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Maternal Morbidity Outcomes in Idiopathic Moyamoya Syndrome in New York State

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Maternal morbidity outcomes in idiopathic moyamoya syndrome in New York State

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BACKGROUND

- Pregnancy is associated with an increased risk of stroke in young women
- Idiopathic moyamoya syndrome (IMMS) is a rare condition characterized by progressive narrowing of large cerebral arteries resulting in flimsy collaterals prone to rupture or thrombosis
- Data are limited on pregnancy outcomes in women with IMMS
- We hypothesized that IMMS would be associated with increased pregnancy morbidity, including stroke

METHODS

- Using the New York State Department of Health Statewide Planning and Research Cooperative System data from 2000-2014 and the International Classification for Diseases Ninth Edition (ICD-9), we identified all women aged 18 and older with diagnoses of IMMS (ICD-9 437.5) who had hospitalizations for delivery at any time either prior, concomitant or subsequent to IMMS diagnosis
- We excluded patients with Down syndrome (ICD-9 758.0), neurofibromatosis type 1 (ICD-9 237.71) and sickle cell disease (ICD-9 282.6) at time of IMMS diagnosis
- We then aggregated all pregnancies for these identified patients occurring between January 1, 1994 to December 31, 2014
  - Pregnancies were considered exposed if IMMS diagnosis occurred prior to or within 1 year of delivery
  - Intermediate unexposed pregnancies were those within 2-5 years prior IMMS diagnosis
  - Unexposed pregnancies occurred 6 or more years prior IMMS diagnosis
- Pregnancy morbidity was defined as admission within 1 year of delivery for any of the Center for Disease Control and Prevention's severe maternal morbidity indicators, including stroke
- We compared the morbidity of IMMS-exposed pregnancies to intermediate unexposed and unexposed pregnancies
- Generalized estimating equations were used to calculate odds ratio (OR) and 95% confidence intervals (95%CI) as well as adjust for women with multiple pregnancies occurring in both exposed and unexposed periods
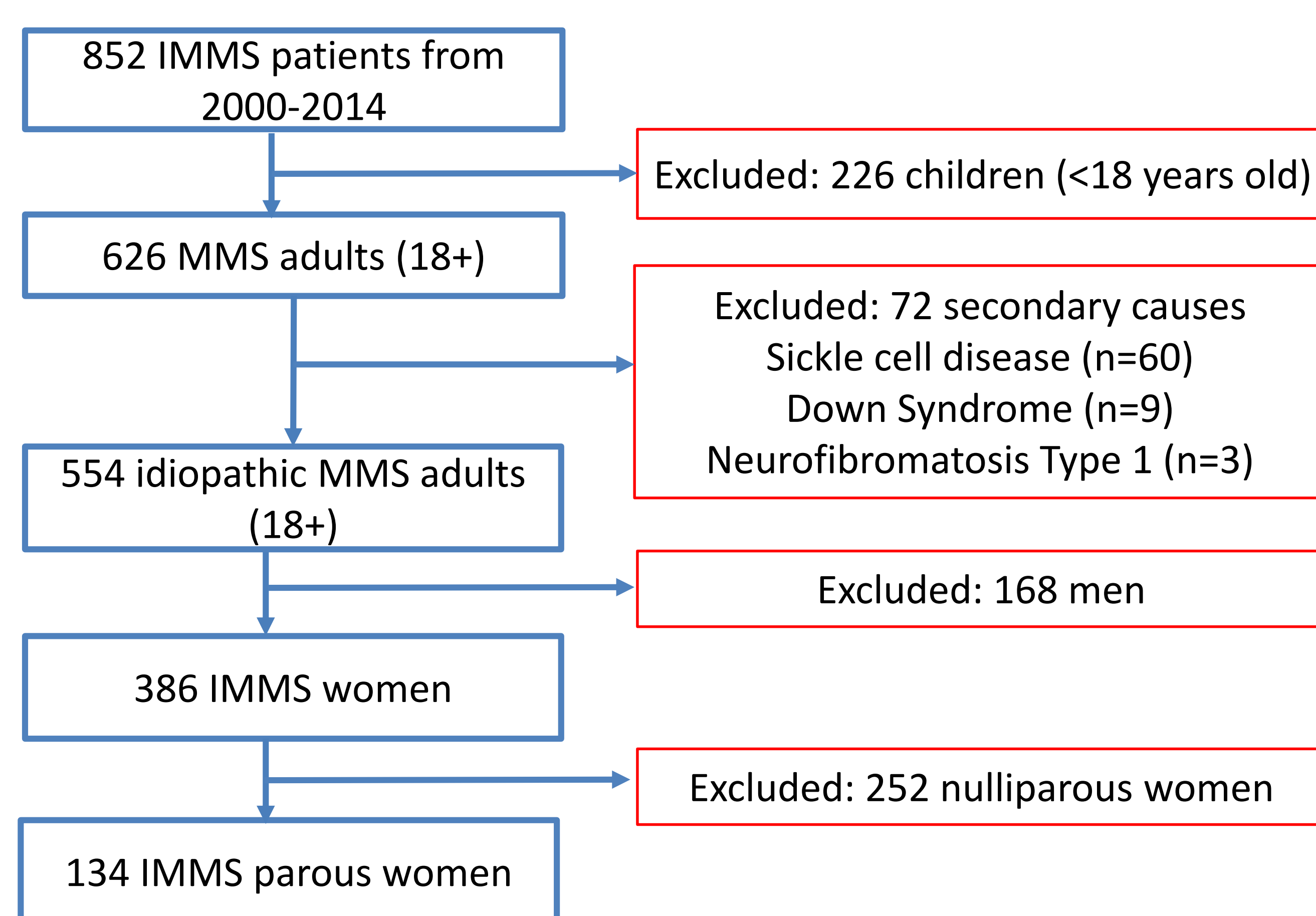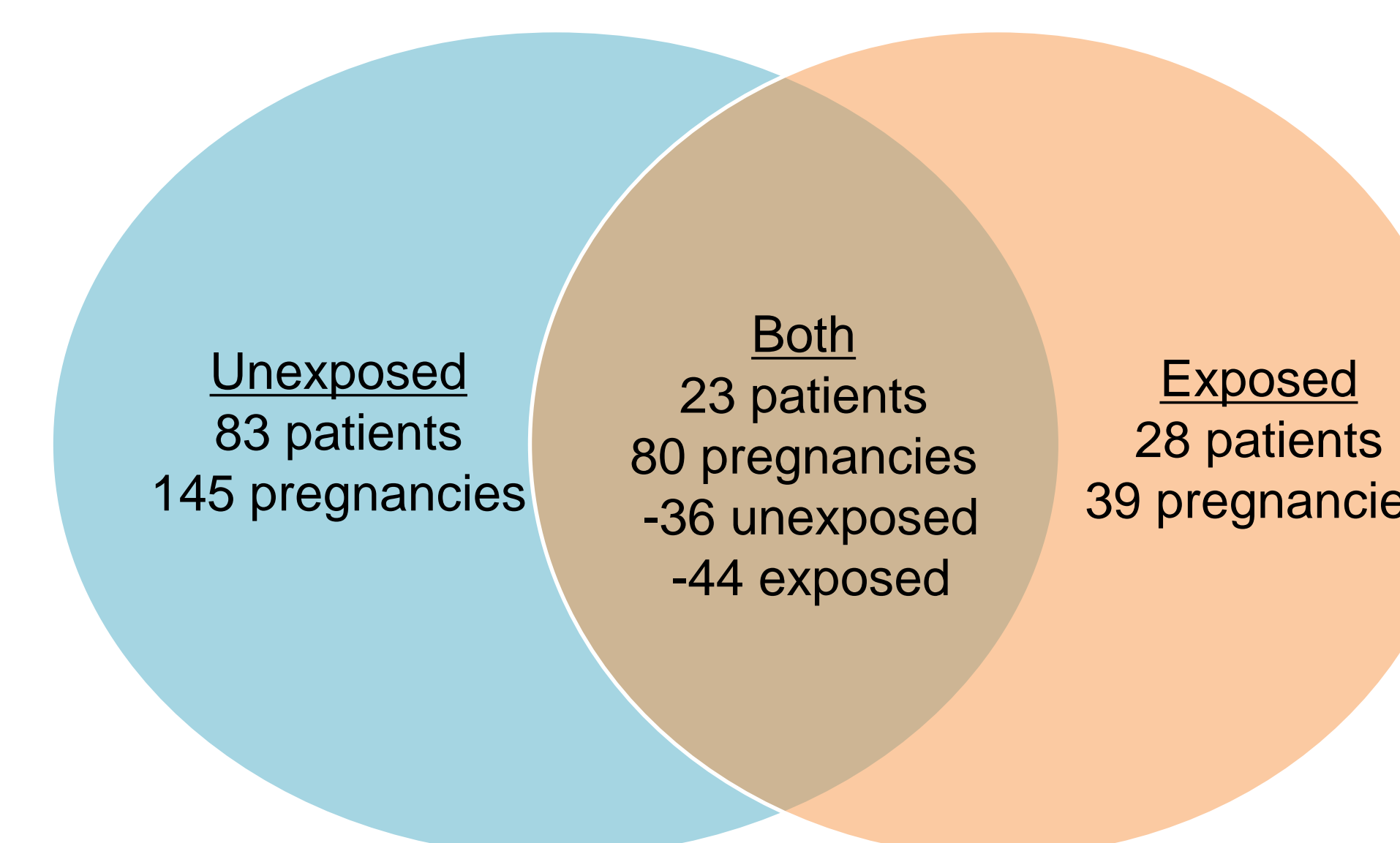
RESULTS

Fig 1. Study Population Flow Diagram

852 IMMS patients from 2000-2014
→ Excluded: 226 children (<18 years old)
626 MMS adults (18+)
→ Excluded: 72 secondary causes
Sickle cell disease (n=60)
Down Syndrome (n=9)
Neurofibromatosis Type 1 (n=3)
554 idiopathic MMS adults (18+)
→ Excluded: 168 men
386 IMMS women
→ Excluded: 252 nulliparous women
134 IMMS parous women

Fig 2. Distribution of exposed and unexposed pregnancies

Unexposed 83 patients 145 pregnancies
Both 23 patients 80 pregnancies -36 unexposed -44 exposed
Exposed 28 patients 39 pregnancies

Table 1: Population demographics and characteristics	Exposed (n=83)	Intermediate Unexposed (n=62)	Unexposed (n=119)	P-value
	N (%)	N (%)	N (%)	
Age (Mean ± Standard deviation)	26.2 ± 7.3	32.2 ± 7.3	39.0 ± 8.0	
Insurance Status				
Medicare/Medicaid	21 (25.3%)	15 (24.2%)	19 (16.0%)	0.01
Private	11 (13.3%)	1 (1.6%)	6 (5.0%)	
Other	51 (61.4%)	46 (74.2%)	94 (79.0%)	
Pregnancy Number				
1 (First pregnancy)	28 (20.9%)	35 (26.1%)	71 (53.0%)	<.0001
2 (Second pregnancy)	21 (33.9%)	12 (19.4%)	29 (46.8%)	
3+ (Third or greater pregnancy)	34 (50.0%)	15 (22.1%)	19 (27.9%)	
CDC indicator	25 (30.1%)	15 (24.2%)	19 (16.0%)	0.001
Stroke	6 (7.2%)	2 (3.2%)	3 (2.5%)	0.02
CDC indicator and/or stroke	29 (34.9%)	17 (27.4%)	21 (17.7%)	0.0003
Death	1 (1.2%)	0 (0.0%)	0 (0.0%)	0.3
ECIC	10 (12.1%)	0 (0.0%)	0 (0.0%)	<.0001
C section	38 (45.8%)	27 (43.6%)	9 (7.6%)	<.0001

Table 2: Racial distribution of IMMS parous women	N (%)
Non-Hispanic White	51 (38.1%)
Non-Hispanic Black	27 (20.1%)
Hispanic	19 (14.2%)
Other	24 (17.9%)
Asian	13 (9.7%)

Table 3: Adjusted GEE models	OR (95% CI)	P-value
Age, CDC and stroke (ref = unexposed)		
Exposed	2.3 (0.8-6.9)	0.1
Intermediate unexposed	1.6 (0.6-4.1)	0.4

RESULTS

- We identified 134 patients with 264 pregnancies in total
- A majority of pregnancies were unexposed (45.1%, n=119) compared to exposed (31.4%, n= 83) and intermediate unexposed (23.4%, n=62)
- There were 23 (17.1%) women that had both exposed and unexposed pregnancies
- Severe maternal morbidity was highest for exposed pregnancies compared to intermediate unexposed and unexposed (34.9% vs. 27.4% vs 17.7%; p=0.0003)
- After adjusting for age and multiple pregnancies, there were no significant odds of severe maternal morbidity or stroke in exposed pregnancies compared to unexposed pregnancies (OR: 2.3, 95% CI: 0.8-6.9)

CONCLUSION

- Pregnancies within 1 year prior or any time after IMMS diagnosis did not have increased maternal morbidity compared to unexposed pregnancies after adjusting for age and clustering of women with multiple pregnancies
- Prospective studies are needed to better characterize increased maternal risks for women with moyamoya syndrome and develop preventive strategies