# Employment and its Associations in an International Cohort of Myelin Oligodendrocyte Glycoprotein Antibody Disease

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## INTRODUCTION

Myelin oligodendrocyte glycoprotein associated antibody disease (MOGAD) can lead to significant disability by attacking the optic nerve, spinal cord, and brain. Since MOGAD typically presents in adolescence or young adulthood, the frequent medical visits required for symptoms can also disrupt one's ability to work and earn a meaningful income. The socioeconomic consequences of MOGAD, especially in adults, remain underreported.

The study addresses two main questions:

- What is the prevalence of unemployment and underemployment in MOGAD?
- What demographic, clinical, and country income-level factors are associated with lost employment and work hours in MOGAD?

## METHODS

Ethics: Approved by the Massachusetts General Brigham Institutional Review Board. Additional approvals occurred by local ethics board, as needed.

Study Sites: Participants were recruited from clinical sites in 13 countries between April 2022 and August 2023. Recruitment was conducted through neurologist referrals. Participating countries included Australia, Italy, Singapore, United Kingdom, U.S.A. (high-income), Argentina, Brazil, China, Colombia, Dominican Republic, Malaysia, Turkey (upper middle-income), and India (lower middle-income).

Data Collection: Adults aged 18-70 with neurologist-diagnosed MOGAD completed a one-time survey. Data collected included demographic variables, clinical history including symptoms and treatment, and employment-related information.

Data Analysis: Generalized linear models assessed associations between MOGAD diagnosis and employment status, and reduced work hours. Key variables included participant age, gender, education, country income level, myelitis presence, visual loss, fatigue, depressed mood, pain, and disease duration. Certain clinical variables were binarized into presence/absence categories for clearer statistical comparisons. Data analyses were conducted using R (version 4.3.1).

## RESULTS

Demographic Variables:

The study analyzed 117 participants with MOGAD (66.7% female, 33.3% male), with an average age of 39.7 years (Table 1). Participants were from 5 high-income, 7 upper-middle-income, and 1 lower-middle-income countries. Most participants (69.2%) were from China, India, and the U.S.A. The average years of schooling was 13.6, with 3.4% completing primary education, 18.8% high school, 47.0% college, and 17.9% professional schools.

Clinical Features:

The average age at first disease attack was 32.7 years, and the average duration of MOGAD was 5.2 years. At the time of the survey, 31.6% had unilateral visual loss, 23.9% bilateral visual loss, and 31.6% had myelitis. Comorbidities included obesity (12.0%), hypertension (8.5%), and asthma (6.8%). Moderate to high levels of fatigue were reported by 35.9%, and significant pain by 35.0%. Depressed mood interfered with job-related duties for 37.6%. Most participants (81.2%) received immunosuppressive treatments (Table 2).

Employment and Work:

Pre-MOGAD diagnosis, 63.2% of participants were employed, which decreased to 48.7% post-diagnosis. Average weekly work hours dropped from 31.6 to 19.5 post-diagnosis. Employment rates were 66.7% for women and 57.9% for men pre-diagnosis and 43.6% for women and 59.0% for men post-diagnosis.

There was a statistically significant positive association between high-income country residence (odds ratio (OR)=4.47, p=0.03) and employment, while depressed mood had a statistically significant negative association (OR=0.36, p=0.045). Myelitis (OR = 4.03, p=0.046), residence in a high-income country (OR=12.02, p=0.0038), and pain (OR=4.81, p=0.03) were positively associated with reduced work hours.

**Table 1. Demographic and clinical characteristics**

| | Total group (*n* = 117) |
|---|---|
| **Age (years)** | |
| Mean ± SD | 39.7 ± 12.7 |
| Range | 18 – 70 |
| **Gender, n (% )** | |
| Male | 39 (33.3) |
| Female | 78 (66.7) |
| **Level of education, n (% )** | |
| Primary school | 4 (3.4) |
| Secondary school | 11 (9.4) |
| High school | 22 (18.8) |
| Trade school | 4 (3.4) |
| College | 55 (47.0) |
| Professional school | 21 (17.9) |
| **Country income level, n (% )** | |
| Lower middle-income | 32 (27.4) |
| Upper middle-income | 43 (36.8) |
| High income | 42 (35.9) |
| **Disease duration (years)** | |
| Mean ± SD | 5.2 ± 5.2 |
| Range | 0 – 31 |
| **Visual loss, n (% )** | |
| Unilateral | 37 (31.6) |
| Bilateral | 28 (23.9) |
| **Myelitis, n (% )** | 37 (31.6) |
| **Freq. of fatigue, n (% )** | |
| Never | 31 (26.5) |
| Rarely | 16 (13.7) |
| Sometimes | 26 (22.2) |
| Often | 24 (20.5) |
| Almost always | 18 (15.4) |
| No answer | 2 (1.7) |
| **Pain level, from 0 - 10 (mean ± SD)** | 2.9 ± 3.1 |
| **Freq. of depressed mood, n (% )** | |
| Not at all | 43 (36.8) |
| Several days | 27 (23.1) |
| More than half the days | 22 (18.8) |
| Nearly every day | 22 (18.8) |
| No answer | 3 (2.6) |

**Table 2. Therapies used by MOGAD patients**

| | | | |
|---|---|---|---|
| **One therapy** | | **Two therapies** | |
| Azathioprine | 10 | Azathioprine and steroids | 3 |
| Intravenous immunoglobulin (IVIG) | 3 | Mycophenolate mofetil and IVIG | 1 |
| Mycophenolate mofetil | 15 | Mycophenolate mofetil and steroids | 6 |
| Ocrelizumab | 1 | Rituximab and IVIG | 2 |
| Rituximab | 19 | Rituximab and steroids | 4 |
| Rozanolixizumab | 1 | Tocilizumab and IVIG | 1 |
| Subcutaneous immunoglobulin (SCIg) | 1 | Steroids and plasma exchange | 1 |
| Steroids | 14 | | |
| Tocilizumab | 2 | **Three therapies** | |
| Unknown | 2 | Mycophenolate mofetil, rituximab, steroids | 1 |
| | | Rituximab, IVIG, and steroids | 1 |
| **No therapies** | 22 | | |

**Table 3. Variables associated with employment and work hours**

| Regression variables | Employment (multivariable analysis) | | | Work hours (multivariable analysis) | | |
|---|---|---|---|---|---|---|
| | Odds Ratio | 95% CI | *p* | Odds Ratio | 95% CI | *p* |
| **Age** | 0.97 | 0.94 - 1.01 | 0.16 | 1.03 | 0.98 - 1.08 | 0.33 |
| **Gender** | | | | | | |
| Male | Reference category | | | Reference category | | |
| Female | 0.67 | 0.26 - 1.67 | 0.39 | 1.76 | 0.51 - 6.24 | 0.37 |
| **Country income level** | | | | | | |
| Lower middle-income | Reference category | | | Reference category | | |
| Upper middle-income | 2.89 | 0.73 - 13.73 | 0.15 | 4.76 | 0.78 - 34.29 | 0.1 |
| High income | 4.47 | 1.19 - 20.10 | 0.035 | 12.02 | 2.45 - 73.67 | 0.0038 |
| **Myelitis** | 1.69 | 0.66 - 4.59 | 0.28 | 4.03 | 1.08 - 17.57 | 0.046 |
| **Optic neuritis** | 2.15 | 0.88 - 5.52 | 0.099 | 0.86 | 0.23 - 2.96 | 0.81 |
| **Fatigue** | 0.35 | 0.10 - 1.08 | 0.08 | 3.33 | 0.73 - 17.54 | 0.13 |
| **Pain** | 0.79 | 0.28 - 2.21 | 0.64 | 4.81 | 1.18 - 23.05 | 0.03 |
| **Depressed mood** | 0.36 | 0.13 - 0.98 | 0.045 | 1.55 | 0.34 - 6.9 | 0.56 |
| **Disease duration** | 0.99 | 0.90 - 1.09 | 0.84 | 0.89 | 0.77 - 1.03 | 0.12 |

## DISCUSSION & CONCLUSION

Although our study cannot identify all aspects of the environmental components of work and employment, we are able to identify individual-level, self-reported aspects of the mostly treated history of MOGAD and its reported symptoms in the context of employment. There is a significant socioeconomic impact of MOGAD on adult employment. Post-diagnosis, employment rates dropped from 63.2% to 48.7%, with average work hours reduced from 31.6 to 19.5 hours per week. More than a third (37%) report losing employment due to MOGAD.

Our study had several notable limitations. Notably, our sampling was by convenience. People who had a clinically monophasic disease may not have presented for longitudinal neurological follow up to clinics and may therefore have been overlooked, underestimating the number of people who are employed. By contrast, people with severe disease such as bilateral visual loss may have been less willing to participate due to barriers to participation in a lengthy survey, overestimating our employment prevalence estimate. Similarly, patients with concerns about employment may have been more motivated to participate in a survey on employment. Importantly, there are no control participants in this study. Therefore, it is difficult to disaggregate which factors are related exclusively to MOGAD, the country setting, or to some relationship between the two.

The findings emphasize the often "invisible symptoms" of MOGAD, like depressed mood and pain, which are significant yet potentially modifiable factors that influence employment status. Targeted interventions for mood and pain management could improve employment outcomes for individuals with MOGAD.

Other resources on employment, such as job counseling and professional retraining opportunities can also be valuable for adults with MOGAD, given the relatively young age of diagnosis in this adult cohort.

## DISCLOSURES

Funding for this work was provided by The Sumaira Foundation and Horizon Therapeutics (Amgen).

Dr. Mateen has received research funding to her institution from Alexion, Amgen, EMD Serono, Genentech, Novartis, and TG Therapeutics and consulting fees from Alexion, EMD Serono, Genentech, and Roche. Dr. Yeo has received honoraria from ASNA, Edanz Pharma, Euroimmun AG, Merck, Novartis, Roche, Terumo BCT for consulting services and speaker's fees, and research grants from the National Medical Research Council (NMRC Singapore) and Roche. Dr. Siva has received research grants from The Turkish Multiple Sclerosis Society; and research grants from The Scientific and Technological Research Council Of Turkey & Istanbul University-Cerrahpasa Research Support Funds.

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