Neuropsychiatric predictors of disability and functional dependence in older adults with Parkinson's disease and related movement disorders: a population-based study in Chile

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ABSTRACT

Purpose: To analyse the association between neuropsychiatric symptoms and severity of disability and functional dependence in older adults with Parkinson's disease in Chile.

Methods: A cross-sectional secondary analysis of the National Disability and Dependency Survey (ENDIDE 2022) was conducted, which included 135 older adults (mean age 77.7 ± 8.6 years) with Parkinson's disease or related movement disorders. Disability and functional dependence were modelled as ordinal variables (mild, moderate and severe). Neuropsychiatric variables, including cognitive impairment/dementia, depressive symptoms, anxiety and sleep–wake disorders, were derived from self-reported conditions during the survey. Multivariable ordinal logistic regression models adjusted for age, sex and comorbidities were used to evaluate associations with functional outcomes. Clinical staging measures were not available in the dataset.

Results: Cognitive impairment showed elevated odds for disability (aOR 8.28; 95% CI = 1.42–159.83) and was associated with functional dependence severity (aOR 4.19; 95% CI = 1.34–15.26). Depressive symptoms were associated with greater disability severity (aOR 3.09; 95% CI = 1.08–9.88), but did not remain significant for functional dependence after adjustment. In addition, balance problems, unintentional weight loss and difficulties in medication management were associated with worse functional outcomes.

Conclusions: Neuropsychiatric symptoms, particularly cognitive impairment and depressive symptoms, were associated with disability and functional dependence severity in older adults with Parkinson's disease. Cognitive impairment appeared to show a stronger association with functional dependence, whereas depressive symptoms were more closely related to disability severity. These findings suggest the value of multidisciplinary rehabilitation approaches integrating cognitive and mental health support to preserve functional autonomy.

Keywords: activities of daily living, cognition disorders, depressive disorder, mental health, physical therapy modalities

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INTRODUCTION

Parkinson's disease (PD) is one of the most prevalent neurodegenerative disorders in older adults, and represents a major and growing cause of disability and functional dependence worldwide. Its global burden has increased substantially over the recent decades, driven by population ageing and longer survival, making PD a significant challenge for health systems and rehabilitation services[1–3].

Although PD is traditionally characterised by motor symptoms such as tremor, rigidity and bradykinesia, it is now well established that the disease also involves a wide range of non-motor manifestations, including depression, cognitive impairment, anxiety, psychosis and sleep disorders[4–6]. These neuropsychiatric symptoms are highly prevalent, may appear early in the disease course and often progress alongside or independently of motor impairment[7,8].

Accumulating evidence indicates that neuropsychiatric symptoms may contribute substantially to functional decline, loss of autonomy and reduced quality of life in people with PD[9–11]. Several studies suggest that symptoms such as depression and cognitive impairment may contribute more strongly to disability and dependence than motor severity alone, increasing caregiver burden, institutionalisation and health care costs[12–14]. Despite this, clinical management and rehabilitation strategies continue to prioritise motor symptoms, frequently underestimating the impact of mental and cognitive health on functional outcomes.

From a rehabilitation perspective, disability and dependence in PD are multidimensional constructs resulting from the interaction of motor, cognitive, emotional and social factors[15,16]. Disability refers to limitations in functioning and participation, whereas functional dependence reflects the need for assistance from another person to perform activities of daily living. Understanding disability as a graded process, ranging from preserved autonomy to partial or total dependence, allows for a more comprehensive assessment of functional deterioration and better alignment with real-world rehabilitation needs, including occupational therapy, physical activity interventions and psychosocial support[17].

In Chile, the population with PD is rapidly ageing, and the prevalence of disability and dependence among older adults is expected to increase substantially in the coming decades.

However, population-based evidence examining the relationship between neuropsychiatric symptoms and functional outcomes in PD remains limited. Most national studies have focused on descriptive profiles or clinical samples, with few using analytical approaches to identify independent predictors of disability and dependence across levels of functional severity[18,19].

Identifying neuropsychiatric factors associated with increasing levels of disability and dependence is essential for informing preventive strategies, early intervention and comprehensive rehabilitation planning. Analytical models that account for ordered functional outcomes may provide clinically meaningful insights into the progression towards dependence and help prioritise modifiable targets for intervention.

Therefore, the aim of this study was to identify independent neuropsychiatric predictors of increasing disability and functional dependence in older adults with PD, using population-based data from the National Disability and Dependency Survey (ENDIDE 2022) in Chile.

MATERIALS AND METHODS

Study design and data source

A cross-sectional analytical study was conducted using data from the ENDIDE 2022, a population-based survey carried out in Chile by the Ministry of Social Development and Family. The ENDIDE 2022 was designed to estimate the prevalence and severity of disability and functional dependence at the national level, using standardised instruments aligned with the World Health Organization (WHO) Model Disability Survey framework.

The survey was conducted in private households between April and August 2022 and provides national, regional, and urban–rural representativeness.

Participants

Eligibility criteria were defined to select the analytical subsample from the original ENDIDE 2022 database. The study population consisted of adults aged 60 years and older who self-reported a diagnosis of PD or other movement disorders, identified through the ENDIDE health condition coding system. The ENDIDE database groups PD together with related movement disorders within the same diagnostic category; therefore, the analytical sample may include participants with movement disorders beyond idiopathic PD. From the total ENDIDE sample, 135 participants met the inclusion criteria and were included in the analysis.

Inclusion criteria:

- Age ≥60 years
- elf-reported diagnosis of PD or other movement disorders
- Participation in the ENDIDE 2022 survey
- Availability of data on disability and functional dependence

Exclusion criteria:

- Participants younger than 60 years
- Missing data on key outcome variables (disability or dependence)
- Missing information on main explanatory variables

Ethical considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. This study involved a secondary analysis of the ENDIDE 2022 database, which is publicly available and anonymised. Informed consent was obtained from all participants by the survey administrators at the time of the original data collection. The secondary use of this anonymised database was reviewed and approved by the Ethics Committee of Universidad Mayor (CECUM), Approval No. 0470.

Outcome variables

Two ordinal outcome variables were analysed separately:

1. Degree of disability, categorised into ordered levels according to ENDIDE criteria:

- No disability
- Mild/moderate disability
- Severe disability

2. Degree of functional dependence, categorised into ordered levels:
- No dependence
- Mild dependence
- Moderate dependence
- Severe dependence

ENDIDE classifies disability and dependence severity using standardised criteria derived from the WHO Model Disability Survey framework and functional performance indicators. Disability severity reflects limitations in functioning and participation, whereas functional dependence reflects the need for assistance from another person to perform activities of daily living.

Mild disability/dependence refers to partial limitations with relative preservation of autonomy, moderate levels indicate greater functional restrictions requiring intermittent assistance and severe levels represent substantial impairment with significant loss of independence in daily functioning.

These outcomes represent increasing levels of functional impairment and were treated as ordinal variables in all analyses.

Explanatory variables

The main explanatory variables were neuropsychiatric symptoms, which included the following:
- Depressive symptoms
- Anxiety
- Sleep disorders
- Cognitive impairment or dementia

Neuropsychiatric variables were derived from self-reported health conditions reported by participants during the ENDIDE 2022 survey. Therefore, these variables should not be interpreted as diagnoses confirmed through standardised psychiatric, neurological or neuropsychological clinical assessments.

Additional clinical and functional variables included balance problems, unintentional weight loss, difficulty managing medications and difficulty with self-feeding.

Covariates

The models were adjusted for age, sex and the presence of comorbidities associated with disability.

Procedure and data collection

Data were collected by trained interviewers using standardised questionnaires administered during face-to-face household interviews. All variables analysed in this study were extracted directly from the ENDIDE 2022 database following official documentation and coding manuals.

Statistical analysis

Descriptive statistics were used to characterise the study population. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate, and continuous variables were compared using the Kruskal–Wallis test. No post-hoc pairwise tests or adjustments for multiple comparisons were applied, as these

analyses were considered descriptive and exploratory. Ordinal logistic regression models (proportional odds models) were fitted to assess factors associated with increasing levels of disability and functional dependence, and odds ratios (OR) with 95% confidence intervals (95% CI) were reported. The proportional odds assumption was evaluated using the Brant test.

All multivariable models were adjusted a priori for age, sex and the presence of comorbidities based on clinical relevance and previous literature. Neuropsychiatric, clinical and functional variables were considered independently associated with the outcomes if they remained statistically significant in the fully adjusted models.

All analyses were conducted using a complete-case approach for each specific model. The analytical sample included 135 participants, and no additional participants were excluded after sample selection. However, some variables derived from specific survey instruments, including the Memory, Fluency, and Orientation (MEFO) test and the 5-item Geriatric Depression Scale (GDS-5), contained incomplete responses. Therefore, analyses involving these variables were conducted using available-case data without imputation procedures. Statistical significance was set at $p < 0.05$. All analyses were performed using R version 4.3.1 (R Foundation for Statistical Computing, Vienna, Austria).

As a sensitivity analysis, binary logistic regression models were fitted using severe disability (yes/no) and severe functional dependence (yes/no) as outcomes, to evaluate the robustness of the associations when the proportional odds assumption was not fully met.

RESULTS

Characteristics of the study population

A total of 135 older adults (mean age 77.7 ± 8.6 years) were analysed. The sample showed a near-equal distribution by sex (48.9% female), with a notably high prevalence of depressive symptoms (46.7%) and unintentional weight loss (48.1%). Detailed sociodemographic and clinical characteristics are presented in Table 1.

Table 1. Socio-demographic and clinical characteristics of the study population ($n = 135$)

Variable	Total	*p*
Age, years (mean ± SD)	77.7 ± 8.6	< 0.001
Female sex, *n* (%)	66 (48.9)	0.020
Depressive symptoms, *n* (%)	63 (46.7)	< 0.001
Cognitive impairment/dementia, *n* (%)	38 (28.1)	0.335
Balance problems, *n* (%)	52 (38.5)	< 0.001
Unintentional weight loss, *n* (%)	65 (48.1)	0.006
Difficulty managing medications, *n* (%)	77 (57.0)	0.147
Difficulty with self-feeding, *n* (%)	65 (48.1)	< 0.001

PD - Parkinson's disease, SD - standard deviation.
Notes: p-values were calculated using the chi-square test, Fisher's exact test or the Kruskal–Wallis test, as appropriate.

Neuropsychiatric predictors of disability and dependence

The multivariable ordinal regression models revealed distinct neuropsychiatric drivers for each functional outcome (Tables 2 and 3). Regarding disability severity, depressive symptoms were significantly associated with higher disability severity (adjusted odds ratio [aOR] 3.09; 95% CI 1.08–9.88; $p = 0.043$). Cognitive impairment showed elevated odds for greater disability severity (aOR 8.28; 95% CI 1.42–159.83), although the estimate was imprecise and should be interpreted with caution.

By contrast, for functional dependence, cognitive impairment showed the strongest association with increasing functional dependence severity (aOR 4.19; 95% CI 1.34–15.26; $p = 0.019$), whereas depressive symptoms lost statistical significance after adjustment. In both models, advanced age (≥ 80 years) was the strongest non-neuropsychiatric factor associated with worse outcomes ($p < 0.05$). Other factors, including anxiety and sleep–wake disorders, did not show independent associations in either model.

Table 2. Ordinal logistic regression of predictors for disability levels

Variable	aOR	95% CI	*p*
Cognitive impairment/dementia	8.28	1.42–159.83	0.054
Depressive symptoms	3.09	1.08–9.88	0.043
Sleep–wake disorders	1.77	0.68–4.84	0.249
Anxiety disorders	0.68	0.16–3.18	0.610
Age group: 70–79 years	0.82	0.27–2.39	0.712
Age group: ≥80 years	4.45	1.28–16.16	0.020
Sex (female)	1.00	0.43–2.35	0.994
Comorbidities	1.25	0.12–29.93	0.862

aOR - adjusted odds ratio, 95% CI - 95% confidence interval.

Notes: Reference category for age: 60–69 years. Ordinal logistic regression adjusted for age, sex and comorbidities. Outcome variable: degree of disability (no disability, mild/moderate and severe). The proportional odds assumption was assessed using the Brant test; a partial violation was observed for the dementia variable.

Table 3. Ordinal logistic regression model for functional dependence

Variable	aOR	95% CI	*p*
Cognitive impairment/dementia	4.19	1.34–15.26	0.019
Depressive symptoms	1.87	0.82–4.37	0.140
Sleep–wake disorders	1.61	0.74–3.55	0.235
Anxiety disorders	1.50	0.43–5.33	0.522
Age group: 70–79 years	12.06	4.46–34.64	<0.001
Age group: ≥80 years	29.45	3.84–628.51	0.005
Sex (female)	0.87	0.42–1.81	0.717
Comorbidities	3.67	0.45–39.44	0.244

aOR - adjusted odds ratio, 95% CI - 95% confidence interval.

Notes: Reference category for age: 60–69 years. Ordinal logistic regression (proportional odds model) adjusted for age, sex and comorbidities. Outcome variable: functional dependence severity (mild, moderate and severe). The proportional odds assumption was evaluated using the Brant test (global $p = 0.07$); a partial violation was observed for the dementia variable.

Functional and clinical profile according to disability and dependence severity

The analysis of clinical factors (**Table 4**) identified specific limitations that were associated with higher severity levels. Difficulty with self-feeding (OR 8.36; $p = 0.003$) and medication management (OR 6.91; $p < 0.001$) were the main functional indicators of disability. Additionally, clinical markers such as unintentional weight loss and balance problems were consistently linked to higher severity levels in both disability and dependence models ($p < 0.01$).

Table 4. Ordinal logistic regression models for disability and functional dependence according to clinical and functional factors

Variable	Disability OR	95% CI	*p*-value	Dependence OR	95% CI	*p*
Balance problems	2.90	1.84–4.57	<0.001	2.83	1.96–4.08	< 0.001
Unintentional weight loss	3.11	1.30–7.49	0.010	3.69	1.54–8.86	0.003
Difficulty with self-feeding	8.36	2.08–33.71	0.003	5.57	2.39–12.99	< 0.001
Difficulty managing medications	6.91	5.14–55.59	<0.001	3.13	2.29–3.98	< 0.001
Age group: ≥80 years	4.45	1.28–16.16	0.020	29.45	3.84–628.51	0.005

95% CI - 95% confidence interval, OR - odds ratios.

Notes: Outcomes (disability and functional dependence) were modelled as ordinal variables with increasing severity. $p < 0.05$ denotes statistical significance.

Sensitivity analysis and robustness of the models

The sensitivity analysis (**Table 5**) supported the consistency of the primary findings. Cognitive impairment remained consistently associated with severe functional impairment across different model specifications, supporting the consistency of the observed associations and independent of specific scale cut-offs.

Table 5. Sensitivity analysis comparing different definitions of functional impairment and neuropsychiatrics predictors

Variable	aOR	95% CI	*p*
Dementia	7.75	0.94–64.29	0.058
Depressive disorder	1.89	0.68–5.26	0.226
Sleep–wake disorders	1.73	0.65–4.56	0.270
Anxiety disorders	0.87	0.21–3.70	0.855
Age group: ≥ 80 years	5.29	2.01–13.88	0.001
Sex (female)	0.80	0.33–1.92	0.611
Comorbidities	1.54	0.13–17.65	0.730

aOR - adjusted odds ratio, 95% CI - 95% confidence interval.

Notes: Binary logistic regression models were fitted comparing dependent disability versus non-dependent disability (the latter including no disability and independent disability). Models were adjusted for age, sex and comorbidities. $p < 0.05$ denotes statistical significance.

DISCUSSION

The present study aimed to analyse the association between neuropsychiatric symptoms and the severity of disability and functional dependence in older adults with PD, using population-based data from the ENDIDE 2022[18,25]. The findings indicate that neuropsychiatric conditions, particularly cognitive impairment/dementia and depressive symptoms, may contribute substantially to functional decline associated with PD. Cognitive impairment/dementia emerged as a consistent predictor of increasing severity of both disability and functional dependence, suggesting a potential influence on loss of autonomy[12,13]. By contrast, depressive symptoms were independently associated with greater disability severity but not with functional dependence after adjustment for covariates, suggesting that mood-related symptoms may predominantly influence earlier stages of functional impairment[5,11]. This could be because, as functional decline progresses towards severe dependence, the impact of cognitive and motor deficits tends to overshadow the contribution of neuropsychiatric symptoms like depression.

These findings are consistent with previous evidence suggesting that cognitive deterioration may be associated with loss of autonomy in PD, often exceeding the impact of motor symptoms alone[12,13]. Although depression has been widely associated with reduced quality of life and functional limitations[6,15], its stronger association with disability rather than advanced dependence in this study may indicate a greater influence during initial phases of functional decline, prior to the establishment of dependence requiring assistance with activities of daily living.

Beyond neuropsychiatric factors, several clinical and functional variables, including balance problems, unintentional weight loss and difficulties in self-feeding or medication management, showed a direct association with higher levels of disability and dependence. These findings highlight the multifactorial nature of functional deterioration in PD and underscore the importance of comprehensive functional assessment in rehabilitation settings[7,10].

Age remained significantly associated with functional dependence, particularly among individuals aged 70 years and older, which is consistent with the literature describing increased vulnerability to progressive functional decline in the context of ageing and neurodegenerative disease[2,9]. By contrast, sex and the presence of other chronic conditions were not independently associated in the adjusted models, suggesting that neuropsychiatric and functional factors may exert a greater influence on functional outcomes than demographic characteristics alone.

From a methodological perspective, the use of ordinal logistic regression models enabled the evaluation of functional outcomes across increasing severity levels, which is more clinically meaningful than traditional dichotomous approaches[10]. Although minor violations of the proportional odds assumption were observed for selected covariates, the consistency of associations across outcome levels supports the appropriateness of this analytical strategy.

Limitations and future research directions

This study has several limitations that should be considered when interpreting the results. First, its cross-sectional design precludes causal inference between neuropsychiatric symptoms and the progression of disability and functional dependence. Therefore, the identified predictors should be interpreted as significant associations rather than causal factors. Second, the use of self-reported information from the ENDIDE survey may introduce information bias, although the survey methodology includes rigorous validation protocols. Additionally, the ENDIDE

coding framework groups PD together with other movement disorders within the same diagnostic category, which may reduce diagnostic specificity and limit the interpretation of findings as being exclusively attributable to idiopathic PD. Therefore, the results should be interpreted with caution regarding disease-specific generalisability[18,20].

Some estimates showed wide confidence intervals, likely reflecting the relatively small sample size and low frequency of certain conditions, which may limit the precision and generalisability of the findings. Therefore, the observed associations should be interpreted with caution, particularly for variables with borderline statistical significance.

Furthermore, the dataset did not include detailed clinical measurements that would allow a more precise characterisation of disease status and functional impairment. Specifically, data on quality of life assessed with validated instruments (e.g., WHOQOL-BREF)[11], standardised measures of cognitive decline progression (Montreal Cognitive Assessment [MoCA], Mini-Mental State Examination [MMSE], Test Your Memory [TYM] and Clock Drawing Test)[12,16], or disease progression according to the Hoehn and Yahr[16] stages were not available. The inclusion of these measures in future studies would allow a more comprehensive evaluation of the clinical and functional impact of PD. Future studies should incorporate structured cognitive assessment and diagnostic procedures consistent with established clinical guidelines for dementia[27].

Similarly, the lack of a structured nutritional assessment (e.g., Mini Nutritional Assessment MNA])[17] limited a more detailed characterisation of nutritional status and its potential influence on disability and functional dependence. Given the relevance of malnutrition and nutritional risk in functional outcomes among individuals with PD, future research incorporating validated nutritional screening tools could provide further insight into the interaction between nutritional status, functional decline and disease progression[18,22].

The absence of significant associations between anxiety and disability, as well as the lack of relationship with sleep–wake disorders, suggests that these symptoms may be modulated by other intrinsic disease-related factors or by variables not captured in the present analysis[5,10].

Finally, considering that population ageing is a global phenomenon and that the prevalence of PD continues to increase[24,25], it is essential to advance research aimed at identifying modifiable risk factors and developing therapeutic strategies to preserve functional capacities throughout the course of the disease, thereby reducing the burden associated with neurological disorders in an ageing population[3,4].

Practical implications

The findings of this study highlight the need to promote integrated and multidisciplinary care strategies for older adults with PD, incorporating early detection of neuropsychiatric symptoms and comprehensive rehabilitation approaches. Interventions targeting cognition, balance, nutritional status and functional abilities may contribute to preserving autonomy, improving quality of life and reducing the burden associated with functional dependence[7,24]. These findings also support the implementation of integrated care pathways aligned with the Chilean National Dementia Plan, which emphasizes person-centered, multidisciplinary care for individuals with cognitive impairment[26]. Furthermore, strengthening mental health services within multidisciplinary rehabilitation programs may contribute to a more efficient use of health care resources in Chile[15].

CONCLUSIONS

Neuropsychiatric symptoms, particularly cognitive impairment and depressive symptoms, were associated with greater disability and functional dependence severity in older adults with PD in Chile[12,13]. While depressive symptoms appeared to be more closely associated with disability levels, cognitive impairment showed a stronger association with advanced functional dependence[5,11]. These findings suggest that multidisciplinary rehabilitation strategies integrating cognitive and mental health support may help preserve functional autonomy and reduce the burden of care in this population.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

REFERENCES

1. National Institute of Statistics. National statistical collection plan [Internet]. Santiago: INE; 2018. [cited 2023 Jul 12]. Available from: https://www.ine.gob.cl.
2. Rojas FH, Rodríguez L, León R. Population aging in Chile: demographic trends and challenges [Internet]. Santiago: INE-SENAMA; 2022. [cited 2023 Jul 18]. Available from: https://www.senama.gob.cl.
3. Hojman DA, Duarte F, Ruiz-Tagle J, Budnich M, Delgado C, Slachevsky A. The cost of dementia in an unequal country: the case of Chile. PLoS One. 2017;12(11):e0188274. doi: 10.1371/journal.pone.0188274.
4. World Health Organization. Parkinson disease: a public health approach [Internet]. Geneva: World Health Organization; 2022. [cited 2023 Aug 3]. Available from: https://www.who.int.
5. Cófreces P, Ofman SD, Estay JA, Hermida PD. Parkinson's disease: a bibliographic update of psychosocial aspects. Rev Fac Cienc Med Univ Nac Cordoba. 2022;79(2):181-7. doi: 10.31053/1853.0605.v79.n2.36039.
6. Zhao N, Yang Y, Zhang L, Zhang Q, Balbuena L, Ungvari GS, et al. Quality of life in Parkinson's disease: a systematic review and meta-analysis of comparative studies. CNS Neurosci Ther. 2021;27(3):270-9. doi: 10.1111/cns.13549.
7. Salles Gándara P, Chaná-Cuevas P. Non-motor symptoms in Parkinson's disease. Rev Med Chil. 2020;148(8):1075-82. doi: 10.4067/S0034-98872020000801075.
8. Russo M, Amboni M, Volzone A, Ricciardelli G, Cesarelli G, Ponsiglione AM, et al. Gait and neuropsychiatric symptoms in Parkinson's disease. Eur J Transl Myol. 2022;32(2):10430. doi: 10.4081/ejtm.2022.10430.
9. Prince MJ, Wu F, Guo Y, Gutierrez Robledo LM, O'Donnell M, Sullivan R, et al. The burden of disease in older people and implications for health policy. Lancet. 2015;385(9967):549-62. doi: 10.1016/S0140-6736(14)61338-9.

10. Agresti A. Analysis of ordinal categorical data. 2nd ed. Hoboken (NJ): Wiley; 2010.
11. WHOQOL Group. Development of the World Health Organization WHOQOL-BREF quality of life assessment. Psychol Med. 1998;28(3):551-8. doi: 10.1017/S0033291798006667.
12. Aarsland D, Batzu L, Halliday GM, Geurtsen GJ, Ballard C, Ray Chaudhuri K, et al. Parkinson disease-associated cognitive impairment. Nat Rev Dis Primers. 2021;7(1):47. doi: 10.1038/s41572-021-00280-3.
13. Degirmenci Y, Angelopoulou E, Georgakopoulou VE, Bougea A. Cognitive impairment in Parkinson's disease: an updated overview focusing on emerging pharmaceutical treatment approaches. Medicina (Kaunas). 2023;59(10):1756. doi: 10.3390/medicina59101756.
14. Ministry of Health of Chile. Clinical practice guideline for Parkinson's disease [Internet]. Santiago: MINSAL; 2010. [cited 2023 Sep 2]. Available from: https://www.minsal.cl.
15. Errázuriz A, Valdés C, Vöhringer PA, Calvo E. Mental health financing in Chile. Rev Med Chil. 2015;143(8):1040-6. doi: 10.4067/S0034-98872015000800012.
16. Hoehn MM, Yahr MD. Parkinsonism: onset, progression, and mortality. Neurology. 1967;17(5):427-42. doi: 10.1212/WNL.17.5.427.
17. Guigoz Y, Vellas B, Garry PJ. Mini nutritional assessment: a practical assessment tool for grading the nutritional state of elderly patients. Nutr Rev. 1996;54(1 Pt. 2):S59-65. doi: 10.1111/j.1753-4887.1996.tb03793.x.
18. Social Observatory. Methodological report of the National Disability and Dependency Survey (ENDIDE 2022) [Internet]. Santiago: Ministry of Social Development and Family; 2023. [cited 2023 Sep 15]. Available from: https://observatoriosocial.gob.cl.
19. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). 5th ed. Washington (DC): American Psychiatric Association; 2013.
20. Ministry of Social Development and Family, SENADIS. Third National Disability Survey in Chile (ENDIDE 2022) [Internet]. Santiago: SENADIS; 2022. [cited 2023 Oct 20]. Available from: https://www.senadis.gob.cl.
21. University of Chile, Center for Microdata. Fieldwork manual: National Disability and Dependency Survey (ENDIDE 2022) [Internet]. Santiago: University of Chile; 2022. [cited 2023 Oct 28]. Available from: https://www.microdatos.cl.
22. Tosefsky KN, Zhu J, Wang YN, Lam JST, Cammalleri A, Appel-Cresswell S. The role of diet in Parkinson's disease. J Parkinsons Dis. 2024;14(S1):S21-S34. doi: 10.3233/JPD-230264.
23. Leiva-Ordoñez AM, Troncoso-Pantoja C, Petermann-Rocha F, Celis-Morales C. Prevalence of Parkinson's disease in Chile. Rev Med Chil. 2019;147(5):530-6. doi: 10.4067/S0034-98872019000500530.
24. Heim B, DjamshiAdian A. Neuropsychiatric disorders in Parkinson's disease. Ther Adv Neurol Disord. 2025;18:17562864251356062. doi: 10.1177/17562864251356062.
25. Washington Group on Disability Statistics. Disability measurement and monitoring using the Washington Group question sets [Internet]. Hyattsville (MD): WGDS; 2020. [cited 2023 Oct 6]. Available from: https://www.washingtongroup-disability.com.

26. Ministry of Health of Chile. National dementia plan [Internet]. Santiago: MINSAL; 2017. [cited 2023 Nov 4]. Available from: https://www.minsal.cl.

27. Spanish Society of Neurology. Clinical practice guideline for dementias [Internet]. Madrid: SEN; 2018. [cited 2023 Nov 12]. Available from: https://www.sen.es.