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Risk of Specific Infections in Patients with Multiple Sclerosis Versus Matched Controls: An Analysis of Administrative Claims Data

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SUMMARY

- Few population-level risk estimates for specific categories of infections in patients with multiple sclerosis (MS) exist in the United States (US)
- The objective of this study was to assess the risks of specific infection categories in patients with MS vs. matched controls
- This study examined relative risk for outpatient claims and inpatient hospitalizations for specific infections using urinary/kidney, pneumonia/influenza, other respiratory/throat, viral, skin, fungal, and opportunistic infection categories among patients with MS versus controls
- The IQVIA™ RWD Adjudicated Claims–US database (1/1/2010–6/30/2019) was used
- Outpatient claims and inpatient hospitalizations for urinary/kidney infections were higher among patients with MS than matched controls
- Findings will be helpful to clinicians and healthcare payers in understanding the burden of specific infections among patients with MS

Abbreviations: CI, confidence interval; **HCV**, hepatitis C virus; **HIV**, human immunodeficiency virus; **ICD-9/10-CM**, International Classification of Diseases, 9th/10th Edition – Clinical Modification; **MS**, multiple sclerosis; **RR**, relative risk; **RWD**, real-world data; **SD**, standard deviation.

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Abbreviations: CI, confidence interval; **HCV**, hepatitis C virus; **HIV**, human immunodeficiency virus; **ICD-9/10-CM**, International Classification of Diseases, 9th/10th Edition – Clinical Modification; **MS**, multiple sclerosis; **RR**, relative risk; **RWD**, real-world data; **SD**, standard deviation.

BACKGROUND INFORMATION

- **Published studies** have **demonstrated** an **increased risk of infection**,[1-5] infection-related **hospitalization**,[1-5] **and mortality** due to infection[3,6] in patients with MS compared to patients without MS
- It is **important to understand the risk of specific infections in patients with MS**; however, population-based studies in the US are rare

OBJECTIVE

- **To assess the relative risk (RR) of specific infections in patients with MS vs. matched controls** using IQVIA™ Real World Data Adjudicated Claims–US data (1/1/2010–6/30/2019)

Abbreviations: CI, confidence interval; **HCV**, hepatitis C virus; **HIV**, human immunodeficiency virus; **ICD-9/10-CM**, International Classification of Diseases, 9th/10th Edition – Clinical Modification; **MS**, multiple sclerosis; **RR**, relative risk; **RWD**, real-world data; **SD**, standard deviation.

References: 1. Persson R, et al. *Mult Scler Relat Disord* 2020;41:101982. **2.** Wijnands JM, et al. *Mult Scler* 2017;23(11):1506-16. **3.** Nelson RE, et al. *Int J MS Care* 2015;17(5):221-30. **4.** Montgomery S, et al. *Eur J Neurol* 2013;20(8):1153-60. **5.** Marrie RA, et al. *Neurology* 2014;83(10):929-37. **6.** Goodin DS, et al. *PLoS One* 2014;9(8):e105207.

METHODS

- The MS cohort had **≥2 MS diagnoses** (ICD-9-CM/ICD-10-CM: 340.xx/G35) ≥30 days apart
- The control cohort had **2 diagnoses for any other condition** ≥30 days apart
- The index date was a randomly selected office visit
- **Inclusion criteria** were:
  - Age 18–64 years
  - 12-month eligibility pre-/post-index
  - No antibiotic/antiviral claim 60 days prior to index claim
  - No claim for pregnancy/inpatient residential care/end-stage renal disease facility/HIV/HCV
- Cohorts were **matched 1:1 on age, sex, payer type, census region, and index year**
- **RR** were **estimated for presence of outpatient claims and inpatient hospitalization** for urinary/kidney, pneumonia/influenza, other respiratory/throat, viral, skin, fungal, and opportunistic **infections** in the **12-month post-index** period
- RR were evaluated in a modified Poisson regression model with robust error variance
- ICD-9-CM/ICD-10-CM codes for urinary/kidney, pneumonia/influenza, other respiratory/throat, viral, skin, fungal, and opportunistic **infections** were identified from Wijnands et al[1]

Abbreviations: CI, confidence interval; **HCV**, hepatitis C virus; **HIV**, human immunodeficiency virus; **ICD-9/10-CM**, International Classification of Diseases, 9th/10th Edition – Clinical Modification; **MS**, multiple sclerosis; **RR**, relative risk; **RWD**, real-world data; **SD**, standard deviation.

References: 1. Wijnands JM, et al. *Mult Scler* 2017;23:1506–16.

RESULTS

Patient baseline characteristics

- There were **87,755 patients with MS** and **87,755 control patients** (mean [SD] age 47.3 [10.5] years, 75.7% female)
- After exact matching, the **baseline characteristics** of the two groups were **exactly-balanced**
- There was similar variability in geographic distribution between the groups
- Nearly **two-thirds** of patients from both groups (**65.7%**) had **commercial insurance** and **one-third** (**34.3%**) had **self-insured employer insurance**

Patient baseline characteristics post-matching

Characteristic	MS Cohort (n=87,755)	Non-MS Cohort (n=87,755)
Age, years		
Mean (SD)	47.3 (10.5)	47.3 (10.5)
Median	49.0	49.0
Age Group, n (%)		
18 to <40	20,653 (23.5%)	20,653 (23.5%)
40 to <50	26,160 (29.8%)	26,160 (29.8%)
50 to <60	29,705 (33.9%)	29,705 (33.9%)
≥60	11,237 (12.8%)	11,237 (12.8%)
Sex, n (%)		
Female	66,453 (75.7%)	66,453 (75.7%)
Male	21,302 (24.3%)	21,302 (24.3%)
Region		
East	22,382 (25.5%)	22,382 (25.5%)
Midwest	27,438 (31.3%)	27,438 (31.3%)
South	28,720 (32.7%)	28,720 (32.7%)
West	9,215 (10.5%)	9,215 (10.5%)
Payer Type		
Commercial	57,627 (65.7%)	57,627 (65.7%)
Self-Insured Employer	30,128 (34.3%)	30,128 (34.3%)

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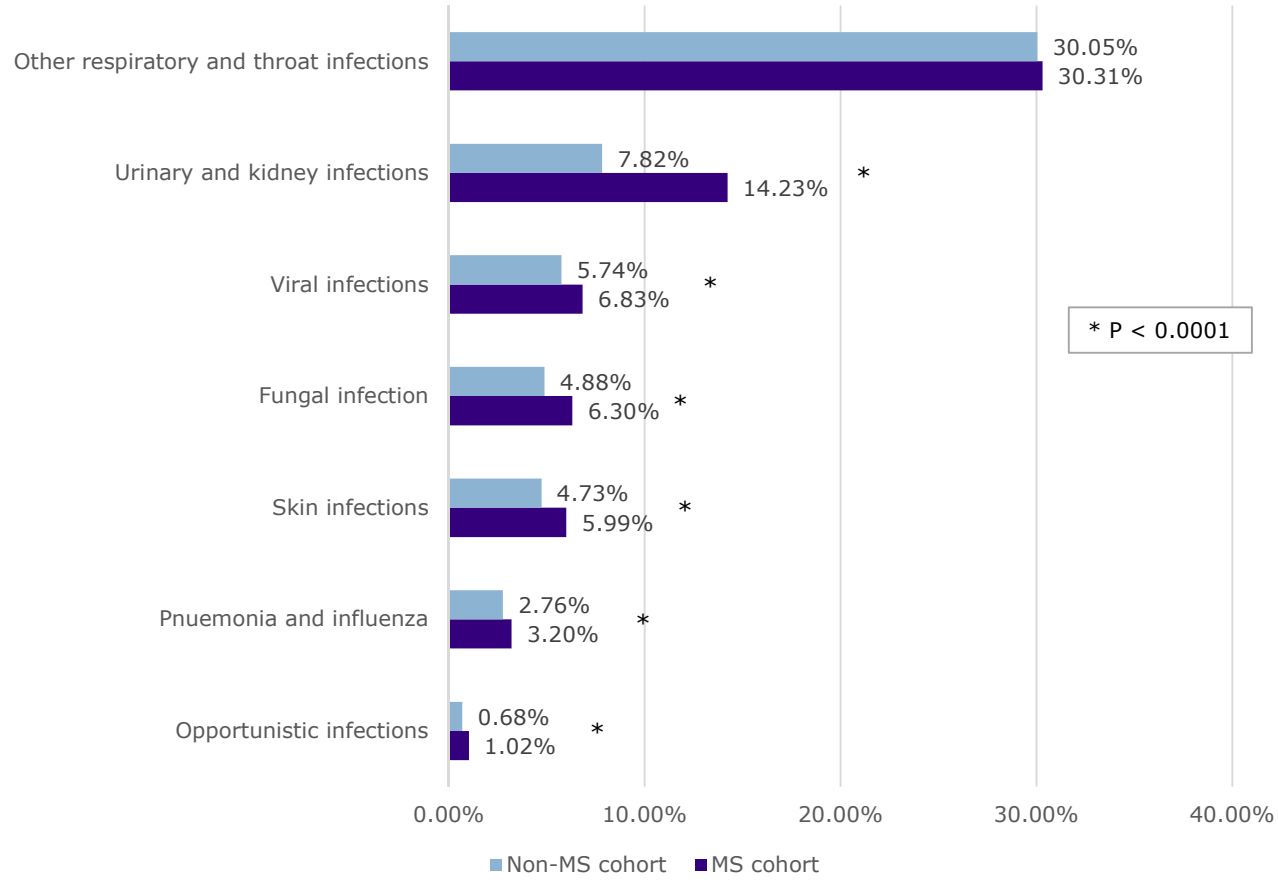
RESULTS

Outpatient infection diagnosis

- The RR (95% CI) of patients with MS vs. controls of outpatient claims for infections were:
  - **Other respiratory/throat**: 1.01 (0.99–1.02), p=0.24
  - **Urinary/kidney**: 1.82 (1.77–1.87), p<0.0001
  - **Viral**: 1.19 (1.15–1.23), p<0.0001
  - **Fungal**: 1.29 (1.24–1.34), p<0.0001
  - **Skin**: 1.26 (1.22–1.32), p<0.0001
  - **Pneumonia/influenza**: 1.16 (1.10–1.23), p<0.0001
  - **Opportunistic infections****: 1.50 (1.35–1.66), p<0.0001

Outpatient infection claims



** Opportunistic infections category includes pneumocystis pneumonia, cryptosporidiosis, mycobacteria, bartonellosis, other mycoses, cryptococcosis, cytomegaloviral disease, human papillomavirus, other viral hepatitis, progressive multifocal leukoencephalopathy, Epstein-Barr virus, histoplasmosis, toxoplasmosis, and legionella.

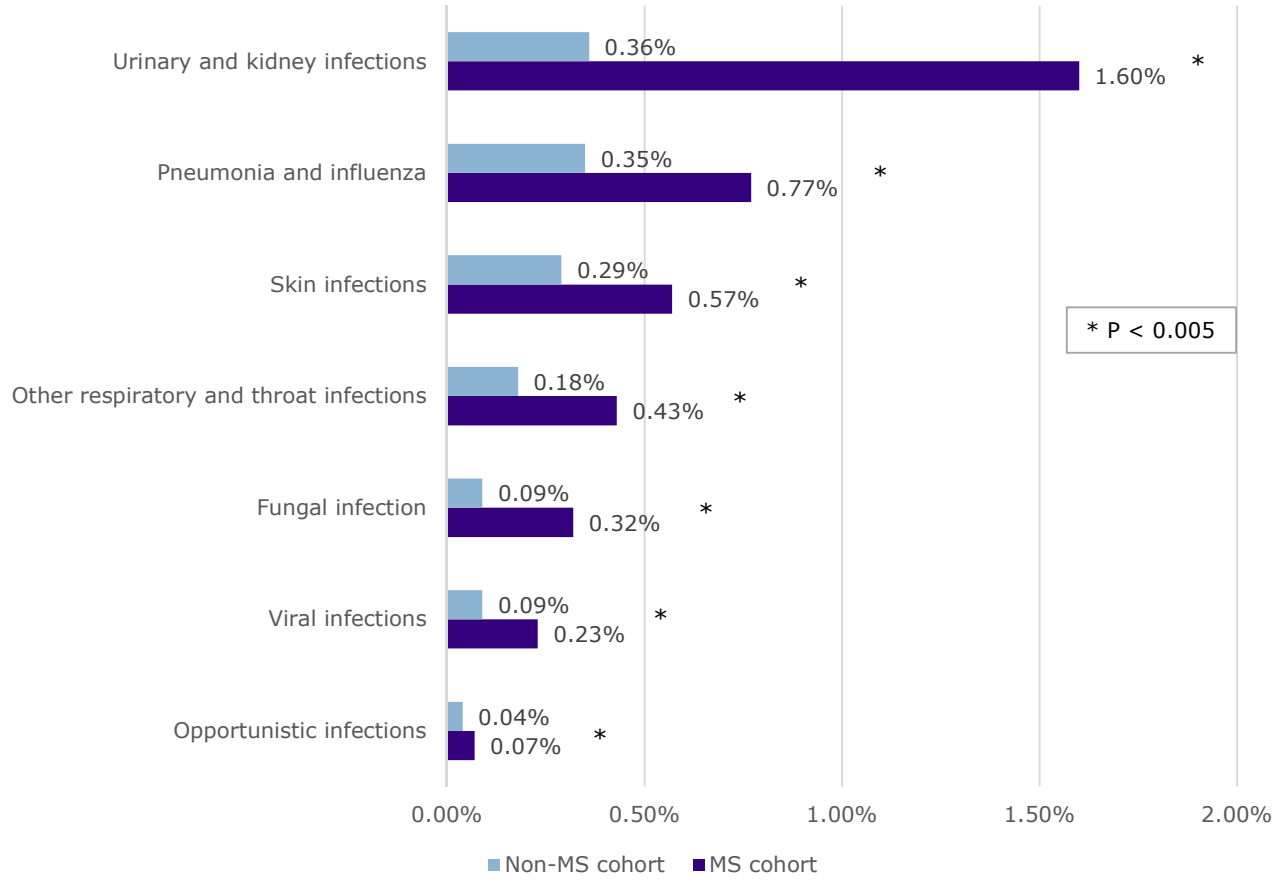
Abbreviations: CI, confidence interval; **HCV**, hepatitis C virus; **HIV**, human immunodeficiency virus; **ICD-9/10-CM**, International Classification of Diseases, 9th/10th Edition – Clinical Modification; **MS**, multiple sclerosis; **RR**, relative risk; **RWD**, real-world data; **SD**, standard deviation.

RESULTS

Inpatient infection diagnosis

- The RR (95% CI) of patients with MS vs. controls of inpatient hospitalizations for infection were:
  - **Urinary/kidney**: 4.49 (3.98–5.08), p<0.0001
  - **Pneumonia/influenza**: 2.22 (1.94–2.54), p<0.0001
  - **Skin**: 1.95 (1.68–2.27), p<0.0001
  - **Other respiratory/throat**: 2.37 (1.97–2.85), p<0.0001
  - **Fungal**: 3.69 (2.86–4.77), p<0.0001
  - **Viral**: 2.58; (1.99–3.36), p<0.0001
  - **Opportunistic infections****: 1.94 (1.26–2.97), p=0.0024

Inpatient infection claims



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CONCLUSIONS

- **Outpatient claims** and **inpatient hospitalizations** for **urinary/kidney infections** were **higher among patients with MS** than controls
- Findings provide **insights** to clinicians and healthcare payers **into the burden of outpatient and inpatient infections among patients with MS**

LIMITATIONS

- **Patients in this study had commercial health insurance** and findings may not apply to patients with no commercial health insurance
- We were unable to further categorize infection risk in MS patients based on disease severity

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