 23 kg/m^2, 63% men)	11640	Ultrasonography	2025	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or drug treatment	Age, sex, smoking, alcohol intake, physical activity, family history of diabetes, plasma lipid profile, HOMA-IR, C-reactive protein	aHRs for incident diabetes in NAFLD with low NFS and NAFLD with intermediate/high NFS vs. no NAFLD were 2.01, 95% CI 1.8–2.2, and 4.74, 95% CI 3.7–6.1, respectively	8

Yamazaki H et al. 2015	26156527	Japan	Retrospective	11.3	3074 (mean age 43 years, BMI 24 kg/m^2, 61% men)	728	Ultrasonography	189	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or history or drug treatment	Age, sex, family history of diabetes, BMI, IFG status, dyslipidemia, hypertension, physical activity	NAFLD was independently associated with incident diabetes (aOR 2.37, 95% CI 1.60-3.50). In addition, improvement of NAFLD was associated with a diabetes risk reduction	8
Ming J et al. 2015	25879672	China	Retrospective	5	508 (mean age 46 years, BMI 24 kg/m^2, 42% men)	97	Ultrasonography	20	Fasting glucose ≥7.0 mmol/L or 2-hour post-load glucose ≥11.1 mmol/L or drug treatment	Age, sex, BMI, educational level, smoking, alcohol intake, physical activity, family history of diabetes, blood pressure, fasting glucose, 2-h glucose, triglycerides, HDL-cholesterol	NAFLD was independently associated with incident diabetes (aHR 4.46, 95% CI 1.90-10.7)	6
Li WD et al. 2015	26327768	China	Retrospective	4	4736 (mean age 53 years, BMI 24 kg/m^2, 67% men)	1412	Ultrasonography	380	Fasting glucose ≥7.0 mmol/L, previous history, or drug treatment	Age, sex, blood pressure, lipids, serum ALT, uric acid, creatinine	NAFLD was independently associated with incident diabetes (aHR 3.37, 95% CI 2.40-4.30)	7
Shah RV et al. 2015	26209814	USA	Prospective	9.1	3153 (mean age 59 years, BMI 27 kg/m^2, 44% men)	786	Computed tomography	216	Fasting glucose ≥7.0 mmol/L, previous history, or drug treatment	Age, sex, race, family history of diabetes, BMI, waist circumference, systolic blood pressure, triglycerides, HDL-cholesterol, fasting glucose, C-reactive protein, physical activity, statin use	NAFLD was independently associated with incident diabetes (aHR 2.06, 95% CI 1.5-2.8)	8
Fukuda T et al. 2016	26176710	Japan	Retrospective	12.8	4629 (mean age 42 years, BMI 22	1779	Ultrasonography	351	Fasting glucose ≥7.0 mmol/l or HbA1c	Age, sex, family history of diabetes, alcohol intake, smoking,	aHRs for incident diabetes were: 3.59 (95%CI 2.1–5.8) in the non-	7

					kg/m^2, 59% men)				≥6.5% or drug treatment	regular exercise, HbA1c level	overweight NAFLD group, 1.99 (95%CI 1.5–2.7) in the overweight group without NAFLD, and 6.77 (95%CI 5.2–8.9) in the overweight NAFLD group	
Chen GY et al. 2016	27042272	China	Retrospective	6	6542 (mean age 35 years, BMI 23 kg/m^2, 86% men)	209	Ultrasonography	368	Fasting glucose ≥7.0 mmol/l or HbA1c ≥6.5% or drug treatment	Age, BMI, triglycerides, fasting glucose, IFG status	NAFLD was independently associated with incident diabetes (aHR 2.17, 95% CI 1.60–3.0)	7
Kim SS et al. 2017	29398414	South Korea	Retrospective	5.1	2818 (non-obese: 2059, mean age 46 years, BMI 23 kg/m^2, 56% men; obese: 759 mean age 47 years, BMI 27 kg/m^2, 72% men)	924	Ultrasonography	193	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or previous history or drug treatment	Age, sex, waist circumference, plasma lipid profile, uric acid level, smoking	NAFLD was independently associated with incident diabetes both in non-obese group (aHR 2.69, 95% CI 1.72-4.20) and in obese group (aHR 2.81, 95% CI 1.73-4.84)	7
Mitsuhashi K et al. 2017	28867686	Japan	Retrospective	5.1	17810 (15794 without metabolic syndrome) (mean age 45 years, BMI 23 kg/m^2, 59% men)	3846	Ultrasonography	491	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or previous history or drug treatment	Age, BMI, physical activity, smoking status, alcohol consumption, fasting glucose	NAFLD was independently associated with incident diabetes both in those with (aHR 2.33, 95% CI 1.85-2.94) and those without metabolic syndrome (aHR 2.35, 95% CI 1.91-2.89)	8
Chen SC et al. 2017	28680048	Taiwan	Prospective	5.8	132377 (mean age 45 years, BMI 24 kg/m^2, 49% men)	42410	Ultrasonography	6555	Fasting glucose ≥7.0 mmol/L, previous history, or drug treatment	Age, BMI, family history of diabetes, hypertension, smoking, drinking, physical activity, lipids,	NAFLD was independently associated with incident diabetes both in women (aHR 2.70, 95% CI 2.46-2.96) and in	9

										serum liver enzymes	men (aHR 1.98, 95% CI 1.81-2.16)	
Ma J et al. 2017	27729222	USA	Retrospective	6.2	1051 (mean age 46 years, BMI 28 kg/m^2, 54% men)	187	Ultrasonography	64	Fasting glucose ≥7.0 mmol/L, previous history, or drug treatment	Age, sex, smoking, exercise, alcohol intake, fasting glucose, systolic blood pressure, BMI, visceral adipose tissue, and changes in BMI, visceral adipose tissue, and liver fat over the follow-up	NAFLD was independently associated with incident diabetes (aOR 2.66, 95% CI 1.20–5.70)	8
Liu M et al. 2017	28324002	China	Retrospective	5	18507 (mean age 71 years, BMI 25 kg/m^2, 100% men)	3474	Ultrasonography	453	Fasting glucose ≥7.0 mmol/L or 2-hour post-load glucose ≥11.1 mmol/L or previous history or drug treatment	Age, BMI, smoking, marital status, alcohol intake, hypertension, dyslipidemia	NAFLD was independently associated with incident diabetes (aHR 1.67, 95% CI 1.40–2.10)	7
Li Y et al. 2017	28350839	China	Prospective	4	18111 (mean age 63 years, BMI 26 kg/m^2, 42% men)	5759	Ultrasonography	1262	Fasting glucose ≥7.0 mmol/L, previous history, or drug treatment	Age, sex, BMI, waist circumference, alcohol intake, smoking, exercise, family history of diabetes, fasting glucose, triglycerides, total cholesterol	aHRs for incident diabetes vs. those without NAFLD group were 1.88, 95% CI 1.6–2.2, in the mild NAFLD group and 2.34, 95% CI 1.9–3.0, in the moderate-severe NAFLD group, respectively	8
Björkström K et al. 2017	28479500	Sweden	Retrospective	18.4	396 (mean age 46 years, BMI 28 kg/m^2, 65% men)	396	Biopsy	132	Previous history or drug treatment	None	Higher proportion of NAFLD patients with fibrosis stages 3–4 developed diabetes compared to those with fibrosis stages 0-2 (unadjusted HR 2.30, 95% CI 1.12-	8

											4.75)	
Shen X et al. 2018	29975579	China	Prospective	3.6	41650 (mean age 51 years, 65% men)	11809	Ultrasonography	2763	Fasting glucose ≥7.0 mmol/L, or drug treatment	Age, sex, smoking, physical activity, education status, family incomes, family history of diabetes, waist circumference, hypertension, serum ALT, lipids, fasting glucose, uric acid, C-reactive protein, presence of metabolic syndrome	NAFLD was independently associated with incident diabetes (aHR 1.62, 95% CI 1.49-1.76). In addition, patients with severe steatosis had a higher risk of incident diabetes than those with moderate/mild steatosis (aHR 2.66, 95% CI 2.17-3.25)	8
Bae JC et al. 2018	29111276	South Korea	Retrospective	4	5564 (mean age 45 years, BMI 24 kg/m^2, 69% men)	1383	Ultrasonography	174	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or previous history or drug treatment	Age, sex, BMI, fasting glucose, HbA1c, plasma lipid profile, systolic blood pressure, HOMA-IR, smoking	NAFLD was independently associated with incident diabetes (aHR 1.50, 95% CI 1.13-1.98)	7
Zhang J et al 2018	29936075	China	Prospective	2.2	45022 (mean age 46 years, BMI 24 kg/m^2, 63% men)	10212	Ultrasonography	1051	Fasting glucose ≥7.0 mmol/L, previous history, or drug treatment	Age, BMI, education level, smoking, alcohol consumption, family history of diabetes, plasma lipid profile, uric acid, systolic blood pressure	NAFLD was independently associated with incident diabetes (aHR 2.26, 95% CI 1.95-2.63)	8
Sung KC et al. 2018	29860108	South Korea	Prospective	3.9	29836 (mean age 37 years, BMI 27 kg/m^2, 81% men)	16833	Ultrasonography	1200	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or previous history or drug treatment	Age, sex, center, year of screening exam, smoking, alcohol intake, regular exercise, family history of diabetes, education level, metabolic syndrome, C-reactive protein	NAFLD was independently associated with incident diabetes both in women (aHR 3.09, 95% CI 2.04-4.67) and in men (aHR 2.03, 95% CI 1.73-2.38)	8
Sinn DH et al. 2019	31176297	South Korea	Retrospective	4	51453 (non-obese:	15841	Ultrasonography	5357	Fasting glucose ≥7	Age, sex, year of visit, smoking,	NAFLD was independently	6

					21974, mean age 49 years, BMI 22 kg/m^2, 33% men; obese: 29479, mean age 51 years, BMI 26 kg/m^2, 67% men)				mmol/l or HbA1c ≥6.5% or previous history or drug treatment	alcohol intake, systolic blood pressure, fasting glucose, plasma lipid profile, use of anti-hypertensive or lipid-lowering drugs	associated with incident diabetes both in non-obese group (aHR 1.18, 95% CI 1.03-1.35) and in obese group (aHR 1.45, 95% CI 1.34-1.57)	
Cho HJ et al. 2019	30970431	South Korea	Retrospective	5.2	2726 (mean age 44 years, BMI 23 kg/m^2, 58% men)	670	Ultrasonography	141	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5%	Age, sex, BMI, fasting glucose, serum ALT	Presence of persistent NAFLD was independently associated with incident diabetes (aHR 3.59, 95% CI 2.05-6.27)	8
Lee J et al. 2019	31754157	South Korea	Retrospective	4.3	6240 (mean age 51 years, BMI 25 kg/m^2, 74% men)	2830	Ultrasonography	505	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or previous history or drug treatment	Age, sex, BMI, smoking, alcohol, serum ALT, triglycerides, HDL-cholesterol, systolic blood pressure, HbA1c	NAFLD was independently associated with incident diabetes (aHR 1.81, 95% CI 1.47-2.21)	7
Önnerhag K et al. 2019	30907181	Sweden	Prospective	18.8	144 (mean age 53 years, BMI 28 kg/m^2, 58% men)	144	Biopsy	77	Previous history or drug treatment	Sex, BMI, cardiovascular disease, hypertension, histologic stages of liver fibrosis	High FIB-4-index was independently associated with incident diabetes (aHR 4.18, 95% CI 1.96-8.92)	7
Fuse K et al. 2020	31904446	Japan	Prospective	5	640 (mean age 64 years, BMI 23 kg/m^2, 100% men)	121	Computed tomography	36	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or previous history or drug treatment	Age, family history of diabetes, smoking, alcohol intake, physical activity, BMI, waist circumference, and visceral fat	NAFLD was independently associated with incident diabetes (aHR 2.27, 95% CI 1.00-5.14)	7
Nasr P et al. 2020	32087038	Sweden	Prospective	2	106 (mean age 49 years, BMI 28	106	Ultrasonography	66	Fasting glucose ≥7.0 mmol/L or 2-hour post-	Age, BMI	Histologic fibrosis stage was independently associated with	7

					kg/m^2, 69% men)				load glucose ≥11.1 mmol/L or drug treatment		incident diabetes (aHR 6.0, 95% CI 1.32, 27.05 for stage F4 and aHR 1.54, 95% CI 0.65-3.67 for stage F3)	
Ampuero J et al. 2020	32147361	Spain	Prospective	5.6	178 (mean age 45 years, BMI 31 kg/m^2, 56% men)	178	Ultrasonography	16	Fasting glucose ≥7 mmol/l or HbA1c ≥6.5% or drug treatment	Age, sex, BMI, serum AST, ALT, bilirubin, albumin, fasting glucose, plasma lipid profile, platelet count and presence of NASH on histology	NAFLD with significant fibrosis was independently associated with incident diabetes (aHR 3.39, 95% CI 1.11-3.58)	8

Abbreviations: ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; aHR, adjusted HR; aOR, adjusted OR; BMI, body mass index; CI, confidence interval; GGT, gamma-glutamyl transferase; HbA1c, haemoglobin A1c; HOMA-IR, HOMA of insulin resistance; IFG, impaired fasting glycaemia; NFS, NAFLD fibrosis score; NOS, Newcastle-Ottawa Scale category.

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