

Impact of Generalized Myasthenia Gravis on Pregnancy Outcomes: Findings from a Healthcare Claims Database

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Background

- Generalized myasthenia gravis (gMG) is a chronic autoimmune neuromuscular disorder characterized by fluctuating muscle weakness¹
- Incidence of gMG spikes among women of reproductive age, raising concerns about maternal and fetal outcomes during pregnancy and postpartum¹
- Management of gMG during pregnancy is complex, and its real-world impact on maternal and neonatal outcomes, as well as associated healthcare resource utilization (HRU) and costs, remains poorly understood

Objective

- To compare pregnancy outcomes, HRU, and costs among pregnant women with gMG and those without myasthenia gravis (MG)

Methods

Data Source

- Healthcare insurance claims from the Komodo Research database (from January 1, 2016, to September 30, 2023) were used
- The data were de-identified and complied with the Health Insurance Portability and Accountability Act

Study Design

- A retrospective, observational cohort study comparing pregnant women with gMG versus those without MG
- The index date was the estimated date of last menstrual period, based on an algorithm developed by Sarayani et al²
- The follow-up period spanned from the index date to the 6-month postpartum period after the pregnancy end date (i.e., delivery date for live birth, or date of abortion [induced or spontaneous], removal of ectopic pregnancy, or stillbirth)
- The baseline period was defined as 12 months before the index date

Inclusion Criteria

- All patients met the following criteria:
 - Female aged 18–49 with evidence of pregnancy between January 1, 2017, and March 30, 2023, based on the algorithm by Sarayani et al²
 - Continuous health insurance eligibility ≥12 months before the index date and after the index date for the duration of pregnancy plus a 6-month postpartum period
 - No diagnosis for congenital MG (International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] code G70.2) during the study period

- Pregnant patients with gMG also met the following criteria during the baseline period or on the index date:
 - At least one claim with a principal diagnosis for MG (ICD-10-CM code G70.00 or G70.01) in an inpatient setting or at least two claims on separate days (at least 1 month apart) in an outpatient, emergency department, or other setting
 - At least one diagnosis of MG made by a neurologist
- Pregnant patients without MG had no claims with a diagnosis for MG during the study period
- Patients in the pregnant with gMG cohort were matched 1:10 to patients in the pregnant without MG cohort, based on the distribution of follow-up time after the index date due to varying pregnancy durations, to remove the influence of differential follow-up duration on the ability to observe study outcomes

Statistical Analysis and Outcomes

- Cohorts were weighted using entropy balancing on age, race, region, insurance type, and index year; in addition, the Quan-Charlson Comorbidity Index³ was used to account for the difference in health state between the two cohorts
- Pregnancy outcomes were identified based on the algorithm² and included live birth, abortion (induced or spontaneous), and ectopic pregnancy
- Gestational age, preterm birth, and Cesarean delivery were also reported among those with a live birth
- HRU and costs were reported monthly; costs represented the sum of the payer's reimbursed amount and the patient's out-of-pocket expense, and were adjusted for inflation using the US Consumer Price Index and reported in 2023 US dollars
- Weighted regression models (logistic for binary variables, Poisson for count variables, linear for continuous variables) were used to compare outcomes
- Non-parametric bootstrap procedures with 500 replications were used to generate confidence intervals for count and continuous variables

Results

Patient Characteristics

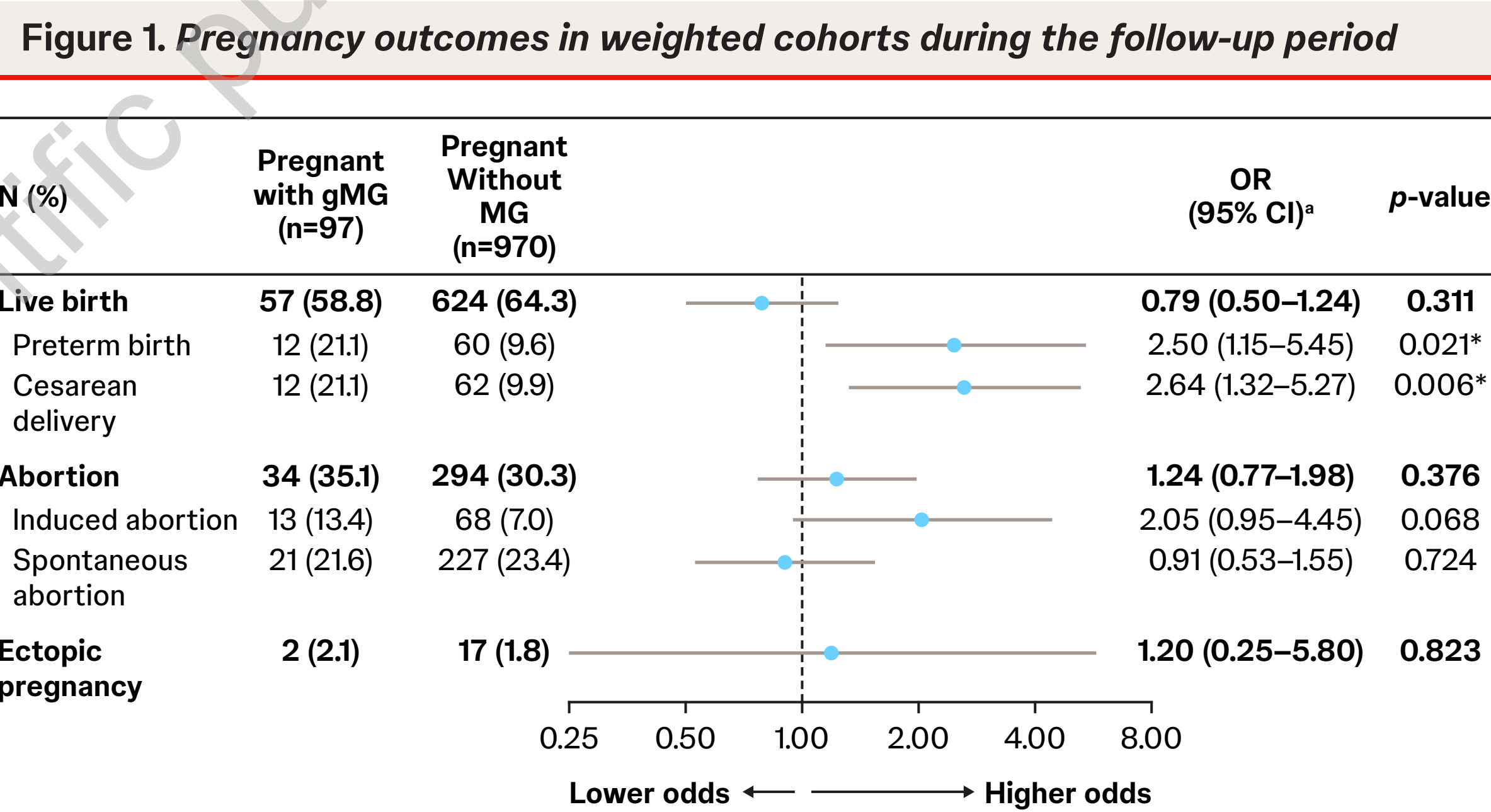
- A total of 97 pregnant patients with gMG and 970 pregnant patients without MG were included in the study (see characteristics in **Table 1**)

Table 1. Baseline characteristics among weighted cohorts			
Mean ± SD [median] or n (%)	Pregnant with gMG (n=97)	Pregnant Without MG (n=970)	Standardized Difference, %
Age at index date, years	32.2 ± 6.0 [33.0]	32.3 ± 5.9 [33.1]	1.3
Race			
White	37 (38.1)	370 (38.1)	0.0
Hispanic or Latino, Asian or Pacific Islander, or other	19 (19.6)	190 (19.6)	0.0
Black or African American	13 (13.4)	130 (13.4)	0.0
Unknown	28 (28.9)	280 (28.9)	0.0
Geographical region			
South	37 (38.1)	370 (38.1)	0.0
Northeast	28 (28.9)	280 (28.9)	0.0
Midwest	18 (18.6)	180 (18.6)	0.0
West	14 (14.4)	140 (14.4)	0.0
Payer			
Commercial insurance	70 (72.2)	700 (72.2)	0.0
Medicare Advantage	19 (19.6)	190 (19.6)	0.0
Medicaid	8 (8.2)	80 (8.2)	0.1
Quan-CCI	0.5 ± 0.9 [0.0]	0.5 ± 1.0 [0.0]	0.0
Common comorbidities			
Obesity	25 (25.8)	226 (23.3)	5.8
Hypothyroidism	15 (15.5)	154 (15.9)	1.1
Hypertension	13 (13.4)	110 (11.3)	6.2
Number of MG exacerbations or crises	6.2 ± 28.6 [0.0]	–	–
All-cause monthly healthcare costs, 2023 US dollars	6117 ± 11,064 [1214]	745 ± 1908 [198]	68.0*
Follow-up time, months	12.2 ± 3.2 [14.0]	12.6 ± 3.1 [15.0]	–

*Standardized difference >10%.
gMG=generalized myasthenia gravis, MG=myasthenia gravis, Quan-CCI=Quan-Charlson Comorbidity Index, SD=standard deviation.

Pregnancy Outcomes

- The pregnant with gMG cohort was 2.50 times more likely to have a preterm birth and 2.64 times more likely to have a Cesarean delivery compared to the pregnant without MG cohort ($p=0.021$ and $p=0.006$, respectively) (**Figure 1**)
- Among patients who had a live birth, the mean gestational age was significantly shorter among the pregnant with gMG cohort (37.0 weeks) compared to the pregnant without MG cohort (38.2 weeks) ($p=0.008$)



^aOR >1 indicates that the pregnant with gMG cohort had greater odds of having the outcome compared to the pregnant without MG cohort.
* $p<0.05$.
CI=confidence interval, gMG=generalized myasthenia gravis, MG=myasthenia gravis, OR=odds ratio.

Healthcare Resource Utilization

- The pregnant with gMG cohort had 1.81 times more all-cause outpatient visits compared to the pregnant without MG cohort ($p<0.001$). Inpatient admission and emergency department visit patterns were similar between cohorts (**Figure 2**)

Costs

- The pregnant with gMG cohort had \$3170 higher monthly all-cause total healthcare costs compared to the pregnant without MG cohort ($p<0.001$) (**Figure 3**)
- The difference in total healthcare costs was driven by \$2290 higher monthly pharmacy costs in the pregnant with gMG cohort compared to the pregnant without MG cohort ($p<0.001$)
 - Immunoglobulin costs accounted for 72.1% of the pharmacy cost difference (\$1651 per month among the pregnant with gMG cohort)
- The \$881 higher monthly medical costs in the pregnant with gMG cohort stemmed from \$728 higher outpatient visit costs compared to the pregnant without MG cohort ($p<0.001$)
- Pregnancy-related costs were similar between the cohorts



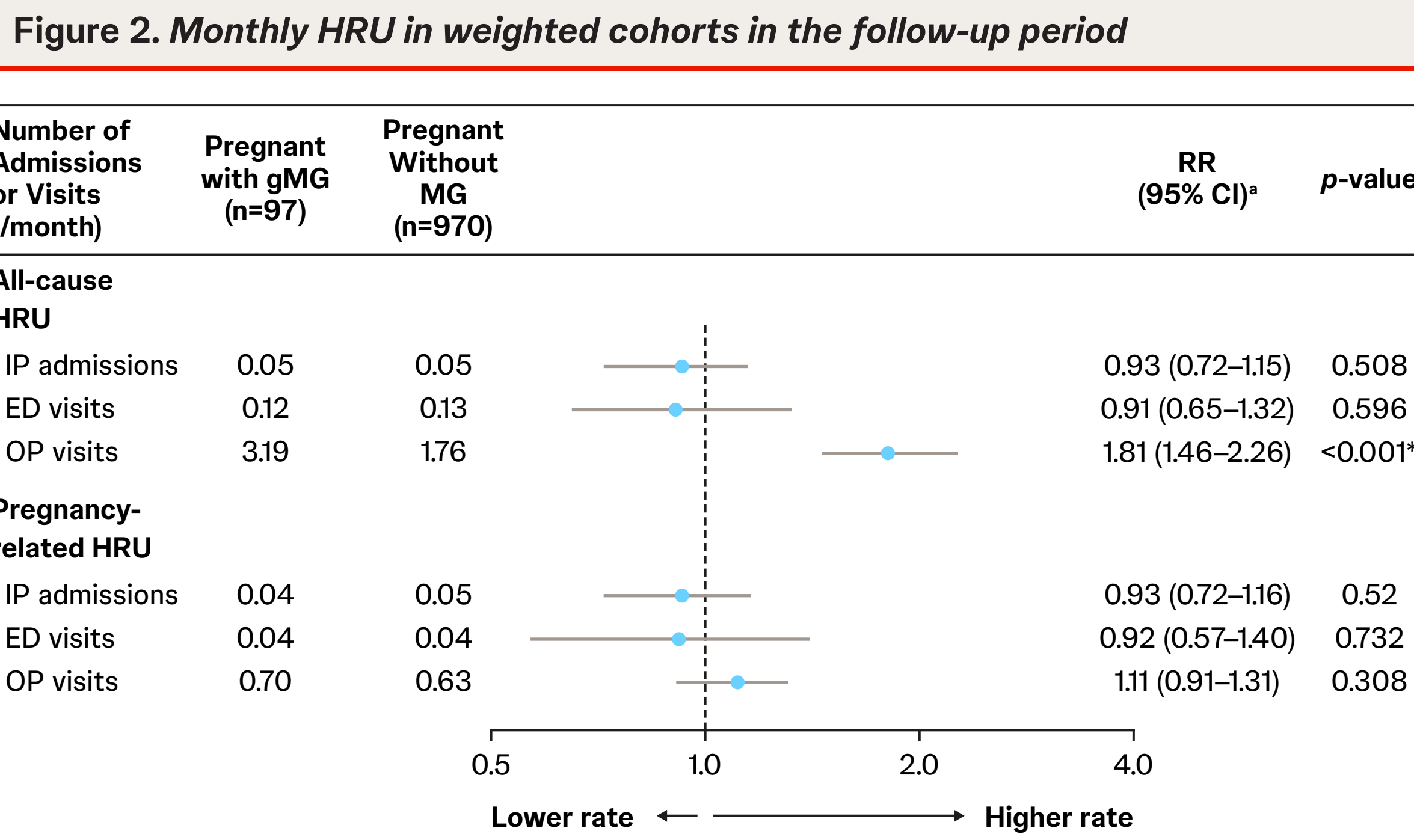
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Key Takeaways

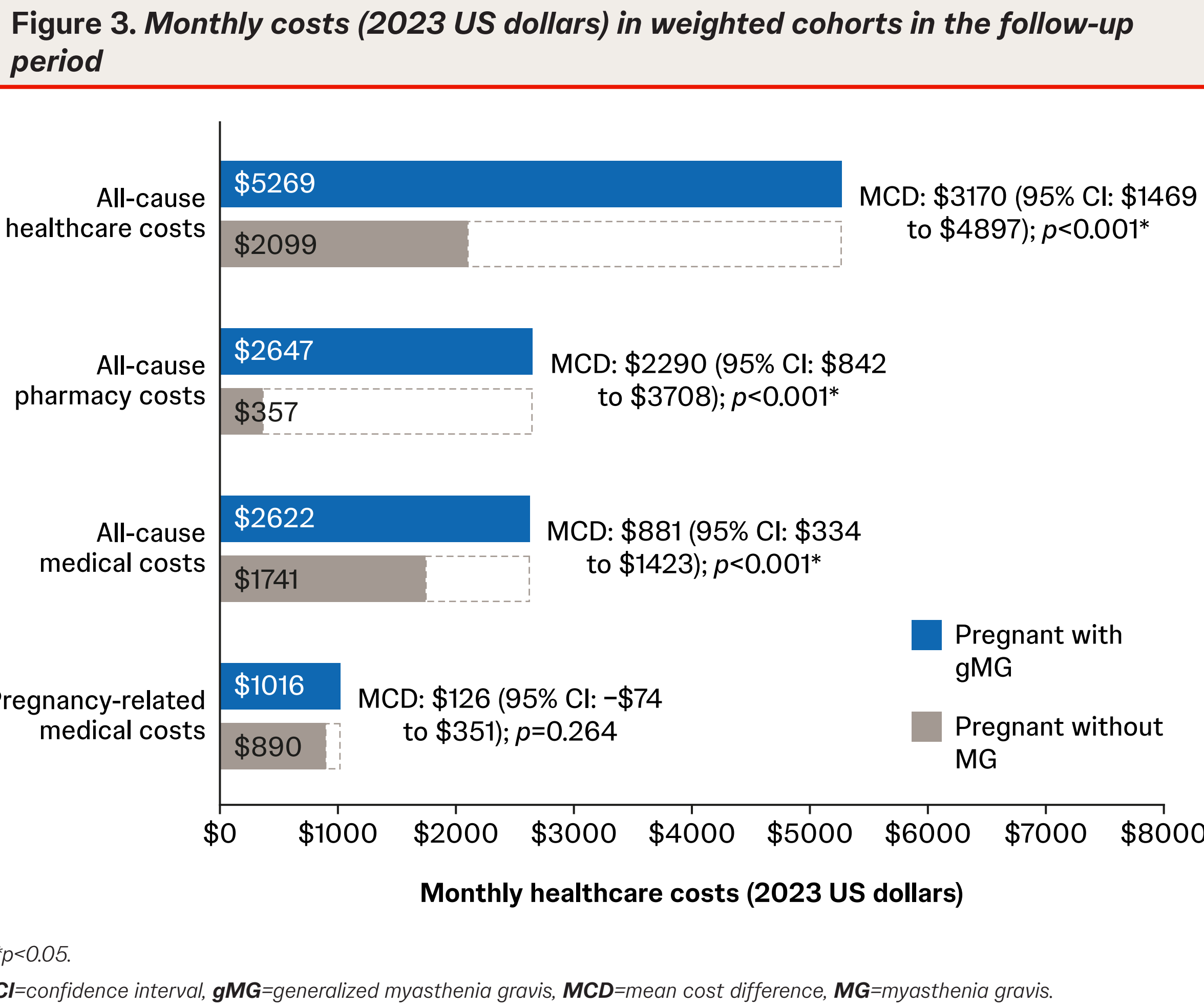
- The proportions of preterm births and Cesarean deliveries were greater among pregnant women with gMG than among those without MG
- These findings highlight the necessity for tailored management approaches to mitigate pregnancy-related risks in women with gMG
- Future research should focus on specific demographic and clinical characteristics that drive adverse pregnancy outcomes among pregnant women with gMG

Limitations

- Potential misclassification due to the nature of administrative claims data, lack of specific diagnosis codes for gMG, and identification of pregnancy and pregnancy outcomes based on an algorithm
- Potential residual confounding due to unmeasured variables (e.g., lifestyle, socioeconomic status)
- Findings may not be generalizable to uninsured individuals or those with types of insurance not well represented in the data



^aRR >1 indicates that the pregnant with gMG cohort had a higher rate of having the outcome compared to the pregnant without MG cohort.
* $p<0.05$.
CI=confidence interval, ED=emergency department, gMG=generalized myasthenia gravis, HRU=healthcare resource utilization, IP=inpatient, MG=myasthenia gravis, OP=outpatient, RR=rate ratio.



* $p<0.05$.
CI=confidence interval, gMG=generalized myasthenia gravis, MCD=mean cost difference, MG=myasthenia gravis.