

Table SI. Search strategy for each database.

Database	Search strategy
MEDLINE-Embase*	'atopic dermatiti*':ab,ti OR eczema:ab,ti AND cogniti*:ab,ti OR dementi*:ab,ti OR alzheimer*:ab,ti OR 'lewy body':ab,ti OR huntington:ab,ti OR chorea:ab,ti AND cohort:ab,ti OR 'case control':ab,ti OR longitudinal:ab,ti OR 'follow up':ab,ti OR prospective:ab,ti OR retrospective:ab,ti OR incidence:ab,ti AND [article]/lim OR [article in press]/lim) AND [humans]/lim
Web of Science	TI=(atopic dermatiti*) OR AB=(atopic dermatiti*) OR TI=(eczema) OR AB=(eczema) AND TI=(cogniti*) OR AB=(cogniti*) OR TI=(dementi*) OR AB=(dementi*) OR TI=(Alzheimer*) OR AB=(Alzheimer*) OR TI=(lewy body) OR AB=(lewy body) OR TI=(huntington) OR AB=(huntington) OR TI=(chorea) OR AB=(chorea) AND TI=(case control) OR AB=(case control) OR TI=(cohort) OR AB=(cohort) OR TI=(longitudinal) OR AB=(longitudinal) OR TI=(follow-up) OR AB=(follow-up) OR TI=(prospective) OR AB=(prospective) OR TI=(retrospective) OR AB=(retrospective) OR TI=(incidence) OR AB=(incidence)
Scopus	TITLE-ABS-KEY(atopic dermatitis) OR TITLE-ABS-KEY(eczema) AND TITLE-ABS-KEY(cognitive) OR TITLE-ABS-KEY(dementia) OR TITLE-ABS-KEY(alzheimer) OR TITLE-ABS-KEY(lewy body) OR TITLE-ABS-KEY(huntington) OR TITLE-ABS-KEY(chorea) AND TITLE-ABS-KEY(case control) OR TITLE-ABS-KEY(cohort) OR TITLE-ABS-KEY(longitudinal) OR TITLE-ABS-KEY(prospective) OR TITLE-ABS-KEY(follow-up) OR TITLE-ABS-KEY(retrospective) OR TITLE-ABS-KEY(incidence)
ScienceDirect	atopic dermatitis OR eczema AND dementia OR alzheimer OR cognitive AND cohort OR case-control OR longitudinal

Table SII. Brief description of outcome datasets utilized in the Mendelian randomization study

Outcome	Source	GWAS ID	Sample size	Cases	Controls	Population
Any cause dementia	FinnGen	finn-b -F5_DEMENTIA	216,771	7,284	209,487	European
Alzheimer's disease	ADGC, EADI, CHARGE, GERAD/PERADES	ieu-b-2	63,926	21,982	41,994	European
Vascular dementia	FinnGen	finn-b-F5_VASCDEM	212,389	881	211,508	European
Cognitive performance	NA	ebi-a-GCST006572	257,841	-	-	European

ADGC, Alzheimer's Disease Genetics Consortium; CHARGE, Cohorts for Heart and Aging Research in Genomic Epidemiology Consortium; EADI, European Alzheimer's Disease Initiative; GERAD/PERADES, Genetic and Environmental Risk in AD/Defining Genetic, Polygenic and Environmental Risk for Alzheimer's Disease Consortium

Table SII. Quality assessment of included studies

Study (cohort)	Selection				Comparability based on design and analysis	Outcome			Assessment
	Representativeness of the sample	Selection of the non-exposed cohort	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study		Assessment of outcome	Was follow up long enough for outcomes to occur	Adequacy of follow up of cohorts	
Eriksson, 2008	1	1	1	1	2	1	1	1	Good
Pan, 2021	1	1	1	1	2	1	1		Good
Magyari, 2022	1	1	1	1	2	1	1	1	Good
Joh, 2023	1	1	1	1	2	1		1	Good
Vingeliene, 2023	1	1	1	1	2	1	1	1	Good

* Good quality: 3 or 4 points in selection domain AND 1 or 2 points in comparability domain AND 2 or 3 points in outcome/exposure domain, Fair quality: 2 points in selection domain AND 1 or 2 points in comparability domain AND 2 or 3 points in outcome/exposure domain, Poor quality: 0 or 1 point in selection domain OR 0 points in comparability domain OR 0 or 1 point in outcome/exposure domain

Table SIV. Instrumental variables for genetically predicted atopic dermatitis in the Mendelian randomization analysis

SNP	Chr	Position (GRCh38)	Effect allele	Other allele	EAF	Beta	SE	<i>p</i> -value
rs7542147	1	25294618	C	T	0.49	0.01703334	0.00422068	8.52E−11
rs12123821	1	152179152	T	C	0.05	0.14612804	0.00777549	4.05E−90
rs61816766	1	152319572	C	T	0.03	0.22010809	0.01042916	6.44E−89
rs72702900	1	152771963	A	T	0.04	0.10720997	0.00849065	2.98E−46
rs61815704	1	152893891	G	C	0.02	0.25042	0.01328663	3.21E−71
rs12133641	1	154428283	G	A	0.39	0.02938378	0.00206121	1.72E−21
rs859723	1	172744543	A	G	0.36	-0.0268721	0.00466499	3.74E−14
rs11811788	1	173150727	G	C	0.24	0.02938378	0.00206121	1.85E−17
rs301804	1	8476441	G	C	0.3	0.0211893	0.00418086	2.3E−09
rs61776548	1	12091024	A	G	0.47	0.01703334	0.00212039	4.2E−08
rs12565349	1	110371629	G	C	0.15	0.0211893	0.00418086	1.3E−08
rs187080438	1	150374354	T	C	0.03	0.06818586	0.01108125	3.7E−10
rs146527530	1	151059196	G	T	0.02	0.10380372	0.01353574	5.5E−15
rs115161931	1	151063299	T	C	0.04	0.07188201	0.00919546	1.0E−13
rs71625130	1	151625094	A	G	0.04	0.08990511	0.00882901	2.4E−27
rs149199808	1	151626396	T	C	0.03	0.12057393	0.00984957	4.4E−30
rs821429	1	153275443	A	G	0.96	-0.0655015	0.00759773	5.9E−18
rs12138773	1	153843489	A	C	0.03	0.04532298	0.00976276	2.3E−08
rs891058	2	8442547	A	G	0.29	-0.0177288	0.00229617	1.76E−10
rs112111458	2	71100105	G	A	0.12	-0.0268721	0.00466499	5.50E−09
rs2272128	2	103039929	A	G	0.77	-0.0409586	0.00242165	8.14E−35
rs67766926	2	61163581	G	C	0.23	0.0211893	0.00210029	5.7E−10
rs112385344	2	112275538	T	C	0.12	0.02530587	0.00414178	2.8E−09

rs62193132	2	242788256	T	C	0.46	0.01703334	0.00422068	1.5E-09
rs4131280	3	18414570	A	G	0.57	-0.0177288	0.0045688	1.2E-08
rs13097010	3	18673161	G	A	0.34	0.0211893	0.00210029	9.0E-11
rs35570272	3	33047662	T	G	0.4	0.01703334	0.00212039	5.7E-09
rs6808249	3	112648985	T	C	0.54	-0.0177288	0.00229617	9.05E-11
rs45599938	4	123386720	A	G	0.35	0.0211893	0.00210029	4.61E-12
rs10833	4	142654547	C	T	0.65	0.01703334	0.00422068	7.3E-09
rs10214273	5	35883986	G	T	0.27	-0.0268721	0.00466499	5.97E-16
rs17132590	5	110331899	C	T	0.1	0.02938378	0.00612699	1.16E-08
rs4706020	5	130674076	A	G	0.34	-0.0222764	0.00232022	1.12E-11
rs4705908	5	131347520	A	G	0.37	-0.0222764	0.00232022	6.80E-13
rs20541	5	131995964	G	A	0.78	-0.0409586	0.00242165	1.00E-36
rs114503346	5	172192350	T	C	0.04	-0.05061	0.00734583	3.62E-11
rs148161264	5	14604521	G	C	0.04	0.04139269	0.00791437	7.4E-10
rs7701967	5	130059750	A	G	0.31	-0.0222764	0.00461639	3.4E-09
rs4532376	5	176774403	A	G	0.3	0.01703334	0.00422068	3.5E-09
rs41293876	6	31466536	C	G	0.14	-0.0457575	0.00726553	7.02E-16
rs12153855	6	32074804	C	T	0.1	-0.0362122	0.00476532	1.96E-11
rs28383330	6	32600340	G	A	0.13	-0.0555173	0.00497951	1.42E-18
rs9275218	6	32658933	G	C	0.34	0.02530587	0.00414178	5.36E-10
rs629326	6	159496713	T	G	0.61	-0.0222764	0.00461639	1.7E-12
rs72925996	6	90930513	C	T	0.33	-0.0177288	0.00229617	3.2E-10
rs989437	7	28830498	G	A	0.61	-0.0177288	0.00229617	6.1E-11
rs952558	8	81288734	T	A	0.62	-0.0268721	0.00234477	3.60E-20
rs6996614	8	126609868	A	C	0.53	0.02938378	0.00206121	8.48E-17

rs34215892	8	21767240	A	G	0.03	-0.0604807	0.00751187	4.7E-11
rs118162691	8	21767809	A	C	0.05	-0.0362122	0.00476532	7.8E-09
rs7843258	8	141601542	C	T	0.82	0.0211893	0.00418086	1.5E-09
rs7857407	9	33430707	A	T	0.4	0.01703334	0.00212039	2.5E-08
rs10988863	9	102331281	C	A	0.21	-0.0222764	0.00232022	5.1E-11
rs12251307	10	6123495	T	C	0.12	0.04139269	0.00399252	1.98E-20
rs10796303	10	6627700	C	T	0.66	-0.0177288	0.00229617	8.69E-10
rs10822037	10	64376558	C	T	0.61	0.02530587	0.00414178	8.53E-19
rs10836538	11	36365253	T	G	0.34	-0.0177288	0.00229617	9.18E-11
rs28520436	11	36428447	T	C	0.03	0.07918125	0.00726553	1.22E-24
rs10791824	11	65559266	G	A	0.58	0.04139269	0.00200525	1.34E-43
rs7936323	11	76293758	A	G	0.46	0.03342376	0.00406578	2.07E-34
rs11236813	11	76343427	C	G	0.1	-0.0315171	0.00471462	1.94E-12
rs10790275	11	118745884	C	G	0.8	0.02530587	0.00208057	5.46E-11
rs7127307	11	128187383	C	T	0.49	-0.0222764	0.00232022	1.29E-16
rs17368814	11	102748695	G	A	0.13	-0.0222764	0.00461639	1.4E-08
rs11216206	11	116843425	G	C	0.07	0.04139269	0.00791437	5.5E-10
rs705699	12	56384804	A	G	0.4	0.01703334	0.00212039	3.31E-09
rs2227491	12	68646521	C	T	0.61	0.0211893	0.00418086	1.46E-15
rs5005507	12	94611908	C	G	0.74	0.0211893	0.00210029	3.6E-09
rs2415269	14	35638937	A	G	0.26	-0.0268721	0.00466499	2.26E-16
rs4906263	14	103249127	C	G	0.65	0.02530587	0.00208057	2.65E-12
rs7147439	14	105523663	A	G	0.73	-0.0177288	0.00229617	4.7E-08
rs2041733	16	11229589	C	T	0.54	-0.0362122	0.00239547	7.85E-36
rs1358175	17	38757789	T	C	0.63	0.0211893	0.00210029	1.99E-11

rs17881320	17	40485239	T	G	0.08	0.0374265	0.00601608	5.34E-13
rs4247364	17	43336687	C	G	0.7	-0.0177288	0.0045688	4.54E-08
rs56308324	17	45819206	T	A	0.13	0.02530587	0.00414178	4.89E-10
rs28406364	17	47454507	T	C	0.38	0.02530587	0.00208057	5.01E-18
rs2542147	18	12775851	T	G	0.84	-0.0222764	0.00232022	1.5E-09
rs2967677	19	8789721	T	C	0.15	0.03342376	0.00406578	3.35E-20
rs6062486	20	62302539	A	G	0.69	0.0374265	0.00202356	5.03E-30
rs4821569	22	37316873	G	A	0.53	0.0211893	0.00210029	3.14E-13

Chr, chromosome; EAF, effect allele frequency; SE, standard error; SNP, single nucleotide polymorphism

Table SV. Results from Mendelian randomization sensitivity analyses between atopic dermatitis and dementia

Outcome	MRPRESSO			MR-Egger regression		
	Global test \$RSSobs	Global test \$P value	Distortion test \$p-value	Intercept	SE	<i>p</i> -value
Any Cause Dementia	107.09	0.02	NA	0.01	0.01	0.31
Alzheimer's Disease	109.64	0.02	NA	-0.005	0.005	0.27
Vascular Dementia	64.23	0.89	NA	<0.001	0.014	0.99
Cognitive Performance	156.31	<0.001	0.93	0.001	0.001	0.29

SE, standard error