Burden of Lupus Nephritis in the Brazilian Public Health System Perspective: A Real-World Study (2023)

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BACKGROUND & OBJECTIVE

Background

- **Context:** Lupus Nephritis (LN) presents a critical disease burden[1] within the Brazilian Unified Health System (SUS), characterized by late specialized interventions and significant logistical barriers for patients.
- **Study Scope**: Clinical progression to dialysis and the geographic displacement to access this treatment of Adult LN patients (≥18 years)

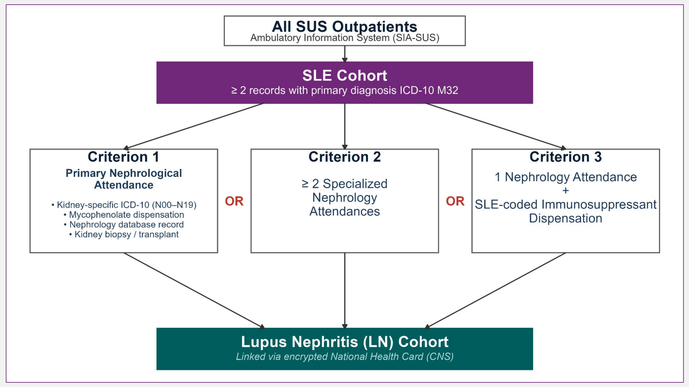
Objective

- **Clinical Progression:** Analyze the time intervals from the first Systemic Lupus Erythematosus (SLE) attendance to dialysis initiation.
- **Healthcare Access:** Evaluate the frequency and regional impact of inter-municipal travel to highlight gaps in early detection.
- **Logistical Burden:** Estimate LN patient displacement by measuring the travel distance and time required to undergo dialysis treatment.

METHODS

- **Study Design:** Retrospective, observational cost-of-illness study.
- **Data Source:** Outpatient Information System of the SUS (SIA-SUS/DATASUS)[2].
- **Population:** Adult patients (≥18 years) with Lupus Nephritis (LN) identified nationwide in 2023.
- **Inclusion Criteria**: As LN does not have a specific ICD-10 code, patients required a documented diagnosis of Systemic Lupus Erythematosus (SLE) (ICD-10: M32) linked via a National Health Card identifier to at least one of the criterias: documented dialysis, immunosuppression, or nephrology care (Figure 1).
- **Patient travel distance and time:** was estimated using patient ZIP codes from SIA-SUS, provider coordinates from health facilities (CNES), and route evaluation via OpenStreetMap (OSM) in R[3]

Figure 1. Inclusion Criteria and Patient Selection Flow Diagram



RESULTS

Overall Results

In 2023, **15,580 patients with lupus nephritis were identified** within the Unified Health System (SUS). Of these, **1,503 (approximately 9.6%) underwent dialysis** during the same period.

For the travel analysis, **270 of the 1,503 dialysis patients (18%) were excluded** due to georeferencing errors (121 involving residences and 149 involving facilities). This resulted in a **final sample of 1,233 patients.**

Table 1. Median Time from SLE Diagnosis* to Dialysis Initiation (2023)

Category	N (%)	Median Time in Days (Years)
Dialysis after SLE (≥0 days)	738 (50.9)	1,068 (2.92)
Dialysis before SLE (< 0 days)	765 (49.1)	-480 (-1.31)
Total	1503 (100)	-13 (-0.04)

Table 2. Median Time from SLE Diagnosis* to Dialysis Initiation, by Geographic Region (2023)

Region	N (%)	Median Time in Days (Years) Before SLE (≥0)	After SLE (<0)
Central-West	143 (9.51)	-427.0 (-1.17)	1,192.5 (3.26)
North	146 (9.71)	-533.5 (-1.46)	1,044.0 (2.86)
Northeast	438 (29.14)	-447.5 (-1.23)	1,072.5 (2.94)
South	152 (10.11)	-650.0 (-1.78)	1,155.5 (3.16)
Southeast	624 (41.52)	-449.5 (-1.23)	1,055.0 (2.89)

Table 3. Number and Proportion of LN Patients Receiving Dialysis Treatment Outside Their Municipality of Residence, by Geographic Region

Region	Within Municipality of Residence n (%)	Outside Municipality of Residence n (%)	Total (n)
Central-West	107 (78.7)	29 (21.3)	136
North	206 (47.2)	230 (52.8)	436
Northeast	380 (61.1)	242 (38.9)	622
South	83 (53.9)	71 (46.1)	154
Southeast	96 (61.9)	59 (38.1)	155
Total	872 (58.0)	631 (42.0)	1,503

Figure 2. Proportion of Patients by Travel Time and Distance for Dialysis**

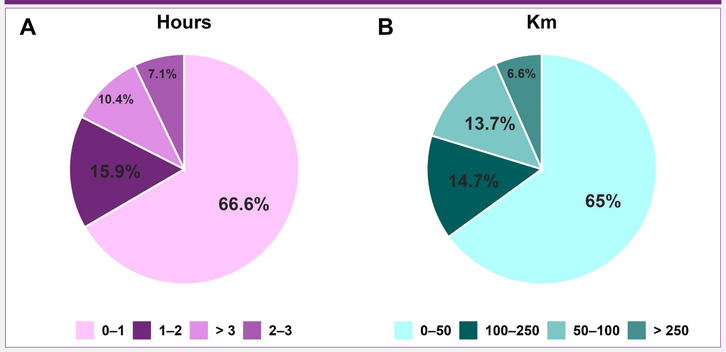


Figure 3. Spatial Distribution and Travel Impedance of LN Patients to Dialysis Centers

- Geospatial mapping of travel impedance for LN patients requiring dialysis.
- The map illustrates the displacement from patient residence (triangles) to the corresponding treatment facility (circles).
- The connecting lines illustrate the travel routes and geographic displacement required to access specialized renal care within the SUS network.
- Coastal and southern clustering contrasts with extended northern and central-western routes, highlighting regional healthcare disparities.

Table 4. Median Travel Distance and Time for Dialysis, by Geographic Region**

Region	N Patients	N CNES	Median Distance (km)** (IQR)	Distance Range** (min/max)	Median Time (hh:mm)** (IQR)	Time Range** (min/max)
Central-West	111	32	26.7 (94.0)	1.6 / 1,367.0	00:34 (01:37)	00:03 / 39:44
North	338	112	38.0 (105.4)	0.5 / 984.8	00:47 (01:39)	00:01 / 15:04
Northeast	543	197	24.1 (46.5)	0.5 / 1,141.1	00:34 (00:47)	00:02 / 16:49
South	132	67	27.2 (80.3)	2.4 / 405.5	00:37 (01:05)	00:05 / 05:59
Southeast	109	40	29.1 (105.8)	2.8 / 1,900.4	00:36 (01:43)	00:04 / 27:60
Total	1,233	446	28.8 (71.0)	0.5 / 1,900.4	00:37 (01:09)	00:01 / 39:44

Legend: *First attendance with the ICD-10 for SLE (M32). ** Travel distance and time were estimated for round-trip routes using OpenStreetMap (OSM) data; traffic conditions were not accounted for in these estimates. IQR - Interquartile range

CONCLUSION

- **Delayed Diagnosis:** Over half (50.9%) of LN patients initiated dialysis before receiving their first SLE SUS attendance.
- **Geographic Burden:** Nationally, 42.0% of patients travel outside their home municipality for dialysis, with 10.4% facing round-trip travel times exceeding 3 hours. These distances may substantially impact patients' daily routines, including work schedules and overall quality of life, and could contribute to reduced productivity.
- **Regional Disparities:** The Northeast faces the most severe geographical barriers, including the highest inter-municipal travel rate (52.8%).
- **Call to Action:** The compounding burden of late intervention and severe travel strain requires decentralized specialized care and improved early screening protocols across Brazil.

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DISCLOSURES