

Electronic supplementary material

ESM Table 2 Selected characteristics of studies examining the incidence of depression in type 2 diabetes mellitus

Study	Design	Number of participants without depression at baseline			Age (years) at baseline			Length of follow-up (years)	Criteria for depression	Assessment of T2DM	Cases of incident depression	Outcome unadjusted	Outcome adjusted	Methodological issues
		Baseline	Follow-up I	Follow-up II	Mean (SD)	Range	% Male							
USA: Palinkas et al. [21]	Prospective population study	<i>N</i> =971 DM: 116 (11.9%)	<i>N</i> =971 16.1% had T2DM	n/a	66.2 (8.7)	50–89	43	8	BDI ≥11	OGTT, medication for diabetes, advised by physician, or FPG ≥ 7.0 mmol/l	118 (12%)	χ ² =0.01, <i>p</i> =NS	OR = 0.73 (95% CI = 0.41–1.30) ^a	3 of the 21 BDI items excluded at baseline Predominantly female
NL: Bisschop et al. [22]	Prospective population study	<i>N</i> =2,277 DM: <i>n</i> =121 (5.3%)	<i>N</i> =2,205 DM: <i>n</i> =165	<i>N</i> =1,839 DM: <i>n</i> =176 (9.6%)	68.8 (8.5)	55–85	46.7	3, 6	CES-D ≥16	Self-report	n/a	n/a	OR = 0.97 (95% CI = 0.714–1.306) ^b OR = 0.73 (95% CI = 0.53–0.998) ^c	Participants with depression at baseline controlled for statistically
USA: Polsky et al. [23]	Prospective cohort study	<i>N</i> =8,387 DM: <i>n</i> =571	n/a	n/a	55.8 (3.2)	51–61	48.2	2, 4, 6, 8	8 items of the CES-D with cut-off score of 5	Self-report	No DM: 5.7% DM: 5.5%	>0–2 years HR=1.03 (0.70–1.52), <i>p</i> =0.87 >2–4 years HR=1.02 (0.62–1.69), <i>p</i> =0.93 >4–8 years HR =0.90 (0.51–1.58), <i>p</i> =0.71	HR = 1.17 (0.98–1.41), <i>p</i> =0.09 ^d	Depressive symptoms assessed 0–2 years after diagnosis of DM Only used 8 items of CES-D Participants born between 1931 and 1941
CDN: Brown et al. [24]	Retrospective population-cohort study	<i>N</i> =99,677 DM: <i>n</i> =31,635 Case matched	<i>N</i> =99,677 DM: <i>n</i> =31,635 Case matched	n/a	52 non-depressed DM 61.5 depressed	20–95 20–95	n/a 55.7	Average follow-up time was 4.5 years (SD=2.9)	Composite definition: Prescription for antidepressant medication and 3 ICD-9 codes for depressive	Physician service claims for diabetes (ICD-9 code 250) within 2-year	DM: 919/31,635 (2.9%). Without DM: 1,615/57,141 (2.8%)	HR=1.10 (95% CI = 1.01–1.19)	HR=1.04 (0.94–1.15) ^e	Blacks and Hispanics over-sampled Some population groups excluded Depression diagnosis made by healthcare professionals

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		controls: <i>n</i> =57,141	controls: <i>n</i> =57,141		DM 58.3	21–91	47.2%							
					non-depressed controls 46.9	20–94	50.2%		disorder (296, 309, 311) within 6-month period from physician notes	period, ≥ 1 hospitalisation with diabetes code as primary, secondary or tertiary diagnosis	Unadjusted incident rate of depression in the diabetes cohort was 6.5 per 1,000 person-years and 6.6 for the non-diabetes cohort			DM were incident cases Those on insulin excluded
					depressed controls 44.5	20–93	36.7		Depressive episodes up to 3 years before study index date were excluded					
K: Kim et al. [25]	Prospective cohort study	<i>N</i> =521 (7 used antidepressant medication. Exclusion did not alter the results DM: <i>n</i> =47	<i>N</i> =521 DM: <i>n</i> =47		n/a	≥65	n/a	2.4 (0.3)	Community version of the Geriatric Mental State diagnostic schedule. Stage one confidence level of 3 or above in the Automated geriatric Examination for Computer Assisted Taxonomy algorithm	Self-report	DM: 47	OR = 1.0 (95% CI = 0.4–2.5)		No details regarding diabetes. Small <i>N</i>
SP: De Jonge et al. [26]	Prospective cohort study	<i>N</i> =4,757 DM: <i>n</i> =597 46 people were doubtful cases and deleted from analysis	<i>N</i> =3,237	<i>N</i> =2,403	73.5 (9.9)	≥55	42.5	2, 5	Mini-Mental State Examination; interview based on Geriatric Mental State	Self-report	DM: 98/597 (16.5%) ^f Without DM: 520/4,160 (12.4%)	OR unadjusted = 1.4 (95% CI = 1.03–1.9)	OR adjusted = 1.42 (95% CI = 1.04–1.93) ^g When no other chronic somatic disease OR 1.26 (95% CI 0.90–1.77), NS ^h	Used diagnosis of depression Predominantly female

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		Baseline	Follow-up I	Follow-up II	Mean (SD)	Range	% Male							
N: Engum [27]	Prospective population-based study ⁱ	<i>N</i> =37,291 DM: <i>n</i> =337	n/a		Non-depressed 55.2 (14.0) depressed 57.5 (13.4)	30–89	49 40.9	10	T1: compound index of four items relating to nervousness, calmness, mood, and vitality T2: HADS-D (≥8) and compound index	T1: Self-report T2: self-report and non-fasting glucose, HbA _{1c} GAD, C-peptide test and insulin treatment	8.4% of all participants without depression/anxiety symptoms at T1 had HADS-D ≥ 8 at T2	OR = 1.82 (95% CI = 1.14–2.89), <i>p</i> =0.011	OR = 1.24 (95% CI = 0.78–1.98) <i>p</i> =0.368 ^f	Small <i>N</i> Assessment of depression different at T1 and T2
USA: Maraldi et al. [28]	Secondary analysis of prospective population study ^j	<i>N</i> =2,522 DM=597	<i>N</i> =1,925 DM: <i>n</i> =597	-	73.7 (2.9) DM: 73.7 (2.9)	70–79	48.4 DM: 56.6	6	Prevalent depression: self-report or use of antidepressant Incident depression: current use of antidepressant at clinic visits and no prior use of antidepressants Depressed symptoms at baseline, and follow-up years 2, 3, 5, and 6: CES-D≥10	Prevalent DM: self-report or hypoglycaemic medication use Uncontrolled DM: FPG ≥ 7 mmol/l or after 75 g OGTT	Depressed mood: DM 145/597 (24.3%) Without DM 372/1,925 (19.3%)	n/a	OR=1.31 (95% CI = 1.07–1.61) ^k OR=1.27 (95% CI = 1.03–1.57) ^l OR=1.19 (95% CI = 0.96–1.47) ^m	Age group 70–79 years May include T1DM

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USA: Golden et al. [29]	Prospective cohort study	<i>N</i> =6,814	n/a	n/a	n/a	n/a	n/a	3.1	CES-D \geq 16, self-reported use of antidepressants or both	Fasting BG \geq 7 mmol/l or use of oral hypoglycaemic medication, insulin or both	Treated DM <i>N</i> =60/417 (14.4%) or 969 person-years); incidence rate 61.9/1,000 person-years	n/a	Base model	Distinguished between treated and untreated DM Incident depression symptoms assessed at 1 follow-up visit No control for marital status
		Treated DM: <i>n</i> =417			Treated DM 64.9 (9.40)		Treated DM 54.5%				Treated DM OR=1.54 (95% CI = 1.13–2.09) ⁿ			
		Untreated DM: <i>n</i> =203			Untreated DM 63.7 (9.5)		Untreated DM 61.6%				Untreated DM OR=0.75 (95% CI = 0.44–1.27) ⁿ			
		Normal fasting: <i>n</i> =2,868			Normal fasting 60.7 (10.1)		Normal fasting 45.3%				Treated DM OR=1.52 (95% CI = 1.09–2.12) ^o			
NL: Luijendijk et al. [30]	Prospective cohort study	<i>N</i> =2,931	<i>N</i> =2,931	-	71.0 (6.3)	61–95	42	Mean = 5	CES-D \geq 16 followed by diagnostic interview (Schedules for Clinical Assessment in Neuro-psychiatry, SCAN)	Fasting plasma glucose \geq 7.0 mmol/l or OGTT \geq 11.1 mmol/l or treatment with hypoglycaemic medication	Overall sample: 303 had CES-D \geq 16	n/a	Incident depressive symptoms Beta=0.76 (95% CI = 0.02–1.50), <i>p</i> =0.043 ^s	Used diagnosis of depression Study of cardiovascular risk factors and incident depression. Diabetes was one risk factor. Diabetes sample may include T1DM
		DM: <i>n</i> =391									94 met DSM-IV criteria for depressive disorder (MDD <i>n</i> =46, MinDD <i>n</i> =41, dysthymia <i>n</i> =7)	Beta=0.73 (95% CI = -0.10, 1.57), <i>p</i> =0.085 ^p	Incident depressive disorder: OR=1.31	

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												(95% CI = 0.75 – 2.29), $p=0.34^e$		
												OR=2.07 (95% CI = 1.11–3.85), $p=0.022^p$		
USA: O'Connor et al. [31]	Retrospective population cohort study	Prevalent DM: $n=2,932$ Case-matched controls: $n=14,144$	n/a	n/a	DM: 61.0 (0.12) Controls 61.0 (0.12)	≥ 40	DM: 51.9 Controls : 51.9	2	Presence of 1 or more inpatient or 2 or more outpatient ICD-9 codes for depression, or 1 or more outpatient ICD-9 codes for depression in addition to a filled prescription for therapeutic dose of an antidepressant medication	1 or more inpatient, or 2 or more outpatient visits for diabetes (ICD-9) codes for diabetes or patient filled a prescription for a diabetes-specific drug other than metformin	DM: 1,117 (7.9%) Controls: 778 (5.5%)	$\chi^2=24.85, p<0.001$	Prevalent diabetes OR=1.48 (95%CI = 1.35–1.63) ^g	Sample may include T1DM

^aOR adjusted for age, sex, BMI and exercise but not for marital status

^bOR adjusted for age, sex, education level, and living with a partner

^cOR adjusted for age, sex, education level, living with a partner and physical limitations

^dOR adjusted for baseline socioeconomic, demographic, and health variables

^eOR adjusted for age, sex, physician visits, and pre-selected co-morbidities (arthritis, cancer, vascular disease, insulin use)

^fOR adjusted for age, sex, educational level, and marital status

^gOR adjusted for age and sex

^hOR adjusted for age, sex, marital status, education, hypertension, smoking, statin use, cognitive functioning, Katz index, IADL, and presence of chronic somatic disease

ⁱData from two large health studies in Norway, HUNT-1 and HUNT-2 (Nord-Trøndelag Health Studies). All inhabitants of Nord-Trøndelag County aged 20 years and above received invitations to participate in the first and second health studies. Of the total population in the county, 74,997 individuals attended HUNT-1 in 1984–1986 (88.1%) and 65,648 individuals attended HUNT-2 in 1995–1997 (71.3%)

^jFrom a random sample of 3,075 white and all-black Medicare-eligible adults, with oversampling of black participants to provide enough statistical power in each race. Eligibility criteria included no difficulty walking 1/4 of a mile, climbing 10 steps, or performing basic activities of daily living; no life-threatening illness; and no plans to leave the area for 3 years

^kOR adjusted for age, sex, race, study site, and baseline CES-D score

^lOR adjusted for age, sex, race, study site, baseline CES-D score, education level, smoking habits, alcohol intake, and physical activity level

^mBoth ORs adjusted for age, sex, race, study site, baseline CES-D score, education level, smoking habits, alcohol intake, physical activity level, and DM related co-morbidities (hypertension, cerebrovascular disease, ankle-brachial index, obesity, cystatin-C levels, IL-6 levels, 6 m walking speed, and cognitive impairment)

ⁿOR adjusted for age, sex, race/ethnicity, examination site

^oOR adjusted for BMI, SES, lifestyle, diabetes severity

^pAdjusted for age, sex, education, income, disability, cognitive function, BMI, all other CVRFs and medication

BDI, Beck Depression Inventory; CDN, Canada; CES-D, Center for Epidemiologic Studies Depression Scale ; CVRF, cerebrovascular risk factors; DM, diabetes mellitus; FPG, fasting plasma glucose; GAD, glutamic acid decarboxylase; HADS-S, Hospital Anxiety and Depression Scale –Short version; IADL, instrumental activities of daily living; n/a, not available; NL, the Netherlands; N, Norway; SES, socioeconomic status; SK, South Korea; SP, Spain; T1DM, type 1 diabetes mellitus; T2DM= type 2 diabetes mellitus