ARTICLE

Determinants of the use of physiotherapy services among individuals with Parkinson's disease living in Brazil

Determinantes do uso de serviço de fisioterapia entre indivíduos com doença de Parkinson que vivem no Brasil

Fátima Rodrigues-de-Paula[1], Raquel de Carvalho Lana[1], Larissa Karlla Rodrigues Lopes[1], Francisco Cardoso[2], Ana Raquel Rodrigues Lindquist[3], Maria Elisa Pimentel Piemonte[4], Clynton Lourenço Correa[5], Vera Lúcia Israel[6], Felipe Mendes[7], Lidiane Oliveira Lima[8]

ABSTRACT

To identify the factors affecting the use of physiotherapy services among individuals with Parkinson's disease (PD) living in Brazil. **Methods:** Overall, 479 individuals with idiopathic PD, of both sexes, at any stage of the Hoehn & Yahr (HY) scale, and from seven capital cities in Brazil were recruited from 2014 to 2016. Multivariate logistic regression was the main statistical tool. For the construction of the logistic model, the association of the dependent variable "physiotherapy" with the independent sociodemographic/economic and clinical variables: age, education, family income, time of PD since onset, HY, the activities of daily living and motor subscales of the Unified Parkinson's Disease Rating Scale, cognitive aspects, depressive symptoms, fear of falling, freezing gait, history of falls, physical activity level, gait speed, walking performance and balance, were verified. **Results:** The 479 individuals had an average age of 65.2 ± 11.0 years, 88% were in the HY I-III stages and 43.4% were under physiotherapy treatment. The analysis identified two determinant variables related to the use of the physiotherapy service: level of education (OR = 1.24) and walking performance (OR = 0.82). Decreased walking performance and a higher educational level increased the use of a physiotherapy service in individuals with PD living in Brazil. **Conclusions:** The present study shows that individuals with PD, residents from different regions of Brazil, have limited access to physiotherapy services. In addition, the Brazilian Public Health Care System, as well as local programs, need to target PD individuals with a low educational level to improve their access to physiotherapy services. Goals should aim towards the development of physical exercise programs to improve the patients' functional performance for a longer period.

Keywords: Parkinson disease; physical therapy specialty; education; gait.

RESUMO

Descrever a utilização do serviço de fisioterapia e identificar os fatores que determinam o uso desse serviço entre indivíduos com doença de Parkinson (DP) que vivem no Brasil. **Métodos:** No total, 479 indivíduos com DP idiopática, de ambos os sexos, em qualquer estágio da escala de Hoehn & Yahr (HY) e de sete capitais do Brasil foram recrutados durante 2014 a 2016. A análise de regressão logística multivariada foi a principal ferramenta de análise estatística. Para a construção do modelo logístico foi investigada a associação da variável dependente "fisioterapia" com variáveis independentes sociodemográficas, econômicas e clínicas: idade, educação, renda familiar, tempo de DP desde o início, HY, domínio motor e atividade de vida diária da *Unified Parkinson's Disease Rating Scale*, aspectos cognitivos, sintomas depressivos, medo de queda, congelamento marcha, história de quedas, nível de atividade física, velocidade de marcha, capacidade de caminhar e equilíbrio. **Resultados:** 479 indivíduos apresentaram média de 65,2 ± 11,0 anos, 88% tiveram HY = I-III e 43,4% faziam fisioterapia para a DP. A análise identificou duas principais variáveis determinantes do uso da fisioterapia: educação (OR = 1,24) e capacidade de caminhada (OR = 0,82). A diminuição da capacidade de caminhar e maior nível educacional aumentam o uso da fisioterapia em indivíduos com doença de Parkinson vivendo no Brasil. **Conclusões:** O presente estudo mostra que indivíduos com DP, residentes de diferentes regiões do Brasil, têm acesso limitado aos serviços de fisioterapia. Além disso, o Sistema Brasileiro de Saúde Pública, bem como os programas locais, precisam atingir pessoas de DP com baixo nível educacional para melhorar seu acesso aos serviços de fisioterapia. Os objetivos devem ser para o desenvolvimento de programas de exercícios físicos para melhorar o desempenho funcional dos pacientes por um período mais longo.

Palavras-chave: doença de Parkinson; fisioterapia; educação; marcha.

[1]Universidade Federal de Minas Gerais, Departamento de Fisioterapia, Belo Horizonte MG, Brasil;

[2]Universidade Federal de Minas Gerais, Departamento de Clínica Médica, Belo Horizonte MG, Brasil;

[3]Universidade Federal do Rio Grande do Norte, Departamento de Fisioterapia, Natal RN, Brasil;

[4]Universidade de São Paulo, Departamento de Fisioterapia, São Paulo SP, Brasil;

[5]Universidade Federal do Rio de Janeiro, Departamento de Fisioterapia, Rio de Janeiro RJ, Brasil;

[6]Universidade Federal do Paraná, Universidade de Fisioterapia, Curitiba PR, Brasil;

[7]Universidade de Brasília, Departamento de Fisioterapia, Brasília DF, Brasil;

[8]Universidade Federal do Ceará, Departamento de Fisioterapia, Fortaleza CE, Brasil.

Correspondence: Fátima Rodrigues-de-Paula; Departamento de Fisioterapia / UFMG; Av. Antonio Carlos, 6627; 31270-901 Belo Horizonte MG, Brasil; E-mail: fatimarp@globo.com

Parkinson's disease (PD) is a multisystem neurodegenerative disease whose prevalence increases with aging, as well as differing significantly among geographical regions[1]. Higher rates are observed in South America compared with Europe and North America, regardless of the age group[1]. In Brazil, a prevalence rate of 3,300 per 100,000 individuals over the age of 64 years has been estimated, one of the highest in relation to other countries[2]. Considering the aging of the population in Latin America, it is expected that the number of people with PD in Brazil will increase proportionally [3,4].

Parkinson's disease is characterized clinically by an insidious onset and slowly-progressive course. The first symptoms appear with reduction of 80% of the dopamine produced by the cells in the substantia nigra[5]. The results are motor signs characterized by rigidity, bradykinesia and tremor, in addition to nonmotor symptoms like anosmia, constipation and REM sleep behavior disorders[6]. The natural progression of the disease and the gradual decrease in the efficacy of drugs result in loss of mobility and independence, with important gait deficits[7] and restrictions in social life[8].

Physiotherapy is an important resource to improve the functional status of patients with PD[9]. Additionally, specialized physiotherapy is associated with fewer PD-related complications and lower costs in daily clinical practice[10]. However, patients with PD have to deal with the deficiency of certain allied health services in the community[11]. A survey on PD in the United States reported that only 18.4% of patients had seen a physiotherapist[12]. Data on the rate of patients with PD living in Brazil who had access to physiotherapy, and which factors are related to its use, are unavailable.

Fear of falling, low expectations and lack of time to perform physical activity appear to be important perceived barriers to physical activity in individuals with PD[13]. In Brazil, all these aspects, associated with the PD patients' lower level of education and health condition[14], may exacerbate their barriers to using physiotherapy services[4]. Based on this information, we conducted a study to identify the use of physiotherapy services and determine which factors (social, economic and clinical) affect the use of physiotherapy services among individuals with PD living in Brazil.

METHODS

The REPARK-BR is a cross-sectional multicentric study based on questionnaires and clinical evaluations conducted between the years of 2014 and 2016. The research net is organized in six zones, distributed over seven state capitals of Brazil, including: Belo Horizonte (Minas Gerais), São Paulo (São Paulo), Rio de Janeiro (Rio de Janeiro), Curitiba (Paraná), Natal (Rio Grande do Norte), Fortaleza (Ceará) and Brasília (Distrito Federal). In each zone, a public university was responsible for the study, but the main coordinator group was located at the Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil.

Participants

Individuals with PD were recruited consecutively from the community, health centers, and public and private clinics of the institutions involved in the study. Participants in the study comprised 479 males and females with idiopathic PD diagnosed by neurologists specialized in movement disorders, according to the UK Brain Bank Criteria[15]. The participants were in any stage of the Hoehn & Yahr disability scale (HY)[16]. Individuals with other types of parkinsonism or other neurologic diseases that could interfere in the performance of the tests were excluded.

Professors, graduate and undergraduate students of the universities involved collected the data. They all received training by the main group coordinator. Each collaborator received a manual with the instructions on how to collect the data. Data collection lasted, on average, 240 minutes. After screening for the inclusion criteria, the potential participants received information about the objectives of the research, their voluntary participation and right to leave the study at any time, the confidentiality of the information collected and the absence of physical and mental health risks by participating in the study. After accepting the invitation, the participants signed the informed consent form that was approved by the ethics committee of the institutions involved (CAAE= 15050713.6.1001.5149).

Data collection

The dependent variable analyzed was the question: Are you treating PD with physiotherapy?

The data included two categories:

1) Sociodemographic and economic: age, sex, mass, height, state and city, marital status, educational level (years of study completed), family income, occupation and whether living alone or accompanied;

2) Clinical characteristics: duration of PD since onset, daily dosage of levodopa, related PD surgeries, HY disability scale, the Unified Parkinson's Disease Rating Scale (UPDRS), cognitive aspects, depressive symptoms, fear of falling, freezing gait, history of falls, physical activity level, gait speed, walking performance and balance.

For PD severity, we used the domains Activity of Daily Living (ADL) and Motor Examination of the UPDRS[17], in addition to the HY, which included five stages of classification[16]. Patients classified in stages I and II of the HY had mild disability, those in stage III had moderate disability, and patients classified in stages IV and V had severe disability[18].

The cognitive assessment was obtained using the Montreal Cognitive Assessment, a quick, practical, and effective cognitive screening instrument that distinguishes the performance of adults with cognitive deficits due to aging and adults with cognitive impairment[19]. One point

was added to the individuals who had 12 years of schooling or less. Individuals with a cutoff of 26 had mild cognitive impairment and those with a cutoff of 21 had dementia[20]. Depression was assessed using the Brazilian version of the Geriatric Depression Scale[21]. This scale has a cutoff point equal to, or greater than 8/9 to detect depressive symptoms[22].

Fear of falling was measured with the Falls Efficacy Scale – International[23,24]. This scale has excellent internal consistency and test-retest reliability in PD[23]. The items are related to physical or social activities and the scores range from 16 (absence of concern) to 64 points (extreme concern) regarding the possibility of falling when performing a daily activity. The Freezing of Gait Questionnaire was used to evaluate the individuals' subjective perception of severity and the impact of freezing of gait performance. The higher the score, the more affected was the gait by freezing[25].

The history of falls was measured by the number of falls that had occurred in the previous year. As recommended by the Kellogg International Work Group on the Prevention of Falls in the Elderly[26], an operational fall definition was provided for each participant: "Unexpected loss of balance in which you hit the floor, surface or object such as a chair, bench, sofa, toilet, below the knee level". Participants who reported no or one fall in the 12 months prior were classified as non-fallers, and with two or more falls as recurrent fallers[26].

The level of physical activity of the individuals in this study was assessed through the Human Activity Profile. Individuals were classified according to predefined cutoff points as inactive (less than 53), moderately active (between 53 and 74) or active (greater than 74)[27]. Gait velocity was measured with the 10-meter walking test, a simple and reliable measure for individuals with PD[28]. The participants were asked to walk at their self-selected speed for a 14-meter distance and the time taken to traverse the 10 central meters was timed. The average of three measurements was used for the analysis. Walking performance was measured with the six-minute walk test, which is widely used within clinical settings to assess functional capacity, including in PD patients. The distance covered in meters in six minutes was recorded and used for analysis[29].

Balance performance was measured through the Mini-BESTest that comprises 14 items divided into four areas: 1) anticipatory postural adjustments; 2) reactive postural control; 3) sensory orientation and 4) dynamic gait. The Brazilian version of the Mini-BESTest has shown good reliability, construct validity, response stability and capability of discriminating different balance levels in individuals with PD[30].

Data analysis

Data was saved in an electronic database, supervised and confirmed by two trained evaluators to guarantee 100% agreement. Subsequently, two supervisors and one statistician checked the data from all zones. Descriptive statistics, tests for normality (Kolmogorov-Smirnov), and equality of variances (Levene's test) were applied for all outcomes. Descriptive analyses, measures of central tendency and dispersion (mean, standard deviation) were used for quantitative variables, and frequency for categorical variables. For the construction of the logistic model, the associations of the dependent variable "physiotherapy" (0 = no and 1 = yes) with the following independent variables were verified: age, gender, education, family income, duration of PD since onset, HY, the Activity of Daily Living and Motor subscales of the UPDRS, cognitive aspects, depressive symptoms, fear of falling, freezing gait, history of falls, physical activity level, gait velocity, walking performance and balance. The choice of independent variables for possible inclusion in the model was based on a theoretical foundation.

A multiple logistic regression analysis was conducted to predict the use of a physiotherapy service. The forward stepwise method was applied to determine the best fit model in which all variables were significant ($p < 0.05$). The forward stepwise method begins with a model with no explanatory variables. At each step, a variable is added to the model to determine the best fit model with all significant variables. The method stops when the addition of any other explanatory variable to the model results in one or more variables being not significant. The strength of the relationship between the independent variable and each dependent variable was measured by the odds ratio (OR) with a confidence interval of 95% (95%CI).

RESULTS

A total of 479 individuals with PD participated in the study. The distribution of the participants by city (percentage and absolute number) is presented in the Figure. The participants had an average age of 65.2 ± 11.0 years, with mean weight of 70.1 ± 13.9 Kg and mean height of 1.64 ± 0.10 meters. During evaluation, 43.5% of the participants were in physiotherapy treatment and 75.2% did not participate in any other therapeutic activity. Among the therapeutic activities performed by the participants, 18.3% were in speech therapy, 7.5% in occupational therapy and 5.6% in psychology treatment.

The sociodemographic and economic characteristics of the participants are described in Table 1. The clinical characteristics of participants included in this study are presented in Table 2. In relation to the cognitive level, 48% presented with dementia and 34.9% presented with a mild cognitive disability. Depressive symptoms were present in 25% of the participants. The average number of falls in the previous year was 5.7 ± 26.9 and 42.9% were classified as fallers. Of the participants, 39% were classified as inactive, 39% as moderately active and 22% as active.

The dependent variables selected according to the methodology described above were education and walking
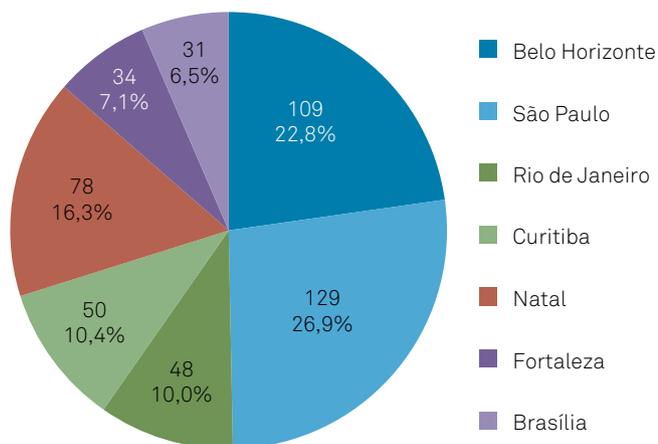
Figure. Distribution of the participants (absolute number and percentage) by city (n = 479).

Legend:
- Belo Horizonte — 109, 22,8%
- São Paulo — 129, 26,9%
- Rio de Janeiro — 48, 10,0%
- Curitiba — 50, 10,4%
- Natal — 78, 16,3%
- Fortaleza — 34, 7,1%
- Brasília — 31, 6,5%

Table 1. Sociodemographic and economic characteristics of the participants with PD (n = 479).

Variable	n	%
Sex		
Men	301	63
Women	178	37
Origin		
Public clinic	192	40
Private clinic	34	7
Hospital	20	4
Community	43	4
Associations	190	40
Marital status		
Single	41	9
Married	333	70
Widowed	61	13
Separated	44	9
Education		
No education	18	4
Primary school	203	42
High school	129	27
Higher education	98	20
Graduate program	31	6
Family income*		
< 1 MW	16	3
1 MW	72	15
1 to 4 MW	230	48
> 4 to 8 MW	89	19
> 8 to 12 MW	40	8
> 12 MW	30	6
Did not answer	2	4
Occupation		
Retired	377	79
Active	71	15
Unemployed	9	2
License / pension	5	1
Domestic life	17	4
Lives		
Alone	38	8
Accompanied	441	92

MW: minimum wage; * The minimum wage at the time of data collection corresponded to R$1005.95 or approximately US$295 dollars (today's value; quotation: R$3.41 on 16/Mar/2018).

performance (distance covered in the six-minute walk test). Table 3 shows the detailed results of the logistic regression analysis, including the p-value and estimated OR with 95% CI. In order to simplify the interpretation of the results, each unit in the walking performance variable corresponded to 100 meters. A one-year increase in the educational level increased the probability of using a physiotherapy service by 24.7% (OR-1). For the variable walking performance, an increase of a distance of 100 meters reduced the probability of using a physiotherapy service by 17% (OR-1). A decrease of 100 meters increased the probability of using a physiotherapy service by 20% (OR-1).

DISCUSSION

This study provides primary data regarding the use of physiotherapy services among individuals with PD in Brazil. It may be the first study that has attempted to gain an insight into the factors (sociodemographic, economic and clinical) associated with the use of physiotherapy services. The main results of our study show that 43.5% of the participants had physiotherapy treatment prescribed because of their disease. In addition, the findings showed that educational level and walking performance (measured in years of study completed and distance covered in the six-minute walk test, respectively) remained in the final model after adjusting for the effects of all the other variables.

Almost 57% of the participants in the study had not had physiotherapy treatment and 75.2% did not do other therapeutic activities. These findings indicate the deficiency of the health care system towards patients with PD. It is alarming that a large part of this group had limited access to physiotherapy or any other therapy. Our results agree with results reported from other similar studies. The numbers vary considerably from country to country, ranging from 7% in the United Kingdom[31], 18.4% in the United States of America[12] and 60% in the Netherlands[32]. Although Brazil showed a high

Table 2. Specific characteristics of the participants with PD (n = 479).

Variable	Mean (SD)	Min-Max
Time since diagnosis (years)	7.1 (5.5)	0.08–49
Levodopa (mg)	563 (375)	25–2,500
UPDRS III – Motor (0-108)	26.6 (16.1)	0.0–76
UPDRS II – ADL (0-52)	14.9 (7.9)	0.0–47
Hoehn & Yahr (HY) (I-V)	2.4 (0.9)	0–5
FOG-Q; (0-16)	8.8 (5.8)	1–24
MoCA total; (0-30)	20.1 (5.5)	3–30
GDS 15; (0-15)	5.4 (3.3)	1–15

UPDRS: Unified Parkinson's Disease Rating Scale; ADL: Activities of Daily Living; SD: standard deviation; FOG-Q: Freezing Gait Questionnaire; MoCA: Montreal Cognitive Assessment; GDS: Geriatric Depression Scale.

Table 3. Influence of sociodemographic, economic and clinical variables on physiotherapy service use.

Variable	Estimate	95%CI	p-value	OR	95%CI
Age	0.01	-0.00–0.02	0.19	1.01	0.99–1.02
Gender	0.28	-0.08–0.46	0.13	1.33	0.92–1.59
Family income	0.10	-0.05–0.20	0.19	1.11	0.95–1.23
Duration of PD since onset	0.00	-0.02–0.05	0.56	1.01	0.98–1.06
Daily dosage of levodopa					
History of falls	0.03	-0.35–0.69	0.85	1.03	0.72–1.99
UPDRS-ADL	-0.02	-0.04–0.06	0.06	0.97	0.96–1.07
UPDRS-Motor	-0.00	-0.01–0.02	0.25	0.99	0.98–1.03
HY	0.05	-0.13–0.32	0.60	1.05	0.87–1.38
Cognitive aspects	0.04	0.01–0.02	0.08	1.04	1.01–1.02
Depression	-0.04	-0.10–0.15	0.06	0.95	0.90–1.16
Fear of falling	0.01	-0.00–0.02	0.21	1.01	0.99–1.02
Freezing of gait	0.00	-0.03–0.05	0.99	1.00	0.97–1.06
Physical activity level	-0.00	-0.01–0.01	0.68	0.99	0.99–1.02
Gait velocity	-0.13	-0.72–1.28	0.64	0.87	0.48–3.62
Balance	0.01	-0.01–0.03	0.27	1.01	0.99–1.04
Education	0.22	0.01–0.43	0.03	1.25	1.01–1.53
Walking capacity*	-0.19	-0.37–-0.01	0.04	0.83	0.69–0.99

95%CI: 95% confidence interval; OR: odds ratio relative to the increase of one unit of the variable; UPDRS: Unified Parkinson's disease rating scale; ADL: Activities of daily living; HY: Hoehn & Yahr.
*each 100 meters.

percentage of patients using the physiotherapy services—except compared with the Netherlands—this result should be interpreted carefully. In Brazil, the healthcare system is public, and the participants in the study were from the public system, which might justify the 43% compared with the other countries. Although access to physiotherapy might be easier because of the public characteristic of the health system, there are social and clinical factors that are determinants for the use of these services.

Our research findings support the relationship between the level of education and the use of the health care system. They indicate that better-educated patients acquire more information about their rights to access the benefits of physiotherapy than less educated patients. The profile of the participants with PD from the different cities included a majority of elderly males, who were retired, with a low education level and low income, originally from public clinics and who had limited access to physiotherapy treatment. About 4% had no education, 42% had primary education and 27% had secondary education. Thus, the lower education level of the participants may have been a barrier to accessing and using physiotherapy treatment. Studies in developing countries have shown that a low education level may affect the degree of understanding of the prescribed treatment, as well as adherence to[33,34] and satisfaction with the treatment[35]. This result requires a scientific approach to understand the best strategies to maximize access of the low-educated PD patient

to physiotherapy services. Educational booklets and the development of continuous health education strategies by multiprofessional teams, appropriate for people with lower education levels, have been shown to result in a better understanding of treatment procedures among patients[36,37].

Walking performance (six-minute walk test) was significantly associated with the use of physiotherapy services in this study. The results suggest that the greater the distance covered, the lower the use of physiotherapy services. The six-minute walk test has also been used as a measure of functional status in patients with PD[29], as well as a predictor of morbidity and mortality[38]. If the walking function of PD patients is preserved for a longer period of time, there would be less need to use physiotherapy services. It is known that endurance exercise programs are effective and improve functional performance[39]. Recently, a meta-analysis showed that walking and cycling for 20 minutes or more per session with a frequency of three or more per week and intensity from "moderate" to "vigorous", had a positive effect on the UPDRS[39]. Based on the benefits of physical activity and mobility in patients with PD, public policies should focus on strategies to maintain patients' function and mobility for a longer period of time.

The findings of this study have important implications for policy design and service delivery. The need to improve awareness among individuals with PD about the condition and services required to understand the utilization of

physiotherapy is apparent. Efforts are needed to improve awareness and facilitate the use of physiotherapy services, especially in individuals with PD and a low educational level.

This study has positive aspects and some limitations. The benefits of multicenter data include a larger number of participants, different geographic locations and inclusion of patients at different stages, increasing the external validity of the study. One of the limitations of this study is its cross-sectional nature, preventing determination of a cause-and-effect relationship. In addition, this study lacks data from the north region of Brazil, which may be a limitation as well.

In conclusion, the present study shows that individuals with PD, residents from different regions of Brazil, have limited access to physiotherapy services. In addition, the Brazilian Public Health Care System, as well as local programs, need to target PD individuals with a low educational level to improve their access to physiotherapy services. Goals should include the development of physical exercise programs to improve the patients' functional performance for a longer period. The present data are important to guide resource application and training of personnel in the care of individuals with PD in Brazil.

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