Understanding the Burden of Illness in People with Primary Progressive Multiple Sclerosis in the United States: A Matched-Cohort Study

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BACKGROUND

- Multiple sclerosis (MS) is categorized into distinct phenotypes based on its clinical progression[1]
- About 10% to 15% of people with MS develop a progressive form after the disease onset, which is termed as primary progressive multiple sclerosis (PPMS)[1]
- While it is known that people with MS experience a substantially lower quality of life and a greater healthcare resource utilization (HCRU) burden than the general population, data on the clinical and economic burden of PPMS are limited[2–4]

OBJECTIVE

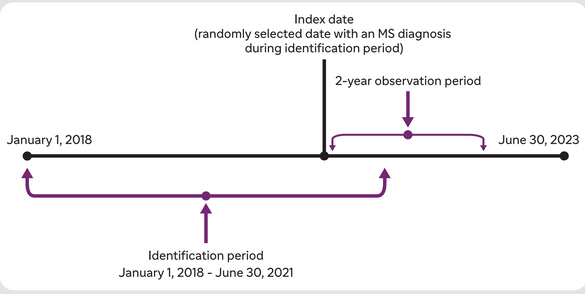
- To understand the real-world clinical and economic burden in people with PPMS in the United States (US)

METHODS

Study design and population

- A retrospective, matched-cohort (1:1) study was conducted using a large, integrated US-based administrative claims database from January 1, 2018 to June 30, 2023 (**Figure 1**)
- The index date was defined as a randomly selected date with an MS diagnosis during the identification period (January 1, 2018 to June 30, 2021)
- People with PPMS were identified as per the inclusion/exclusion criteria illustrated in **Figure 2**
- People with PPMS were then matched to unique MS-free controls based on age, gender, region, and insurance (1:1). The index date of the controls was the same as that of the matched PPMS cohort

Figure 1: Study time frame



MS, multiple sclerosis.

Study measures

- Baseline demographics, Charlson Comorbidity Index (CCI), specific comorbidities of interest, HCRU, and healthcare costs (HCCs) of people with PPMS were compared with that of the matched-controls during the 2-year observation period
  - HCRU and HCCs included inpatient admissions, emergency department (ED) visits, non-ED outpatient service visits, medical and pharmacy costs (the costs of infections), and the use of specific services

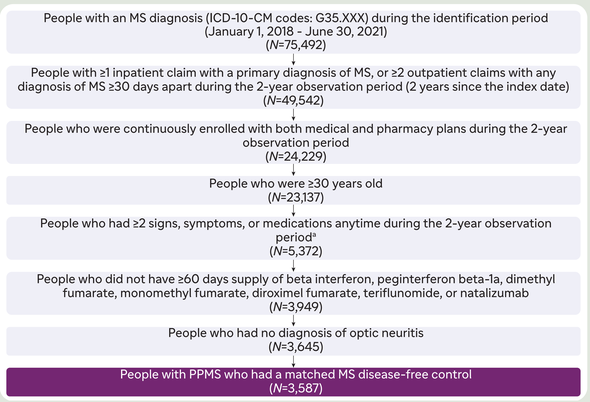
Statistical analysis

- Descriptive statistical analyses were used to compare all study measures
- All costs were reported in US dollars (adjusted to Year 2023)
- All tests were 2-sided, and *P*<0.05 was considered significant

RESULTS

- The final cohort comprised of 3,587 people with PPMS and 3,587 matched MS-free controls (**Figure 2**)

Figure 2: Attrition chart for PPMS cohort



[a]Gait dysfunction or the use of dalfampridine; the use of ambulatory devices (e.g., cane, walker, wheelchair, orthotics, or other walking aids); physical therapy for ≥6 weeks (or 30 sessions) in any 1-year period; occupational therapy for ≥6 weeks or 30 sessions per year; swallowing dysfunction (dysphagia); speech dysfunction (dysarthria); neurogenic bladder; neurogenic bowel; the use of a urinary catheter (e.g., self-catheterization or suprapubic catheter); bowel or bladder incontinence; hospitalization for urinary tract infections (including acute cystitis, urosepsis, or kidney infection) in females; and hospitalization for respiratory infections.
ICD-10-CM, International Classification of Diseases, 10th Revision, Clinical Modification; MS, multiple sclerosis; PPMS, primary progressive multiple sclerosis.

Baseline demographics

- The mean (standard deviation [SD]) age of the PPMS cohort was 57.5 (12.0) years; the majority were female (75.9%) and covered by commercial insurance (72.4%; **Table 1**)

Table 1: Demographics of people in the PPMS cohort versus the matched-controls

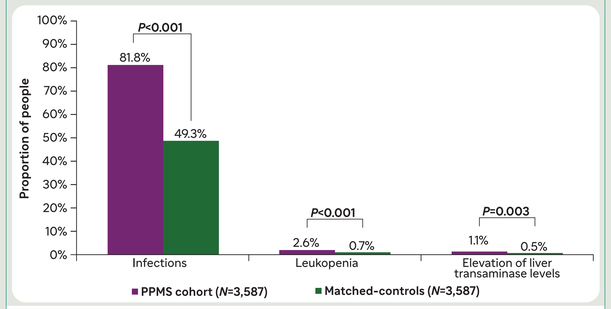
	PPMS Cohort (*N*=3,587)	Matched-controls (*N*=3,587)
Age, mean±SD (years)	57.5±12.0	57.5±12.0
30–39	255 (7.1)	255 (7.1)
40–49	671 (18.7)	671 (18.7)
50–59	1,132 (31.6)	1,132 (31.6)
60–69	882 (24.6)	882 (24.6)
70+	647 (18.0)	647 (18.0)
Female	2,721 (75.9)	2,721 (75.9)
Region		
Midwest	1,243 (34.7)	1,243 (34.7)
Northeast	673 (18.8)	673 (18.8)
South	1,273 (35.5)	1,273 (35.5)
West	398 (11.1)	398 (11.1)
Type of insurance plan		
Commercial	2,597 (72.4)	2,597 (72.4)
Medicare	990 (27.6)	990 (27.6)

Data presented as *n* (%) unless otherwise specified.
PPMS, primary progressive multiple sclerosis; SD, standard deviation.

Clinical characteristics

- The mean CCI score was significantly higher for the PPMS cohort than for the matched-controls (2.10 vs. 0.86; *P*<0.001)
- The proportion of people with infections, leukopenia, and elevated liver transaminase levels was significantly higher in the PPMS cohort than in the matched-controls (**Figure 3**)

Figure 3: Proportion of people with infections, leukopenia, and elevated liver transaminase levels in the PPMS cohort versus the matched-controls

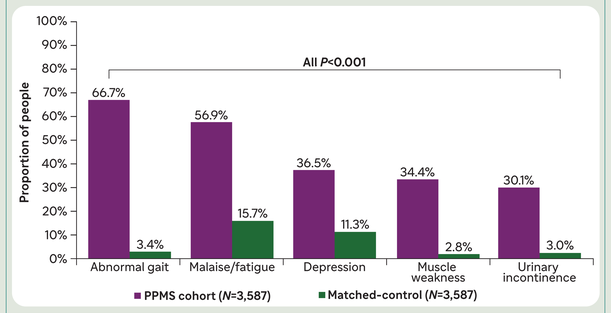


Data presented as the percentage of people.
PPMS, primary progressive multiple sclerosis.

Specific comorbidities of interest

- The most frequent MS-related comorbidities in the PPMS cohort versus the matched-controls included abnormal gait, malaise/fatigue, depression, muscle weakness, and urinary incontinence (**Figure 4**)
- Other comorbidities (84.9% vs. 58.2%; *P*<0.001) and autoimmune comorbidities (31.6% vs. 17.2%, *P*<0.001) were significantly higher in the PPMS cohort than in the matched-controls, respectively

Figure 4: Most frequent MS-related comorbidities in the PPMS cohort versus the matched-controls

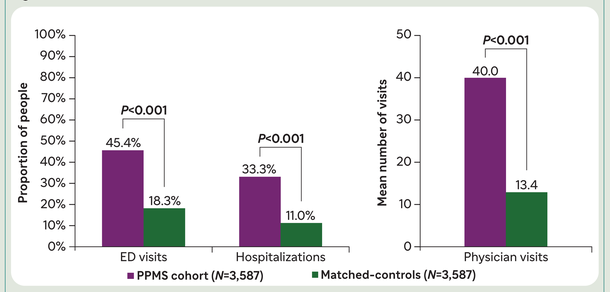


Data presented as the percentage of people.
MS, multiple sclerosis; PPMS, primary progressive multiple sclerosis.

Healthcare resource utilization and healthcare costs

- The PPMS cohort had a significantly higher proportion of people with hospitalizations and ED visits and a higher mean number of physician visits than the matched-controls during the follow-up period (**Figure 5**)
  - The length of hospital stay was also significantly higher in the PPMS cohort than in the matched-controls (mean [SD]: 13.5 [22.8] days vs. 8.8 [16.3] days; *P*<0.001)
- A significantly higher proportion of people with PPMS than in the matched-controls required ambulatory devices (74.3% vs. 9.8%) and physical (67.5% vs. 16.1%), occupational (75.4% vs. 19.4%), and speech (3.2% vs. 0.2%) therapies (all *P*<0.001)

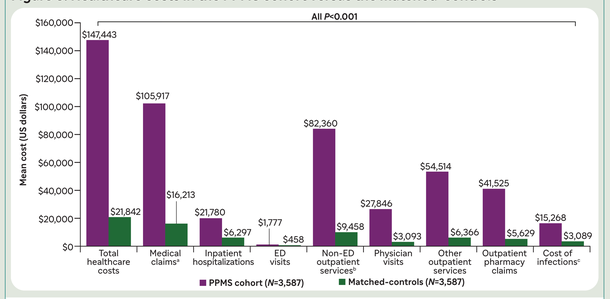
Figure 5: All-cause healthcare resource utilization in the PPMS cohort versus the matched-controls



Data presented as the percentage of people and the mean number of physician visits.
ED, emergency department; PPMS, primary progressive multiple sclerosis.

- The mean total HCCs were significantly higher in the PPMS cohort than in the matched-controls, which were primarily driven by the costs of medical claims and non-ED outpatient services (**Figure 6**)

Figure 6: Healthcare costs in the PPMS cohort versus the matched-controls



Data presented as the mean cost.
[a]Medical claims included the costs of inpatient hospitalizations, ED visits, and non-ED outpatient services.
[b]Non-ED outpatient services included the costs of office visits and other outpatient services (non-ED/non-office).
[c]Cost of infections: The costs of medical claims with a diagnosis of infections in any field plus the costs of antibiotics or antivirals pharmacy claims, with days of supply <21, filled within 7 days of an infection medical claim.
ED, emergency department; PPMS, primary progressive multiple sclerosis; US, United States.

LIMITATIONS

- Limitations included a potential misclassification of people with PPMS, the lack of mortality data of people with PPMS in the database, and limited generalizability to uninsured populations or those over the age of 65 years

CONCLUSIONS

- Overall, people with PPMS had more comorbidities and significantly higher HCRU and HCCs than the matched-controls, resulting in a substantial clinical and economic burden in this population for whom very limited approved therapies exist

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Disclosures
Nupur Greene and **Ines Hemim** are employees of Sanofi and may hold stocks or stock options in the company.
Ashis K. Das, **Eunice Chang**, and **Marian H. Tarbox** were employees of PHAR (now a part of ADVI Health) at the time of this study. PHAR was paid by Sanofi to conduct the research described in this poster. PHAR also discloses financial relationships with the following commercial entities outside of the submitted work: Akcea, Amgen, Celgene, Delfi Diagnostics, Dompe, Exact Sciences Corporation, Genentech, Gilead, GRAIL, Greenwich Biosciences, Ionis, Nobelpharma, Novartis, Pardes, Prothena, Pfizer, Recordati, Regeneron, Sanofi US Services, and Sunovion.

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