

YOUNG STROKE PATIENTS ARE AT HIGH RISK FOR SUBSEQUENT ESRD: A POPULATION-BASED OBSERVATIONAL STUDY

Peir-Haur Hung^{1,2,*}, Yu-Tung Huang^{3,*}, Chih-Yen Hsiao¹, Pi-Shan Sung^{4,5}, How-Ran Guo^{6,7} and Kuen-Jer Tsai⁴

¹Department of Internal Medicine, Ditmanson Medical Foundation Chia-yi Christian Hospital, Chia-yi, Taiwan

²Department of Applied Life Science and Health, Chia-Nan University of Pharmacy and Science, Tainan, Taiwan

³Department of Gerontological Care and Management & Graduate Institute of Health Care, Chang Gung University of Science and Technology, Taoyuan, Taiwan

⁴Institute of Clinical Medicine, National Cheng Kung University, Tainan, Taiwan

⁵Department of Neurology, National Cheng Kung University Hospital, Tainan, Taiwan

⁶Department of Environmental and Occupational Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan;

⁷Department of Occupational and Environmental Medicine, National Cheng Kung University Hospital, Tainan, Taiwan

Background

An increased incidence of END STAGE RENAL DISEASE (ESRD) in stroke patients has not been confirmed. The aim of this population-based study was to examine the risk of ESRD in stroke patients in Taiwan.

Methods

We conducted a nationwide cohort study of 442355 patients newly diagnosed with stroke, but without prior history of ESRD. Data were collected from Taiwan's National Health Insurance claims data during 2000-2008. Incidence and standardized incidence ratio (SIR) of ESRD were calculated using the general population of Taiwan as the reference.

Results

Among all stroke patients, 7813 (1.77%) developed ESRD with a mean follow-up of 4.11 years. The SIR for ESRD was 2.78 (95% CI 2.72 to 2.84) among stroke patients of all ages and was 22.73 (95% CI 20.39 to 25.20) for patients aged 25-44 years. Male patients with stroke had a higher risk of ESRD (SIR 2.94, 95% CI 2.85 to 3.03) among stroke patients of all ages and it was 23.41 (95% CI 20.46 to 26.36) for male patients aged 25-44 years.

Conclusions

Increased risk of ESRD in stroke patients is confirmed in Taiwan, and male patients between ages 25-44 years were at higher risk of ESRD compared with their counterparts in the general population. The clinical implication of our results is to closely monitor renal function in stroke patients, particularly those of younger age.

Table 4. Stratified analyses for ESRD in stroke patients without diabetes, hypertension or CKD

Sex and age	Excluded patients with prior diabetes (n = 304 394)		Excluded patients with prior hypertension (n = 285 907)		Excluded patients with prior CKD (n = 434 385)	
	SIR	95% CI	SIR	95% CI	SIR	95% CI
Men & Women (years)						
25-44	10.92	9.21-12.77	9.96	8.00-12.14	17.72	15.66-19.91
45-64	2.04	1.88-2.20	4.43	4.11-4.74	6.44	6.20-6.67
≥65	0.88	0.83-0.92	0.99	0.92-1.06	1.36	1.31-1.40
All (≥25)	1.13	1.08-1.18	1.67	1.59-1.75	2.27	2.22-2.33
Men (years)						
25-44	11.50	9.29-13.72	10.61	7.92-13.29	18.08	15.49-20.68
45-64	1.89	1.70-2.07	4.09	3.71-4.47	5.75	5.47-6.03
≥65	0.98	0.91-1.05	0.98	0.89-1.08	1.39	1.32-1.46
All (≥25)	1.25	1.18-1.32	1.73	1.61-1.84	2.42	2.34-2.50
Women (years)						
25-44	9.45	6.56-12.34	8.72	5.55-11.90	16.53	12.93-20.13
45-64	2.25	1.96-2.53	4.87	4.32-5.42	7.44	7.02-7.86
≥65	0.78	0.72-0.85	1.03	0.93-1.13	1.34	1.27-1.40
All (≥25)	1.00	0.94-1.07	1.62	1.51-1.74	2.13	2.05-2.21

Table 1. Demographic and clinical characteristics of 442 355 stroke patients in Taiwan, 2000-2008

Sex (n (%))	
Men	255 202 (57.69)
Women	187 153 (42.31)
Age at stroke onset (years, n (%))	
25-44	27 146 (6.14)
45-64	143 774 (32.52)
≥65	271 435 (61.36)
ESRD (n (%))	
Yes	7 813 (1.77)
No	434 542 (98.23)
Death (n (%))	
Yes (Death)	59 583 (13.47)
No (Alive)	382 772 (86.53)
Duration of follow-up (years, (mean±SD))	
Men	4.05±2.66
Women	4.19±2.65

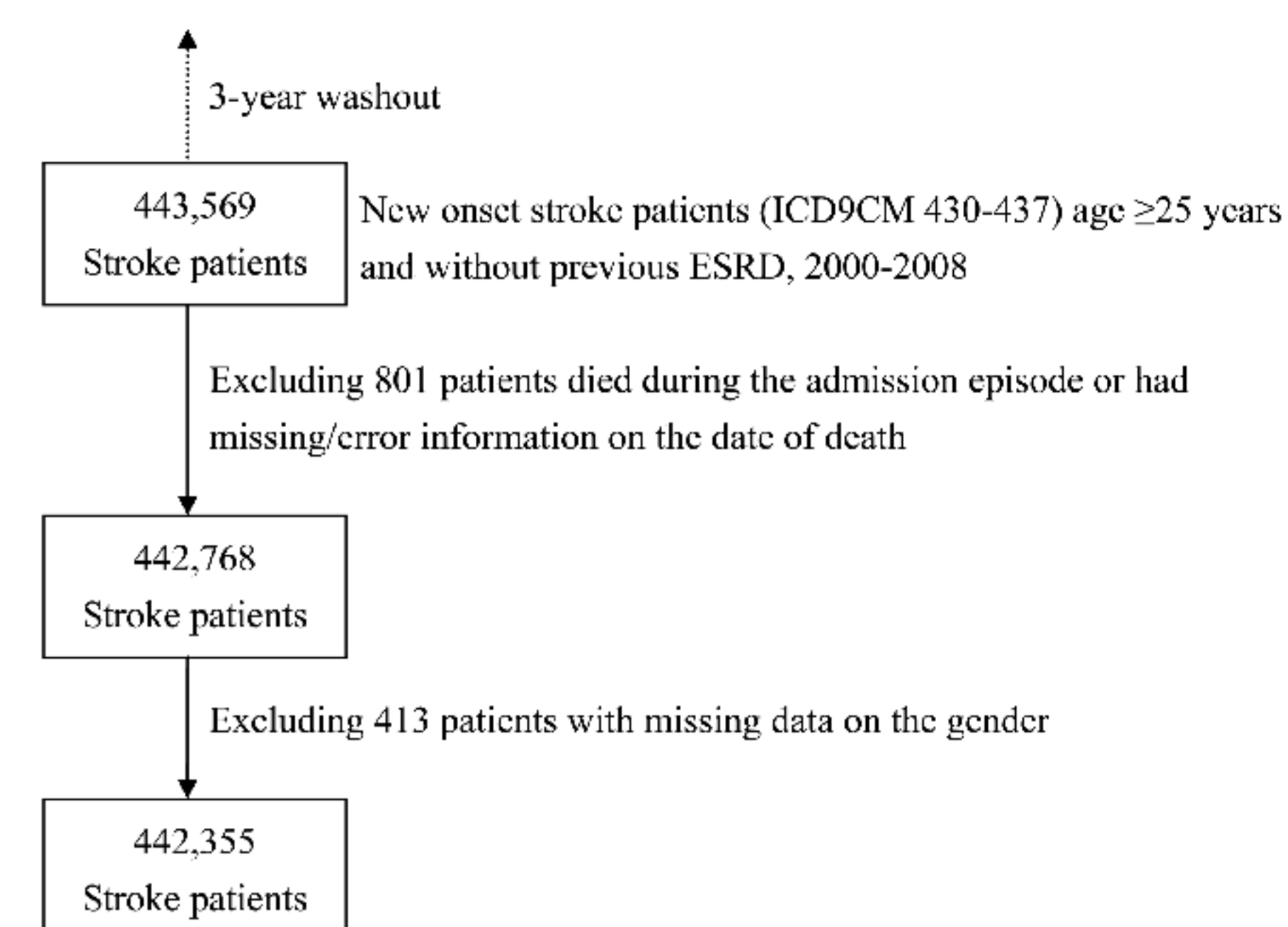


Figure 1. Process of the selection of study population. Three-year washout, new-onset stroke patients (ICD-9-CM 430-437) aged ≥25 years and without previous ESRD, 2000-08, excluding 801 patients died during the admission episode or had missing/error information on the date of death. Excluding 413 patients with missing data on the gender.

Table 2. Incidence and 95% CI for ESRD in stroke patients in Taiwan by sex and age

Sex and age	No	Person-year	Incidence (per 100 000 person-years)	95% CI
Men & Women (years)				
25-44	344	111 521	3.1	2.8 to 3.4
45-64	3400	604 131	5.6	5.4 to 5.8
≥65	4069	1 101 700	3.7	3.6 to 3.8
All (≥25)	7813	1 817 352	4.3	4.2 to 4.4
Men (years)				
25-44	242	74 401	3.3	2.8 to 3.7
45-64	1967	372 725	5.3	5.0 to 5.5
≥65	2002	586 154	3.4	3.3 to 3.6
All (≥25)	4211	1 033 280	4.1	4.0 to 4.2
Women (years)				
25-44	102	37 121	2.7	2.2 to 3.3
45-64	1433	231 406	6.2	5.9 to 6.5
≥65	2067	515 546	4.0	3.8 to 4.2
All (≥25)	3602	784 073	4.6	4.4 to 4.7

Table 3. SIR and 95% CI for ESRD in stroke patients in Taiwan by sex and age

Sex and age	Observed	Expected	SIR	95% CI
Men & Women (years)				
25-44	344	15.1	22.73	20.39 to 25.20
45-64	3400	451.8	7.53	7.27 to 7.78
≥65	4069	2343.7	1.74	1.68 to 1.79
All (≥25)	7813	2810.7	2.78	2.72 to 2.84
Men (years)				
25-44	242	10.3	23.41	20.46 to 26.36
45-64	1967	293.8	6.69	6.40 to 6.99
≥65	2002	1127.7	1.78	1.70 to 1.85
All (≥25)	4211	1431.9	2.94	2.85 to 3.03
Women (years)				
25-44	102	4.9	20.76	16.73 to 24.78
45-64	1433	163.8	8.75	8.30 to 9.20
≥65	2067	1204.2	1.72	1.64 to 1.79
All (≥25)	3602	1372.9	2.62	2.54 to 2.71

Table 5. SIR and 95% CI for ESRD in stroke patients by type of stroke in Taiwan

Sex and age	Hemorrhagic (n = 95 613)		Ischemic (n = 267 763)		Unspecified (n = 78 979)	
	SIR	95% CI	SIR	95% CI	SIR	95% CI
Men & Women (years)						
25-44	17.77	14.65-21.20	30.52	26.17-35.21	18.41	13.90-23.55
45-64	4.41	4.03-4.80	9.26	8.88-9.64	6.72	6.17-7.26
≥65	1.21	1.09-1.32	1.80	1.74-1.87	1.94	1.81-2.06
All (≥25)	2.18	2.05-2.31	2.94	2.86-3.02	2.79	2.65-2.94
Men (years)						
25-44	18.83	14.87-22.78	30.03	24.65-35.40	20.35	13.61-27.09
45-64	4.15	3.70-4.59	8.00	7.58-8.43	6.32	5.59-7.04
≥65	1.38	1.21-1.56	1.86	1.76-1.96	1.81	1.63-2.00
All (≥25)	2.52	2.33-2.71	3.12	3.00-3.23	2.74	2.54-2.94
Women (years)						
25-44	14.44	8.89-19.99	30.81	22.66-38.95	15.81	9.05-22.57
45-64	4.75	4.06-5.44	11.33	10.62-12.05	7.16	6.33-7.98
≥65	1.05	0.90-1.20	1.77	1.68-1.87	2.05	1.87-2.23
All (≥25)	1.79	1.62-1.97	2.77	2.65-2.88	2.85	2.65-3.05

