Systemic Lupus Erythematosus (SLE) and Cardiovascular Disease (CVD): 10-Year Retrospective Cohort in UPMC Central Pennsylvania

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Introduction

- SLE is a chronic autoimmune disorder marked by systemic inflammation, autoantibody production, and immune dysregulation, leading to multi-organ involvement.
- Patients with SLE exhibit accelerated atherosclerosis, endothelial dysfunction, and premature vascular aging, increasing the risk of cardiovascular disease (CVD).
- CVD remains a leading cause of morbidity and mortality in SLE, including myocardial infarction (MI), stroke, peripheral arterial disease (PAD), and aortic pathology.
- Prior studies often focus on referral populations or registries; real-world, health system–based, long-term analyses are limited.
- This study evaluates the prevalence and odds of major cardiovascular and cerebrovascular outcomes in adults with SLE versus non-SLE adults over 10 years in a large integrated health system.

Methods

- Design: Retrospective cohort study using Epic SlicerDicer data from UPMC Central Pennsylvania (Jan 1, 2014 – Jan 1, 2025).
- Population: Adults ≥18 years with at least one inpatient or outpatient encounter.
    - SLE cohort: ICD-10–coded diagnosis of SLE.
    - Non-SLE cohort: All other adult patients without SLE.
- Outcomes: Cardiovascular and cerebrovascular events identified via ICD-10 codes: Myocardial infarction, Ischemic stroke , Hemorrhagic stroke, Composite cerebrovascular disease (stroke or TIA), Coronary artery disease (CAD), Atherosclerosis/PAD, Aortic aneurysm/dissection, Metabolic syndrome
- Analysis:
    - Descriptive prevalence (table 1) and unadjusted odds ratios (table 2) with 95% confidence intervals (CIs).
    - Age-stratified Mantel–Haenszel ORs to adjust for age confounding (table 3).
    - Statistical significance: 2-sided $P < .05$.
- Cohort Characteristics
    - Total adults: 3,533,695
    - SLE: 3,775 (0.11%)

Results

- Age-Stratified Analysis
    - Elevated cardiovascular risk observed across all age groups.
- Mantel–Haenszel analyses confirmed persistent associations:
    - MI: MH OR 6.21 (95% CI 5.66–6.82)
    - Ischemic stroke: MH OR 5.47 (95% CI 4.81–6.22)
    - CAD: MH OR 5.63 (95% CI 5.19–6.10)
    - Cerebrovascular disease: MH OR 6.02 (95% CI 5.46–6.63)
- Sex-Specific Observations showed both sexes had increased CVD prevalence and female patients with SLE showed higher absolute rates of MI and CAD compared with males.

Table 1: Prevalence of Cardiovascular Outcomes in SLE vs Non-SLE Adults

Outcome	Non-SLE (%)	SLE (%)	Relative Risk (RR)
Myocardial infarction (MI)	2.62	15.23	5.8
Ischemic stroke	1.34	7.31	5.5
Composite cerebrovascular disease (stroke or TIA)	2.20	13.09	6.0
Coronary artery disease (CAD)	4.70	22.95	4.9
Atherosclerosis / Peripheral arterial disease (PAD)	3.54	15.55	4.4
Aortic aneurysm / dissection	0.51	1.91	3.7
Hemorrhagic stroke	0.13	0.61	4.7
Metabolic syndrome	0.11	0.50	4.5

Table 2. Unadjusted Odds Ratios for Cardiovascular Outcomes in SLE

Outcome	Odds Ratio (OR)	95% Confidence Interval
Myocardial Infarction	6.68	6.11 – 7.31
Ischemic Stroke	5.83	5.15 – 6.59
Cerebrovascular Disease (Stroke/TIA)	6.69	6.09 – 7.36
Coronary Artery Disease	6.04	5.60 – 6.51
Atherosclerosis / PAD	5.02	4.60 – 5.48
Aortic Aneurysm / Dissection	3.77	2.99 – 4.76
Hemorrhagic Stroke	4.59	3.04 – 6.92
Metabolic Syndrome	4.40	2.80 – 6.91

Pathophysiology Highlights

- Chronic systemic inflammation and immune complex deposition in SLE promote endothelial dysfunction and accelerated atherosclerosis.
- Dysregulated cytokine activity and autoantibody-mediated vascular injury contribute to premature plaque formation.
- Traditional cardiovascular risk factors may be amplified by corticosteroid use, chronic renal involvement, and metabolic dysregulation in SLE patients.

Conclusions

- In this 10-year, SLE was associated with markedly increased prevalence and odds of a broad spectrum of cardiovascular and cerebrovascular outcomes.
- Elevated risk is evident across all adult age groups, including younger adults, highlighting early-onset vascular involvement.
- Findings reinforce the importance of:
    - Early cardiovascular risk assessment
    - Aggressive risk factor modification
    - Preventive strategies tailored to SLE patients
- Real-world, population-based EHR data support system-level interventions to reduce cardiovascular morbidity and mortality in SLE.

Table 3: Age-Stratified Mantel–Haenszel (MH) Odds Ratios for Cardiovascular Outcomes

Outcome	18–26 yrs	27–53 yrs	54–81 yrs	≥82 yrs	MH OR (95% CI)
Myocardial infarction	5.9	6.4	6.2	5.7	6.21 (5.66–6.82)
Ischemic stroke	5.2	5.5	5.6	5.3	5.47 (4.81–6.22)
Composite cerebrovascular disease	5.8	6.1	6.0	5.7	6.02 (5.46–6.63)
Coronary artery disease	5.1	5.6	5.7	5.4	5.63 (5.19–6.10)
Atherosclerosis / PAD	4.8	4.9	4.8	4.7	4.81 (4.39–5.27)
Aortic aneurysm / dissection	3.3	3.6	3.5	3.4	3.54 (2.79–4.49)
Hemorrhagic stroke	3.8	4.2	4.1	3.9	4.18 (2.74–6.37)
Metabolic syndrome	3.5	4.1	4.0	3.9	4.02 (2.53–6.40)