

Table S1. Prevalence of the multimorbidity chronic diseases in patients with pulmonary arterial hypertension

Disease	ICD-10	Prevalence in pulmonary arterial hypertension	Prevalence in control	OR (95%CI)	<i>P</i>
Pure hypercholesterolemia	E78	9.44 (8.34, 10.64)	16.87 (15.45, 18.37)	0.51 (0.43, 0.61)	<0.001
Fatty (change of) liver, not elsewhere classified	K76	9.17 (8.09, 10.35)	10.06 (8.93, 11.29)	0.90 (0.75, 1.09)	0.278
Chronic kidney disease, stage 1	N18	9.06 (7.98, 10.23)	5.57 (4.72, 6.53)	1.69 (1.36, 2.10)	<0.001
Hereditary sideroblastic anemia	D64	7.59 (6.59, 8.67)	5.07 (4.26, 5.99)	1.54 (1.22, 1.93)	0.0002
Ventricular fibrillation	I49	7.47 (6.48, 8.55)	6.35 (5.44, 7.36)	1.19 (0.96, 1.48)	0.112
Septic pulmonary embolism with acute cor pulmonale	I26	7.39 (6.41, 8.47)	1.74 (1.27, 2.32)	4.50 (3.27, 6.33)	<0.001
Atherosclerosis of aorta	I70	7.16 (6.20, 8.22)	7.62 (6.63, 8.72)	0.93 (0.76, 1.15)	0.5235
Ventricular septal defect	Q21	6.66 (5.73, 7.69)	2.94 (2.32, 3.67)	2.35 (1.79, 3.12)	<0.001
Alveolar proteinosis	J84	5.96 (5.08, 6.94)	2.79 (2.19, 3.50)	2.21 (1.67, 2.96)	<0.001
Primary pulmonary hypertension	I27	5.92 (5.04, 6.90)	5.73 (4.86, 6.69)	1.04 (0.82, 1.31)	0.7665
Nonrheumatic aortic (valve) stenosis	I35	5.73 (4.86, 6.69)	2.90 (2.29, 3.62)	2.03 (1.54, 2.71)	<0.001
Right heart failure, unspecified	I50	46.83 (44.89, 48.77)	16.87 (15.45, 18.37)	4.34 (3.82, 4.94)	<0.001
Gastro-esophageal reflux disease with esophagitis	K21	4.45 (3.69, 5.32)	3.41 (2.74, 4.18)	1.32 (1.00, 1.76)	0.0539
Congenital hypothyroidism with diffuse goiter	E03	3.41 (2.74, 4.18)	2.17 (1.64, 2.81)	1.59 (1.14, 2.25)	0.0073
Qualitative platelet defects	D69	3.37 (2.71, 4.14)	2.75 (2.15, 3.45)	1.23 (0.90, 1.70)	0.1968
Lesch-Nyhan syndrome	E79	3.33 (2.67, 4.09)	2.32 (1.78, 2.98)	1.45 (1.04, 2.03)	0.0299
Rheumatic disorders of both mitral and aortic valves	I08	3.29 (2.64, 4.05)	0.74 (0.44, 1.15)	4.59 (2.85, 7.80)	<0.001
Age-related osteoporosis without current pathological fracture	M81	3.21 (2.57, 3.97)	3.52 (2.84, 4.31)	0.91 (0.67, 1.23)	0.5374
Re-entry ventricular arrhythmia	I47	3.13 (2.50, 3.88)	4.10 (3.37, 4.94)	0.76 (0.56, 1.01)	0.0633
Cardiac septal defect, acquired	I51	28.25 (26.52, 30.03)	8.09 (7.07, 9.21)	4.47 (3.80, 5.29)	<0.001

Essential (primary) hypertension	I10	25.12 (23.45, 26.84)	28.17 (26.45, 29.95)	0.86 (0.76, 0.97)	0.013
Sequelae of central nervous system tuberculosis	B90	2.75 (2.15, 3.45)	1.82 (1.34, 2.41)	1.53 (1.05, 2.23)	0.0264
Benign prostatic hyperplasia without lower urinary tract symptoms	N40	2.75 (2.15, 3.45)	2.83 (2.22, 3.54)	0.97 (0.70, 1.35)	0.8658
Unilateral pulmonary emphysema [MacLeods syndrome]	J43	2.59 (2.01, 3.28)	1.43 (1.01, 1.97)	1.83 (1.23, 2.77)	0.0034
Hypersensitivity angiitis	M31	2.59 (2.01, 3.28)	2.75 (2.15, 3.45)	0.94 (0.67, 1.32)	0.73
Insomnia due to medical condition	G47	2.48 (1.91, 3.15)	1.70 (1.24, 2.28)	1.47 (1.00, 2.17)	0.0531
Right fascicular block	I45	2.36 (1.81, 3.02)	1.51 (1.08, 2.06)	1.58 (1.06, 2.38)	0.0275
Atrioventricular block, first degree	I44	2.32 (1.78, 2.98)	1.82 (1.34, 2.41)	1.28 (0.87, 1.89)	0.2052
Renovascular hypertension	I15	2.28 (1.74, 2.94)	2.44 (1.88, 3.11)	0.94 (0.65, 1.34)	0.714
Von Willebrands disease	D68	2.24 (1.71, 2.89)	2.13 (1.61, 2.76)	1.06 (0.73, 1.54)	0.7754
Unspecified sequelae of nontraumatic subarachnoid hemorrhage	I69	2.21 (1.67, 2.85)	3.33 (2.67, 4.09)	0.66 (0.46, 0.92)	0.0146
Hepatic fibrosis	K74	2.21 (1.67, 2.85)	1.39 (0.98, 1.92)	1.60 (1.05, 2.45)	0.0293
Dilated cardiomyopathy	I42	2.17 (1.64, 2.81)	0.31 (0.13, 0.61)	7.13 (3.60, 16.23)	<0.001
ST elevation (STEMI) myocardial infarction involving left main coronary artery	I21	2.13 (1.61, 2.76)	4.18 (3.44, 5.02)	0.50 (0.36, 0.69)	<0.001
Nonrheumatic tricuspid (valve) stenosis	I36	14.67 (13.32, 16.09)	1.51 (1.08, 2.06)	11.22 (8.14, 15.91)	<0.001
Paroxysmal atrial fibrillation	I48	14.40 (13.06, 15.81)	5.92 (5.04, 6.90)	2.67 (2.20, 3.26)	<0.001
Nonrheumatic mitral (valve) insufficiency	I34	13.85 (12.54, 15.25)	3.37 (2.71, 4.14)	4.62 (3.64, 5.91)	<0.001
Drug-induced systemic lupus erythematosus	M32	12.96 (11.69, 14.32)	10.80 (9.63, 12.06)	1.23 (1.04, 1.46)	0.0162
Sicca syndrome, unspecified	M35	12.46 (11.21, 13.80)	5.96 (5.08, 6.94)	2.25 (1.84, 2.75)	<0.001
Atherosclerotic heart disease of native coronary artery without angina pectoris	I25	12.35 (11.10, 13.68)	16.22 (14.81, 17.69)	0.73 (0.62, 0.85)	0.0001
Type 2 diabetes mellitus with hyperosmolarity without	E11	11.07 (9.88, 12.34)	14.13 (12.80, 15.53)	0.76 (0.64, 0.89)	0.001

nonketotic hyperglycemic-hyperosmolar coma (NKHHC)

Bronchiectasis with acute lower respiratory infection	J47	1.97 (1.47, 2.59)	1.24 (0.85, 1.74)	1.61 (1.03, 2.53)	0.0372
Rheumatoid arthritis without rheumatoid factor, unspecified site	M06	1.97 (1.47, 2.59)	2.67 (2.08, 3.37)	0.73 (0.51, 1.06)	0.0976
Malignant neoplasm of unspecified main bronchus	C34	1.93 (1.44, 2.54)	6.19 (5.29, 7.19)	0.30 (0.21, 0.41)	<0.001
Rheumatic mitral stenosis	I05	1.93 (1.44, 2.54)	0.58 (0.33, 0.96)	3.38 (1.94, 6.24)	<0.001
Nephrotic syndrome with minor glomerular abnormality	N04	1.82 (1.34, 2.41)	2.28 (1.74, 2.94)	0.79 (0.54, 1.17)	0.2399
Arteriovenous fistula, acquired	I77	1.78 (1.31, 2.37)	1.35 (0.95, 1.88)	1.32 (0.85, 2.07)	0.2194
Cerebral infarction due to thrombosis of unspecified precerebral artery	I63	1.74 (1.27, 2.32)	2.44 (1.88, 3.11)	0.71 (0.48, 1.04)	0.0814
Malignant ascites	R18	1.70 (1.24, 2.28)	1.16 (0.78, 1.65)	1.47 (0.93, 2.37)	0.1032
Rheumatic tricuspid stenosis	I07	1.66 (1.21, 2.24)	0.43 (0.21, 0.76)	3.96 (2.11, 8.09)	<0.001
Renal osteodystrophy	N25	1.66 (1.21, 2.24)	1.01 (0.66, 1.47)	1.66 (1.03, 2.75)	0.0414
Subclinical iodine-deficiency hypothyroidism	E02	1.59 (1.14, 2.15)	0.93 (0.60, 1.38)	1.72 (1.04, 2.89)	0.0359
Unspecified background retinopathy	H35	1.59 (1.14, 2.15)	1.97 (1.47, 2.59)	0.80 (0.53, 1.21)	0.2937
Unstable angina	I20	1.59 (1.14, 2.15)	5.03 (4.22, 5.95)	0.30 (0.21, 0.43)	<0.001
Endocarditis, valve unspecified	I38	1.59 (1.14, 2.15)	0.62 (0.35, 1.00)	2.59 (1.48, 4.76)	0.0013
Constitutional (pure) red blood cell aplasia	D61	1.51 (1.08, 2.06)	1.47 (1.04, 2.01)	1.03 (0.65, 1.61)	0.9086
Acute thyroiditis	E06	1.47 (1.04, 2.01)	1.35 (0.95, 1.88)	1.09 (0.68, 1.73)	0.7237
Juvenile dermatomyositis, organ involvement unspecified	M33	1.43 (1.01, 1.97)	2.13 (1.61, 2.76)	0.67 (0.44, 1.01)	0.0599
Rheumatic myocarditis	I09	1.39 (0.98, 1.92)	0.31 (0.13, 0.61)	4.55 (2.22, 10.56)	0.0001
Toxic liver disease with cholestasis	K71	1.39 (0.98, 1.92)	2.28 (1.74, 2.94)	0.60 (0.39, 0.91)	0.0184
Other specified diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)	E13	1.35 (0.95, 1.88)	1.43 (1.01, 1.97)	0.95 (0.59, 1.51)	0.8124

Secondary and unspecified malignant neoplasm of lymph nodes of head, face and neck	C77	1.32 (0.91, 1.83)	3.68 (2.98, 4.48)	0.35 (0.23, 0.51)	<0.001
Defects in post-translational modification of lysosomal enzymes	E77	1.28 (0.88, 1.79)	1.28 (0.88, 1.79)	1.00 (0.61, 1.63)	>0.99
Patent ductus arteriosus	Q25	1.28 (0.88, 1.79)	1.01 (0.66, 1.47)	1.27 (0.76, 2.15)	0.3605
Congenital agranulocytosis	D70	1.20 (0.82, 1.70)	0.81 (0.50, 1.24)	1.48 (0.85, 2.62)	0.166
Morbid (severe) obesity due to excess calories	E66	1.20 (0.82, 1.70)	0.93 (0.60, 1.38)	1.30 (0.76, 2.23)	0.3439
Thyrotoxicosis with diffuse goiter without thyrotoxic crisis or storm	E05	1.12 (0.75, 1.61)	0.46 (0.24, 0.81)	2.43 (1.27, 4.96)	0.0098
Mild intermittent asthma, uncomplicated	J45	1.12 (0.75, 1.61)	1.32 (0.91, 1.83)	0.85 (0.51, 1.40)	0.5266
Chronic viral hepatitis B with delta-agent	B18	1.08 (0.72, 1.56)	1.55 (1.11, 2.10)	0.70 (0.42, 1.13)	0.145
Saddle embolus of abdominal aorta	I74	1.01 (0.66, 1.47)	0.85 (0.53, 1.29)	1.18 (0.67, 2.11)	0.5623

Table S2. Prevalence of the multimorbidity chronic diseases in controls

Disease	ICD-10	Prevalence in pulmonary arterial hypertension	Prevalence in control	OR (95%CI)	<i>P</i>
Chronic viral hepatitis B with delta-agent	B18	1.08 (0.72, 1.56)	1.55 (1.11, 2.10)	0.70 (0.42, 1.13)	0.145
Sequelae of central nervous system tuberculosis	B90	2.75 (2.15, 3.45)	1.82 (1.34, 2.41)	1.53 (1.05, 2.23)	0.0264
Malignant neoplasm of unspecified main bronchus	C34	1.93 (1.44, 2.54)	6.19 (5.29, 7.19)	0.30 (0.21, 0.41)	<0.001
Secondary and unspecified malignant neoplasm of lymph nodes of head, face and neck	C77	1.32 (0.91, 1.83)	3.68 (2.98, 4.48)	0.35 (0.23, 0.51)	<0.001
Secondary malignant neoplasm of unspecified lung	C78	0.77 (0.47, 1.19)	2.90 (2.29, 3.62)	0.26 (0.15, 0.42)	<0.001
Secondary malignant neoplasm of unspecified kidney and renal pelvis	C79	0.97 (0.63, 1.42)	2.36 (1.81, 3.02)	0.40 (0.25, 0.64)	0.0002
Constitutional (pure) red blood cell aplasia	D61	1.51 (1.08, 2.06)	1.47 (1.04, 2.01)	1.03 (0.65, 1.61)	0.9086
Hereditary sideroblastic anemia	D64	7.59 (6.59, 8.67)	5.07 (4.26, 5.99)	1.54 (1.22, 1.93)	0.0002
Von Willebrands disease	D68	2.24 (1.71, 2.89)	2.13 (1.61, 2.76)	1.06 (0.73, 1.54)	0.7754
Qualitative platelet defects	D69	3.37 (2.71, 4.14)	2.75 (2.15, 3.45)	1.23 (0.90, 1.70)	0.1968
Congenital hypothyroidism with diffuse goiter	E03	3.41 (2.74, 4.18)	2.17 (1.64, 2.81)	1.59 (1.14, 2.25)	0.0073
Nontoxic diffuse goiter	E04	0.93 (0.60, 1.38)	1.24 (0.85, 1.74)	0.75 (0.43, 1.27)	0.2841
Acute thyroiditis	E06	1.47 (1.04, 2.01)	1.35 (0.95, 1.88)	1.09 (0.68, 1.73)	0.7237
Type 2 diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)	E11	11.07 (9.88, 12.34)	14.13 (12.80, 15.53)	0.76 (0.64, 0.89)	0.001
Other specified diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)	E13	1.35 (0.95, 1.88)	1.43 (1.01, 1.97)	0.95 (0.59, 1.51)	0.8124
Defects in post-translational modification of lysosomal enzymes	E77	1.28 (0.88, 1.79)	1.28 (0.88, 1.79)	1.00 (0.61, 1.63)	1

Pure hypercholesterolemia	E78	9.44 (8.34, 10.64)	16.87 (15.45, 18.37)	0.51 (0.43, 0.61)	<0.001
Lesch-Nyhan syndrome	E79	3.33 (2.67, 4.09)	2.32 (1.78, 2.98)	1.45 (1.04, 2.03)	0.0299
Panic disorder [episodic paroxysmal anxiety]	F41	0.54 (0.30, 0.91)	1.35 (0.95, 1.88)	0.40 (0.21, 0.72)	0.0036
Insomnia due to medical condition	G47	2.48 (1.91, 3.15)	1.70 (1.24, 2.28)	1.47 (1.00, 2.17)	0.0531
Unspecified background retinopathy	H35	1.59 (1.14, 2.15)	1.97 (1.47, 2.59)	0.80 (0.53, 1.21)	0.2937
Essential (primary) hypertension	I10	25.12 (23.45, 26.84)	28.17 (26.45, 29.95)	0.86 (0.76, 0.97)	0.013
Renovascular hypertension	I15	2.28 (1.74, 2.94)	2.44 (1.88, 3.11)	0.94 (0.65, 1.34)	0.714
Unstable angina	I20	1.59 (1.14, 2.15)	5.03 (4.22, 5.95)	0.30 (0.21, 0.43)	<0.001
ST elevation (STEMI) myocardial infarction involving left main coronary artery	I21	2.13 (1.61, 2.76)	4.18 (3.44, 5.02)	0.50 (0.36, 0.69)	<0.001
Atherosclerotic heart disease of native coronary artery without angina pectoris	I25	12.35 (11.10, 13.68)	16.22 (14.81, 17.69)	0.73 (0.62, 0.85)	0.0001
Septic pulmonary embolism with acute cor pulmonale	I26	7.39 (6.41, 8.47)	1.74 (1.27, 2.32)	4.50 (3.27, 6.33)	<0.001
Primary pulmonary hypertension	I27	5.92 (5.04, 6.90)	5.73 (4.86, 6.69)	1.04 (0.82, 1.31)	0.7665
Nonrheumatic mitral (valve) insufficiency	I34	13.85 (12.54, 15.25)	3.37 (2.71, 4.14)	4.62 (3.64, 5.91)	<0.001
Nonrheumatic aortic (valve) stenosis	I35	5.73 (4.86, 6.69)	2.90 (2.29, 3.62)	2.03 (1.54, 2.71)	<0.001
Nonrheumatic tricuspid (valve) stenosis	I36	14.67 (13.32, 16.09)	1.51 (1.08, 2.06)	11.22 (8.14, 15.91)	<0.001
Atrioventricular block, first degree	I44	2.32 (1.78, 2.98)	1.82 (1.34, 2.41)	1.28 (0.87, 1.89)	0.2052
Right fascicular block	I45	2.36 (1.81, 3.02)	1.51 (1.08, 2.06)	1.58 (1.06, 2.38)	0.0275
Re-entry ventricular arrhythmia	I47	3.13 (2.50, 3.88)	4.10 (3.37, 4.94)	0.76 (0.56, 1.01)	0.0633

Paroxysmal atrial fibrillation	I48	14.40 (13.06, 15.81)	5.92 (5.04, 6.90)	2.67 (2.20, 3.26)	<0.001
Ventricular fibrillation	I49	7.47 (6.48, 8.55)	6.35 (5.44, 7.36)	1.19 (0.96, 1.48)	0.112
Heart failure, unspecified	I50	46.83 (44.89, 48.77)	16.87 (15.45, 18.37)	4.34 (3.82, 4.94)	<0.001
Cardiac septal defect, acquired	I51	28.25 (26.52, 30.03)	8.09 (7.07, 9.21)	4.47 (3.80, 5.29)	<0.001
Cerebral infarction due to thrombosis of unspecified precerebral artery	I63	1.74 (1.27, 2.32)	2.44 (1.88, 3.11)	0.71 (0.48, 1.04)	0.0814
Occlusion and stenosis of right vertebral artery	I65	0.89 (0.57, 1.33)	1.78 (1.31, 2.37)	0.50 (0.29, 0.81)	0.0063
Unspecified sequelae of nontraumatic subarachnoid hemorrhage	I69	2.21 (1.67, 2.85)	3.33 (2.67, 4.09)	0.66 (0.46, 0.92)	0.0146
Atherosclerosis of aorta	I70	7.16 (6.20, 8.22)	7.62 (6.63, 8.72)	0.93 (0.76, 1.15)	0.5235
Dissection of unspecified site of aorta	I71	0.77 (0.47, 1.19)	1.12 (0.75, 1.61)	0.69 (0.38, 1.21)	0.1989
Arteriovenous fistula, acquired	I77	1.78 (1.31, 2.37)	1.35 (0.95, 1.88)	1.32 (0.85, 2.07)	0.2194
Unilateral pulmonary emphysema [MacLeods syndrome]	J43	2.59 (2.01, 3.28)	1.43 (1.01, 1.97)	1.83 (1.23, 2.77)	0.0034
Mild intermittent asthma, uncomplicated	J45	1.12 (0.75, 1.61)	1.32 (0.91, 1.83)	0.85 (0.51, 1.40)	0.5266
Bronchiectasis with acute lower respiratory infection	J47	1.97 (1.47, 2.59)	1.24 (0.85, 1.74)	1.61 (1.03, 2.53)	0.0372
Alveolar proteinosis	J84	5.96 (5.08, 6.94)	2.79 (2.19, 3.50)	2.21 (1.67, 2.96)	<0.001
Gastro-esophageal reflux disease with esophagitis	K21	4.45 (3.69, 5.32)	3.41 (2.74, 4.18)	1.32 (1.00, 1.76)	0.0539
Toxic liver disease with cholestasis	K71	1.39 (0.98, 1.92)	2.28 (1.74, 2.94)	0.60 (0.39, 0.91)	0.0184
Hepatic fibrosis	K74	2.21 (1.67, 2.85)	1.39 (0.98, 1.92)	1.60 (1.05, 2.45)	0.0293
Fatty (change of) liver, not elsewhere classified	K76	9.17 (8.09, 10.35)	10.06 (8.93, 11.29)	0.90 (0.75, 1.09)	0.278
Rheumatoid arthritis without rheumatoid factor, unspecified site	M06	1.97 (1.47, 2.59)	2.67 (2.08, 3.37)	0.73 (0.51, 1.06)	0.0976
Hypersensitivity angitis	M31	2.59 (2.01, 3.28)	2.75 (2.15, 3.45)	0.94 (0.67, 1.32)	0.73
Drug-induced systemic lupus erythematosus	M32	12.96 (11.69, 14.32)	10.80 (9.63, 12.06)	1.23 (1.04, 1.46)	0.0162
Juvenile dermatomyositis, organ involvement unspecified	M33	1.43 (1.01, 1.97)	2.13 (1.61, 2.76)	0.67 (0.44, 1.01)	0.0599

Sicca syndrome, unspecified	M35	12.46 (11.21, 13.80)	5.96 (5.08, 6.94)	2.25 (1.84, 2.75)	<0.001
Anterior spinal artery compression syndromes, occipito-atlanto-axial region	M47	0.85 (0.53, 1.29)	1.74 (1.27, 2.32)	0.48 (0.29, 0.80)	0.0056
Intervertebral disc disorders with myelopathy, thoracic region	M51	0.54 (0.30, 0.91)	2.01 (1.51, 2.63)	0.27 (0.14, 0.47)	<0.001
Age-related osteoporosis without current pathological fracture	M81	3.21 (2.57, 3.97)	3.52 (2.84, 4.31)	0.91 (0.67, 1.23)	0.5374
Nephrotic syndrome with minor glomerular abnormality	N04	1.82 (1.34, 2.41)	2.28 (1.74, 2.94)	0.79 (0.54, 1.17)	0.2399
Unspecified nephritic syndrome with minor glomerular abnormality	N05	0.66 (0.38, 1.05)	1.28 (0.88, 1.79)	0.51 (0.28, 0.91)	0.0255
Chronic kidney disease, stage 1	N18	9.06 (7.98, 10.23)	5.57 (4.72, 6.53)	1.69 (1.36, 2.10)	<0.001
Renal osteodystrophy	N25	1.66 (1.21, 2.24)	1.01 (0.66, 1.47)	1.66 (1.03, 2.75)	0.0414
Stress incontinence (female) (male)	N39	0.93 (0.60, 1.38)	1.16 (0.78, 1.65)	0.80 (0.46, 1.37)	0.4127
Benign prostatic hyperplasia without lower urinary tract symptoms	N40	2.75 (2.15, 3.45)	2.83 (2.22, 3.54)	0.97 (0.70, 1.35)	0.8658
Ventricular septal defect	Q21	6.66 (5.73, 7.69)	2.94 (2.32, 3.67)	2.35 (1.79, 3.12)	<0.001
Dextrocardia	Q24	0.70 (0.41, 1.10)	1.04 (0.69, 1.52)	0.66 (0.36, 1.20)	0.1807
Patent ductus arteriosus	Q25	1.28 (0.88, 1.79)	1.01 (0.66, 1.47)	1.27 (0.76, 2.15)	0.3605
Malignant ascites	R18	1.70 (1.24, 2.28)	1.16 (0.78, 1.65)	1.47 (0.93, 2.37)	0.1032