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ORIGINAL REPORT

SELF-RATED HEALTH DETERMINANTS IN POST-STROKE INDIVIDUALS

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Objective: **To investigate whether variables of function and disability, which have potential to be modified by rehabilitation, are determinants of self-rated health in post-stroke individuals in the chronic phase.**

Design: **Cross-sectional exploratory study.**

Methods: **The dependent variable was self-rated health. The independent variables were organized according to the International Classification of Functioning, Disability and Health components: Body structure and function (emotional function and motor recovery level), Activity (manual and locomotion skill), and Participation (participation). Logistic regression analysis was performed to identify significant associations between the independent variables and self-rated health (α = 5%).**

Results: **Sixty-three individuals were included in the study: 44 (70%) rated their own health as good ("excellent"/"very good"/"good") and 19 (30%) as poor ("fair"/"poor"). Significant association with self-rated health was identified only for emotional function. Individuals with impaired emotional function were 6.6 times more likely to assess their own health as poor (odds ratio (OR) 6.56; 95% confidence interval 1.53–28.21).**

Conclusion: **Emotional function was found to be a determinant of self-rated health in post-stroke individuals in the chronic phase and, therefore, must be assessed carefully in order to help provide integral healthcare and improve clinical decision-making. Future studies should investigate whether enhancing emotional function is associated with improvements in self-rated health in post-stroke individuals.**

Key words: health status; stroke; International Classification of Functioning, Disability and Health; public health.

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LAY ABSTRACT

The main question studied was: Could variables in function and disability, which have potential to be modified by rehabilitation, be determinants of self-rated health in chronic post-stroke individuals? The variables investigated were: emotional function, motor recovery level, manual and locomotion skill, and participation. Only emotional function determined the self-rated health of the subjects. Individuals with impaired emotional function were 6.6 times more likely to assess their own health as poor. Assessment of self-rated health and emotional function is recommended, since these factors can help to improve clinical decision-making in the rehabilitation process in chronic post-stroke individuals.

tor recommended by the World Health Organization (WHO) (2).

SRH is considered a multidimensional construct, since it involves physical, mental and social aspects of life (1). This construct has been widely reported in the literature to be strongly associated to mortality (3), morbidity (4) and functional decline (5) in different populations. In complex health conditions, which can affect many aspects of individuals' lives, such as stroke (6), health must be monitored with measures such as SRH.

Stroke is a severe health condition with high incidence and prevalence worldwide (7), and is the third most common cause of disability worldwide (8). Low-income and middle-income countries, such as Brazil, experience the majority of the global burden of stroke (7). The complexity of stroke, and its repercussions for the individuals' functioning and health, makes the study of SRH and its determinants in this population extremely relevant.

According to a recent systematic review of the literature about SRH in post-stroke individuals (9), this outcome is poorly investigated in these subjects. Considering the results of some previous studies, significant associations have been found between SRH and symptoms of depression (10), physical health (11), performance in activities of daily living (ADL) (12), upper and lower limb mobility (12), limitations in leisure, physical activities (13), and work activities (13, 14) and restrictions in participation in social activities (15) in subjects with stroke. In addition, according to a previous multicentre longitudinal study developed in England, psychological and social factors are important

Self-rated health (SRH) is a simple, subjective, and valid measure of the way individuals assess their own health. This measure is considered feasible and easy to use and can summarize a large amount of health information (1). In addition, SRH is a health indica-

determinants of SRH in older subjects with stroke (15). Despite the important information already provided by previous studies that have explored the SRH after stroke (9–15), no studies were found on post-stroke individuals that have investigated a group of variables characterizing functioning and disability as possible determinants of SRH (9).

Exploring how SRH interfaces with the International Classification of Functioning, Disability and Health (ICF) model (16) can contribute to better and broader comprehension of SRH in post-stroke individuals. Arnadottir et al. (17) assessed the SRH in a sample of 185 Icelandic elderly people. The independent variables in this study (17) were organized according to the 5 ICF components: body structures and functions, activities, participation, personal factors and environmental factors. Authors pointed out that the use of the ICF theoretical framework facilitated and expanded understanding about the use of SRH in elderly people (17). Tiernan et al. (18) assessed SRH in a sample of 30 American elderly citizens and organized the independent variables according to the 5 ICF components, as performed by Arnadottir et al. (17). According to the authors (18), use of the multifactorial ICF model enabled better understanding of health and corroborated the new terminology, which had been used by scientific associations of rehabilitation professionals (18).

Considering the relevance of SRH as a measure that can provide information about the health status of stroke survivors; the shortage of studies about determinants of SRH in post-stroke individuals; and the usefulness of the ICF theoretical framework to facilitate and expand understanding of SRH, the aim of the current study of patients of the Brazilian Public Health System, was to investigate whether variables in functioning and disability, which have potential to be modified by rehabilitation, might be determinants of SRH in post-stroke individuals in the chronic phase.

METHODS

A cross-sectional exploratory study was carried out in Belo Horizonte, Brazil with post-stroke individuals, who were patients of the Brazilian Public Health System. Four primary care units were selected, following the criteria established by the Brazilian Ministry of Health (19). This study was approved by the Research Ethics Committee of the Universidade Federal de Minas Gerais (UFMG) and the healthcare administration of Belo Horizonte (CAAE: 14038313.4.0000.5149). The data that support the findings of this study are available from the corresponding author on request.

Sample

The potential subjects for this study were identified by primary care health professionals. The inclusion criteria were: diagnosis of stroke, registered after 6 months (chronic phase); living near to the primary care unit; being a patient of the Brazilian Public Health System; at least 20 years old; and signing the informed consent. The exclusion criteria were: presence of motor and/or sensitive aphasia, observed by the examiner at the initial encounter with the patient and possible cognitive impairment, measured by Mini-Mental State Examination (MMSE) considering the cut-off points based on schooling (13 for illiterate, 18 for individuals with 1–7 years of schooling and 26 for those with 8 or more years of schooling) (20). In addition, individuals who were unable to perform any of the tests used to measure the study variables were excluded.

Sample size

The appropriate sample size is considered to give statistical validity to the study, that is, statistical power (21). The formula used for the sample size calculation was proposed by Dohoo et al. (21), $n = 10*(P+1)$, where P is the number of independent variables. The independent variables were organized according to the ICF components (16): body structure and function (2 variables), activity (2 variables) and participation (1 variable). Therefore, the sample for this study should be composed of at least 60 individuals.

Data collection procedures

The medical records for the subjects, identified by the health professionals, were analysed to collect initial data. Subjects who agreed to participate were assessed at the primary care units or at their homes to verify the eligibility criteria. Those who had fulfilled these criteria were enrolled in the study. Data on the clinical and sociodemographic profiles of the patients were then collected, using a previously elaborated semi-structured questionnaire with questions regarding subjects' sex, age, marital status, school degree, socioeconomic status, type of stroke, time since the onset of stroke, associated comorbidities, and medication administered. Data on the dependent and independent variables were then collected. All data collection was performed by 2 experienced and previously trained examiners, MSc students, a physical therapist (PT) and an occupational therapist (OT), and 2 assistants, undergraduate students in physical therapy. They had all been trained by an independent senior researcher regarding the application of all questionnaires and tests, following recommendations (20, 22–26).

SRH was the dependent variable, which was measured using the first question of the Short Form 36 (SF-36): "In general, would you say your own health is…", which has 5 response options (excellent, very good, good, fair, and poor) (27). This variable was dichotomized into 2 categories: "good SRH" and "poor SRH." "Good SRH" was composed of the answers: excellent, very good, and good, and "poor SRH" of the answers: fair and poor (9).

The independent variables or potential determinants of SRH investigated by the present study were selected considering the following criteria: (*i*) be modified by rehabilitation, which was a recommendation provided by previous studies that have investigated determinants of SRH in elderly people and subjects with mild traumatic brain injury (17, 28); (*ii*) be related to the dimensions of the SRH (physical, mental and social) (1); and, (*iii*) be organized according to the ICF components (16), as previously adopted by similar studies with elderly people (17, 18). Considering the particularities of subjects with stroke, the comprehensive ICF Core Set for stroke, which was largely confirmed (6), as well as previous studies about SRH in stroke

subjects (15, 10–12), guided the selection of these variables. Clinical measures, provided by instruments with adequate measurement properties and clinical feasibility when used in subjects with stroke, were then selected (22–26), as follows:

- Body structure and function: "emotional function" assessed by Geriatric Depression Scale shortened version (GDS-15) (23) and "motor recovery level" assessed by Fugl-Meyer Assessment (FMA) (22). Besides being important categories of the comprehensive ICF Core Set for stroke (6), previous associations had been found between SRH and physical health (11), as well as between SRH and symptoms of depression (10) in subjects with stroke.
- Activity: "manual skill" assessed by ABILHAND questionnaire (24) and "locomotion skill" assessed by ABILOCO questionnaire (25). Besides being important categories of the comprehensive ICF Core Set for stroke (6), previous associations had been found between SRH and performance in activities of daily living (ADL) (12), as well as between SRH and both upper and lower limb mobility (12) in subjects with stroke.
- Participation: "participation" assessed by the items of the Stroke Specific Quality of Life (SS-QOL) previously linked with this ICF component (26). Besides being important categories of the comprehensive ICF Core Set for stroke (6), previous associations had been found between low participation in social activities and poor SRH in post-stroke individuals (15).

Statistical analysis

Shapiro–Wilk tests were performed to verify the distribution of the quantitative variables. For the quantitative variables normally distributed, the mean and standard deviation were used as descriptive statistics. For the categorical qualitative variable, frequencies (absolute and relative) were used as descriptive statistics. Median and interquartile range were used for the other variables. As the variables age, sex, and socioeconomic status are usually associated with the SRH (17, 29, 30), between-group comparisons were performed in order to compare these variables between the "good SRH" and "poor SRH" groups (the independent sample student's t-test for the age and χ^2 test for the 2 other variables). Logistic regression analysis was then performed to identify significant association between the dependent variable (SRH, a dichotomous (binary) variable codified as "good SRH" and "poor SRH") and the 5 independent variables (Table I). The Enter method was performed. Before entering the related variables into a multivariate model they were tested for multicollinearity. The following goodness-of-fit tests were used: χ^2, R^2 Nagelkerke and Hosmer–Lemeshow tests. The associations in the multivariate logistic regression analysis were expressed as odds ratios (OR). Confidence intervals of 95%
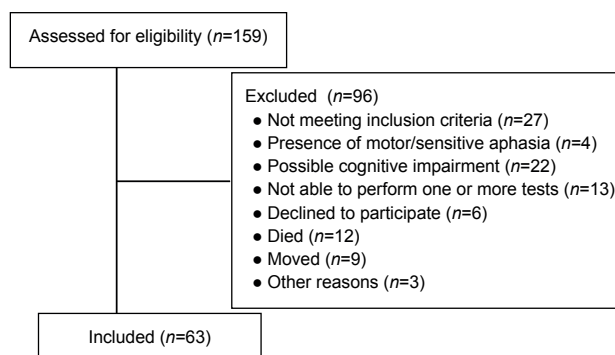

Fig. 1. Flow diagram of subject recruitment.

(95% CI) were estimated. The level of significance was set as $\alpha = 5\%$ (31). All the statistical analyses were performed using the SPSS for Windows® (version 17.0).

RESULTS

A total of 159 post-stroke individuals were identified in the 4 primary care units. Only 63 of these subjects met the eligibility criteria and were included in the study. The recruitment flowchart is shown in Fig. 1.

Most of the enrolled individuals were women (54%, $n = 34$), mean age 66 years (standard deviation (SD) 12.2) and median time since stroke 43 months (SD 69.5) (Table II).

The SRH was assessed as follows: excellent (3.2%, $n = 2$), very good (7.9%, $n = 5$), good (58.7%, $n = 37$), fair (28.6%, $n = 18$) and poor (1.6%, $n = 1$). Considering the proposed dichotomization, 44 individuals (70%) rated their own health as "good" and 19 (30%) as "poor" (Table II). The "good SRH" group was similar to the "poor SRH" group regarding age ($p = 0.498$), sex ($p = 0.172$) and socioeconomic status ($p = 0.878$). The results of the descriptive statistical analysis of the independent variables are shown in Table III.

Significant association with SRH was identified only for the independent variable "emotional function". Individuals with impairment of emotional function are 7 times more likely to assess their own health as "poor" (OR 6.558; 95% CI 1.525–28.205) (Table IV). A good

Table I. Profile of independent variables

ICF component	Independent variable	Measurement Instrument	Operationalization
Body structure and function	Motor recovery level	FMA (22)	"Severe" < 50, "Marked" 50–84, "Moderate" 85–95, "Slight" 96–99 and "Normal" 100 points
	Emotional function	GDS-15 (23)	"With" or "Without" depressive symptoms – using the cut-off points based on schooling
Activity	Manual skill	ABILHAND (24)	"Better" or "Worse" manual skill – positive and negative scores at the linear mean
	Locomotion skill	ABILOCO (25)	"Better" or "Worse" locomotion skill – positive and negative scores at the linear mean
Participation	Participation	SS-QOL P (26)	Not performed

ICF: International Classification of Functioning, Disability and Health; FMA: Fugl-Meyer Assessment; GDS-15: Geriatric Depression Scale shortened version; ABILHAND: questionnaire ABILHAND; ABILOCO: questionnaire ABILOCO; SS-QOL P: Stroke Specific Quality of Life – items of activity and participation.

Table II. Sociodemographic and clinical sample profile, taking into consideration the subgroups good self-rated health (*n* = 44) and poor self-rated health (*n* = 19)

Variables	Total (*n* = 63)	Good self-rated health (*n* = 44)	Poor self-rated health (*n* = 19)
Women, % (*n*)	54 (34)	47.7 (21)	68.4 (13)
Age, years, mean (SD)	66 (12.2)	64.5 (11.7)	70 (12.8)
Marital status, % (*n*)			
Single	14.3 (9)	13.6 (6)	15.8 (3)
Married	38 (24)	41 (18)	31.6 (6)
Stable relationship	3.2 (2)	4.5 (2)	0 (0)
Widow	35 (22)	31.8 (14)	42.1 (8)
Divorced/separated	9.5 (6)	9.1 (4)	10.5 (2)
Level of schooling, % (*n*)			
Uneducated	22.2 (14)	22.7 (10)	21.1 (4)
Elementary 1 incomplete	27 (17)	27.3 (12)	26.3 (5)
Elementary 1 complete/Elementary 2 incomplete	39.7 (25)	34.1 (15)	52.6 (10)
Elementary 2 complete/High school incomplete	3.2 (2)	4.5 (2)	0 (0)
High school complete/Higher education incomplete	7.9 (5)	11.4 (5)	0 (0)
Socioeconomic level, % (*n*)*			
Class B1	6.3 (4)	9.1 (4)	0 (0)
Class B2	9.5 (6)	13.6 (6)	0 (0)
Class C1	39.7 (25)	34.1 (15)	52.6 (10)
Class C2	28.6 (18)	29.5 (13)	26.3 (5)
Class D	14.3 (9)	11.4 (5)	21.1 (4)
Class E	1.6 (1)	2.3 (1)	0 (0)
Type of stroke, % (*n*)			
Ischaemic	60.3 (38)	63.6 (28)	52.6 (10)
Haemorrhagic	20.6 (13)	22.7 (10)	15.8 (3)
Both	1.6 (1)	2.3 (1)	0 (0)
Not informed/not registered in medical records	17.5 (11)	11.4 (5)	31.6 (6)
Stroke time progression (months), median (IQR)[a]	43 (69.5)	35.5 (63)	52 (91)
Comorbidities, % (*n*)			
Healthy	1.6 (1)	2.3 (1)	0 (0)
1 related morbidity	11.1 (7)	9.1 (4)	15.8 (3)
2 related morbidities	4.8 (3)	6.8 (3)	0 (0)
3 or more related morbidities	82.5 (52)	81,8 (36)	84.2 (16)
Amount of medication in use, median (IQR)	4 (4)	4 (4)	4 (4)

*Criteria for Economic Classification (ABEP. Font: www.abep.org) – Class A1: 42–46; Class A2: 35–41; Class B1: 29–34; Class B2: 23–28; Class C1: 18–22; Class C2: 14–17; Class D: 8–13; Class E: 0–7. SD: standard deviation. IQR: interquartile range. [a]Two individuals did not know the exact length of stroke progression, and there are no medical registrations; however, the family states that the event occurred more than 6 months previously.

Table III. Descriptive statistical analysis of the independent variables

Variables		Total (*n* = 63)	Good self-rated health (*n* = 44)	Poor self-rated health (*n* = 19)
Emotional function – depressive symptoms (GDS-15), % (*n*)	With	55.6 (35)	43.2 (19)	84.2 (16)
	Without	44.4 (28)	56.8 (25)	15.8 (3)
Motor recovery level (FMA), % (*n*)	Severe (<50)	17.5 (11)	18.2 (8)	15.8 (3)
	Marked (50 a 84)	31.7 (20)	22.7 (10)	52.6 (10)
	Moderate (85 a 95)	33.3 (21)	38.6 (17)	21.1 (4)
	Slight (96 a 99)	11.1 (7)	11.4 (5)	10.5 (2)
	Normal (100)	6.4 (4)	9.1 (4)	0 (0)
Manual skill (ABILHAND), % (*n*)	Worse	19 (12)	20.5 (9)	15.8 (3)
	Better	81 (51)	79.5 (35)	84.2 (16)
Locomotion skill (ABILOCO), % (*n*)	Worse	20.6 (13)	18.2 (8)	26.3 (5)
	Better	79.4 (50)	81.8 (36)	73.7 (14)
Participation (SS-QOL P), mean (SD)	Level of participation	93.6 (21.8)	96.5 (24)	87 (14.5)

GDS-15: Geriatric Depression Scale shortened version; FMA: Fugl-Meyer Assessment; ABILHAND: questionnaire ABILHAND; ABILOCO: questionnaire ABILOCO; SS-QOL P: Stroke Specific Quality of Life – items of activity and participation; *n*: number of individuals; SD: standard deviation.

Table IV. Statistical results of the logistic regression analysis

Variables		OR [95% CI]	*p*-value
Emotional function (GDS-15)	With depressive symptoms	6.558 [1.525–28.205]	0.012*
Motor recovery level (FMA)	Motor recovery level	0.775 [0.383–1.568]	0.479
Manual skill (ABILHAND)	Worse manual skill	0.109 [0.011–1.046]	0.065
Locomotion skill (ABILOCO)	Worse locomotion skill	2.148 [0.297–15.557]	0.449
Participation (SS-QOL P)	Level of participation	0.983 [0.947–1.020]	0.367

*$p < 0,05$. GDS-15: Geriatric Depression Scale shortened version; FMA: Fugl-Meyer Assessment; ABILHAND: questionnaire ABILHAND; ABILOCO: questionnaire ABILOCO; SS-QOL P: Stroke Specific Quality of Life – items of activity and participation; OR: odds ratio.

model fit was found (χ^2 (gl5)=14.614, $p<0.012$, R^2 Nagelkerke=0.293, Hosmer–Lemeshow test=0.288).

DISCUSSION

These results show that the variable emotional function is a significant determinant of SRH in subjects in the chronic phase of stroke: individuals in the "poor SRH" group are 6.6 times more likely to have symptoms of depression.

Han et al. (32) found that, in general, the theoretical structure of SRH for elderly people is composed of 2 components: physical illness and functional disability (32, 33). Taking into consideration elderly people with stroke, Han et al. (32) stated that a third component should be considered to be of similar importance; the symptoms of depression (R^2=79%), which added 21% to the explanation of the model variation with only physical illness and functional disability (R^2=58%) (32). Schreiner et al. (34) conducted a study with post-stroke individuals in Japan, and emotional function, assessed by the GDS, was found to be impaired in 62% of individuals. In addition, they found a significant correlation between SRH and emotional function (Spearman correlation r_s=–0.425; $p \leq 0.05$) (34). The results of the present study add important information to these previous results, since it was found that subjects in the chronic phase of stroke with "poor SRH" are 6.6 times more likely to have symptoms of depression than those with "good SRH".

In the present study, no significant association was found between the SRH and motor recovery level, manual and locomotion skill, and participation. These results can be explained by a number of factors, such as the chronic phase of the stroke and the dimensions of the SRH, inside which these variables are presented (physical and social). A prospective study has already shown that there was no significant variation in the answers of the post-stroke individuals to the global SRH, on the assessments performed as follow-up (1, 2, and 3 years after the episode), and that their answers were predominantly positive (5). However, the individuals assessed had disabilities (5). It is possible that motor impairments and poor manual and locomotion skills do not have a significant influence on the SRH of post-stroke individuals at the chronic phase. These variables fall into the other 2 dimensions of SRH (physical and social). However, no studies were found that investigated which of the 3 dimensions of SRH is most relevant for SRH of post-stroke individuals (9). Considering the results of the present study, the physical and social dimensions appear to be less significant for the SRH of post-stroke individuals in the chronic phase when variables representing the mental or psychological dimension are considered.

Emotional function is a potentially modifiable variable (17), even in the chronic post-stroke phase (35). This fact is of extreme importance for rehabilitation professionals, such as occupational therapists, physiotherapists, speech therapists and psychologists, who deal with the complexity of rehabilitating post-stroke individuals, commonly in the chronic phase, and face the repercussions that this health condition may bring. Schreiner et al. (34) reported that, from a sample of 101 subjects with stroke, 62% had impairment in emotional function, but none were currently receiving assessment and/or treatment for depressive symptoms (34). Therefore, greater attention should be given to emotional function and to its relationship with SRH in subjects in the chronic phase of stroke.

Several systematic reviews, with or without meta-analysis, and randomized controlled trials have already demonstrated the efficacy of intervention programmes in improving the emotional function of subjects with stroke, even in the chronic phase, such as structured exercises (functional, resistance or aerobic training) (35), integrated approach focused on participation goals (36) and traditional Chinese acupuncture (37). However, the SRH was not considered an outcome in these studies. Taking into consideration the significant association between SRH and emotional function in individuals with stroke in the chronic phase, as observed in the present study, these intervention programmes are also potentially able to improve the SRH of these subjects. Future studies should investigate this hypothesis.

According to clinical guideline recommendations, subjects with stroke in the chronic phase must be assessed by a professional from the rehabilitation team at least once a year (38). Considering the results of the present study, these professionals should systematically assess the SRH and emotional function of post-stroke individuals in the chronic phase, which can provide valuable information for their clinical decision-making. In the present study, the first question of the SF-36 and the GDS were applied for these purposes, but other feasible instruments are available, such as the EuroQol-5D (EQ5D) (9, 39) and the Patient Health Questionnaire (PHQ) (40). Finally, it is important to point out that the emotional function is considered a changeable variable, even in the chronic post-stroke phase, and therefore, intervention programmes with proven efficacy in this outcome could also be used to improve the SRH of post-stroke individuals. This hypothesis needs to be investigated in future studies.

Some limitations can be identified in the present study. First, there were more individuals in the "good

SRH" group than in the "poor SRH" group. As the sample size was small, this mismatch of sample size between the groups might have influenced the outcomes. Finally, the environmental and personal domains, which also moderate the ICF model, were not considered as possible determinants.

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