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Research Article

Influence of Physical and Mental Factors on the Quality of Life in Post Stroke Survivors

Mandić M[1*], Aranđelović M[2,3], Živković M[3,4], Bošković K[5,6], Nikolić M[3,7] and Rančić N[3,7]

[1]Clinic for Physical Medicine and Rehabilitation, University of Niš, Serbia
[2]Insitute for Occupational Medicine Niš, Serbia
[3]Faculty of Medicine, University of Niš, Serbia
[4]Clinic for Neurology, Clinical Center Niš, Serbia
[5]Faculty of Medicine Novi Sad, University of Novi Sad, Serbia
[6]Clinic for Physical Medicine and Rehabilitation, Clinical Center Vojvodina, Serbia
[7]Institute for Public Health Niš, Serbia

***Corresponding author:** Milan Mandić, Clinic for Physical Medicine and Rehabilitation, Clinical Center Niš, Serbia' Medical Faculty, University of Niš, Serbia

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Abstract

The objective of the paper was to assess the influence of physical and mental factors on health-related quality of life (HRQOL) in post stroke survivors.

Methods: Prospective cohort study was done. Study involved 136 post stroke survivors who had inpatient rehabilitation. Functional status was assessed by Barthel Index (BI) and modified Rankin scale (mRS). Mini Mental State Examination (MMSE) was used for screening cognitive function. HRQOL was assessed by the Medical Outcomes Study 36-item Short Form (SF-36). Changes in scores in SF-36 questionnaire were assessed with association with changes in disability over the six months period. Student's t-test test to compare numerical differences of normal distribution and the Mann-Whitney U test is used to compare two values when there were not normally distributed. The repeated-measures analysis of variance ANOVA test was used to understand how changes in the independent variables are associated with changes in quality of life one and six months after the stroke onset.

Results: There were marked decline in all eight domains of SF-36 questionnaire at admission. After one month and after six months of follow up BI and MMSE scores increased and mRS decreased. All eight domains of the SF-36 improved, but six showed statistically significant increase. Domains bodily pain and vitality showed non significant improvement. Six months after the stroke onset five domains continued to increase significantly except vitality, bodily pain and mental health. ANOVA showed that values of mRs, significantly decreased during the investigation ($p<0.001$) while the BI and MMSE scores significantly increased ($p<0.001$).

Conclusions: A strongly correlation between higher BI scores and physical, social domains, role emotional, menthal and general health was found. Improvements in motor disability and improvement of cognitive function were statistically significant associated with increase of HRQOL. All domains of SF 36 improved during six month follow up. Bodily pain, vitality and mental health non significant improve during the six months after the stroke onset.

Keywords: Stroke; Inpatient rehabilitation; Health-related quality of life

Introduction

Despite advances in the diagnosis and treatment of cerebrovascular disease, stroke remains the third most common cause of death worldwide and leading cause of disability [1,2,3]. The prevalence of stroke survivors who experience in an incomplete recovery is 461 per 100,000, and one-third of these survivors require assistance with at least one activity of daily living [3].

Stroke remains one of the most devastating of all neurological diseases, often causing death or physical impairment or disability [4]. According to the World Health Organization (WHO), 15 million people present with stroke annually, and of these five million die as a result of the event and a large part of the survivors present physical and/or mental sequelae [5].

Functional deficits and psychological problems after stroke disrupt the patient's ability to perform activities of daily living, which negatively impacts their health-related quality of life (HRQOL) [5]. The most important consequence of stroke for stroke survivors is decreased quality of life (QOL), [6,7].

In many studies, the QOLs of patients with stroke were evaluated and some were reported as disrupted [8-18]. Patients often experience a loss of self-identity following a stroke [19]. Speech loss or difficulty in speech is a significant factor reducing social contact [20].

Several studies suggest that QOL decreases after stroke because of functional impairments, depression and insufficient social support [17,21], home circumstances and standard of living, and also gender and age, with women and older adults, as well as more dependent stroke survivors, reporting lower QOL [22].

Health-related QOL (HRQL) measurements reflect the physical, functional, psychologic, and social aspects of health [19]. HRQOL is usually a reflection of the patients'subjective and personal evaluation of their own health status [23]. Rehabilitation helps stroke survivors maximize their HRQOL including physical, cognitive, emotional and social aspects [24].

The results of treatment are appraised by applying tests that

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evaluate physical limitations and/or functional impairments [25].

The objective of the paper was to assess influence of physical and mental factors on HRQOL during and after inpatients rehabilitation in post stroke survivors.

Methods

Prospective study was done. The study involved 216 post stroke survivors aged 30-79 from the Nishava District. 196 completed study. Reasons for missing paricipients were: 11 patients declining to participate, 60 patients had outpatient rehabilitation, 9 died. Only 136 post stroke survivors had inpatient rehabilitation after stroke. The observed period was January the first in 2011 to August 15th in 2013. HRQOL was assessed by means of the Medical Outcomes Study 36-item Short Form (SF-36), which is a self-administered questionnaire. Mini Mental State Examination (MMSE) was used for screening cognitive function. Functional status was assessed by Barthel Index (BI) and modified Rankin Scale (mRS). All surviving patients were contacted one and six months after stroke onset and given an appointment with a physiatar.

Criteria for inclusion in the study were first-ever stroke (cerebral infarction or hemorrhage), confirmed by either brain CT or MRI findings consistent with the clinical presentation, patient willingness to participate, and the availability of a complete Mini-Mental State Examination (MMSE), mRs, BI score and SF-36 questionnaire.

Exclusion criteria were another stroke or personal history of stroke, severe cognitive impairment, aphasia.

All patients were informed in detailed about the aims of the study. The Ethical Committee of the Faculty of Medicine in Nis and The Ethical Committee of the Clinical center Niš gave it's approval for the study.

Questionnaires

Patients' functional status was assessed with modified Barthel Index (BI) and modified Rankin Scale (mRS) [26-30].

The BI was developed in 1965 [27] and later modified by Granger and coworkers [28] as a scoring technique that measures the patient's performance in 10 activities of daily life. The BI is considered a reliable disability scale for stroke patients [29]. The items can be divided into a group that is related to self-care (feeding, grooming, bathing, dressing, bowel and bladder care, and toilet use) and a group related to mobility (ambulation, transfers, and stair climbing). The maximal score is 100 if 5-point increments are used, indicating that the patient is fully independent in physical functioning. The lowest score is 0, representing a totally dependent bedridden state.

The mRS measures independence rather than performance of specific tasks. In this way, mental as well as physical adaptations to the neurological deficits are incorporated. The scale consists of 6 grades, from 0 to 5, with 0 corresponding to no symptoms and 5 corresponding to severe disability [29].

Cognitive function was assessed using the mini mental state examination (MMSE). The MMSE is a widely used, reliable and validated instrument used in screening for cognitive impairment. The exam assesses aspects of cognition and is easily performed. Contents include orientation, attention, learning, calculation, abstraction, information, construction and delayed recall. The MMSE provides measures of orientation, registration (immediate memory), short-term memory (but not long-term memory) as well as language functioning. The examination has been validated in a number of populations. Scores of 25-30 out of 30 are considered normal; the National Institute for Health and Care Excellence (NICE) classifies 21-24 as mild, 10-20 as moderate and <10 as severe impairment. The MMSE may not be an appropriate assessment if the patient has learning, linguistic/communication or other disabilities (eg, sensory impairments) [31].

HRQOL was assessed by means of the Medical Outcomes Study 36-item Short Form (SF-36), which is a self-administered questionnaire containing 36 items that, when scored, yield 8 domains. The physical functioning domain assesses limitations in physical activities such as walking and climbing stairs. The role physical and role emotional domains measure problems with work or other daily activities as a result of physical health or emotional problems. Bodily pain assesses limitations resulting from pain; vitality measures energy and tiredness. The social functioning domain examines the effect of physical and emotional health on normal social activities, and mental health assesses happiness, nervousness, and depression. The general health perceptions domain evaluates the personal opinion of one's health compared with that of one's peers, as well as the expectation of changes in health. All domains are scored on a scale from 0 to 100, with 100 representing the best possible health state [32,33].

Change scores were calculated in such a way that positive change scores indicated improvement and negative change scores indicated deterioration.

Statistical analysis

All the calculations were done into the SPSS version 10.0 and S-PLAS programme, version 2000. Analyses included descriptive statistics (mean, SD, frequencies), independent Student's t-test test to compare numerical differences of normal distribution. The Mann-Whitney U test is used to compare two values when the dependent variable is either ordinal or continuous, but not normally distributed.

The repeated-measures analysis of variance ANOVA test was used to understand how changes in the independent variables are associated with changes in quality of life one and six months after the stroke onset. A correlation analysis was used for the relationships among the continuous variables (sex, age, side of stroke, mRs, BI and MMSE score) and domains and Spearman coefficient of rang correlation was calculated. In all statistical analysis as the limit of statistical significance of the default error estimate of 5% ($p<0.05$).

Results

A total number of 136 post stroke survivors completed questionnaires at admission, one month and six months after the stroke onset. The average age of post stroke survivors was 63.72±8.73. There were 66 (48.5%) men and there were 70 (51.5%) women. Determined differences werent statistically significant. Ischaemic brain damage had 105 (77.2%) of patients and Hemorraghia had 31(22.8%).

The basic characteristics of the patients are shown in Table 1.

The most common sides of stroke were: left hemisphere 62

Table 1: Basic characteristics of the post stroke survivors.

Characteristics	Number	Percentage (%)
Sex		
Male	66	48.50%
Female	70	51.50%
Type of stroke		
Ischaemia	105	77.20%
Hemorraghia	31	22.80%
Side of stroke		
Right hemisphere	60	44.10%
Left hemisphere	62	45.60%
Other (brainstem)	10	7.60%
Both hemispheres	4	2.90%

(45.6%), right hemisphere 60 (44.1%) and brainstem 10(7.6%).

Table 2 describes the changes in SF 36 from admission, one month and six months after stroke.

At admission RF and RE summary scores were zero. All other domains were significantly lower compared with average scores of domains one moth later. During rehabilitation, at first month after the stroke there were improvements in all 8 domains, but in two domains, vitality and bodily pain the improvement was non significant.

Six months after discharge 5 domains continued to show significant increase but 3 domains mental health, vitality and bodily pain showed non significant improvement (Table 3).

The value of mRs at admission was 4.75±0.55 and six months after the stroke onset it was 2.60±1.08. Average value of mRS was 1.8 times lower after six months than at admission. There was a continued decrease of mRS during the study.

BI score was the lowest at admission 25.00±24.66 and the highest six months after the stroke onset -83.75±18.59. BI score was 3.35 times higher than at admission.

The average MMSE score in the period from admission to six months from admission increased from 22.84±6.01 up to 27.40±4.20. Mild impairments had post stroke survivors only at admission to the Neurological Unit MMSE (<24), and there weren't cognitive disfunction after one and six months after the stroke onset.

Analysis of variance for repeated measures showed that values of mRs, significantly decreased during the investigation ($p<0.001$) while the BI and MMSE score significantly increased ($p<0.001$) (Table 4).

The significant positive correlation was found between the increase of PF and the value of mRS and MMSE score during investigation ($r=0.346$; $p<0.01$) and BI score ($r=0.296$; $p<0.01$) at admission. The significant negative correlation was determined between the increase RF and the increase of mRS ($r=0.341$; $p<0.01$) and BI score during the study. Significant negative correlation was found between the increase of PF and decrease of BI score during the investigation ($r=-0.457$; $p<0.01$). Significant negative correlation was found between the increase of PF and decrease values of mRS ($r=-0.207$; $p<0.05$) at admission.

The statistically significant increase of role physical correlation with values of mRS ($r=0.315$; $p<0.01$) and the higher BI scores ($r=0.203$; $p<0.05$) at admission. The negative significant correlation determined between the increase of RF and decrese of BI score during study ($r=-0.415$; $p<0.01$), as well as with decreased values of mRS ($r=-0.397$; $p<0.01$) and MMSE score ($r=-0.475$; $p<0.01$) at admission.

Positive correlation was determined between increase of domain

Table 2: Changes in SF-36, admission to one-month and to six-months follow-up.

Measure	Scores		Significance P
Changes in SF-36,	**admission**	**to one month follow–up**	
Physical Functioning	1.91±6.72	18.53±24.21	0.05
Role Physical	0.00±0.00	2.02±9.65 -	
Role Emotional	0.00±0.00	4.17±19.22 -	
Vitality	60.55±22.29	68.68±20.12	n.s.
Mental health	60.55±22.29	77.00±19.20	0.05
Social Functioning	2.76±12.33	13.42±21.76	0.05
Bodily Pain	90.63±25.65	93.64±20.12	n.s.
General Health Perceptions	1.10±5.15.	6.62±11.07	0.05
Changes in SF-36,	**one-month follow-up**	**to six- months follow –up**	
Physical Functioning	18.53±24.21	56.54±34.79	0.05
Role Physical	2.02±9.65	6.84±41.57	0.05
Role Emotional	4.17±19.22	28.19±40.75	0.05
Vitality	68.68±20.12	74.60±17.48	n.s.
Mental health	77.00±19.20	78.82±20.46	n.s.
Social Functioning	13.42±21.76	57.35±36.97	0.05
Bodily Pain	93.64±20.12	95.72±10.14	n.s
General Health Perceptions	6.62±11.07	23.9±18.48	0.05

Table 3: The values of mRs, BI and MMSE scores in stroke survivors at admission, one month and six months after the stroke onset.

Time	Post stroke survivors Number 136		
	mRs	BI	MMSE
At admission	4.75±0.55	25.00±24.66	22.84±6.01
One month after	3.82±0.73	57.28±24.88	25.34±4.73
Six months after	2.60±1.08	83.75±18.59	27.40±4.20

RE and increase of mRS (r=0.315; p<0.01) during the study and higher of BI score at admission (r=0.203; p<0.05). Significant negative correlation was determined between increase of RE and decreased of BI score during the study (r=-0.423; p<0.01), and with lower values of mRS (r=-0.287; p<0.01) and MMSE (r=-0.592; p<0.01) score at admission.

Significant positive correlation was found between the increase of domain vitality and increase of MMSE score (r=0.265; p<0.01) during the study. Domain vitality showed statistically significant improvement in women than in men (r=0.174; p<0.05).

Statistically significant negative correlation was found between the domain MH and the decrease of BI score during the study (r=-0.219; p<0.05).

Statistically significant positive correlation was found between the domain SF and the increase of mRS during the investigation (r=0.262; p<0.01) and between the SF and decreased of BI score at admission (r=0.357; p<0.01). Statistically significant negative correlation was found between the domain SF and the decrease of BI score during the study (r=-0.440; p<0.01), and between the decreased of mRS at admission (r=-0.221; p<0.01).

Statistically significant positive correlation was found between the domain GH and the increase of of mRS (r=0.220; p<0.05) and with the increase of MMSE score (r=0.208; p<0.05) during the study.

There were statistically significant correlations between domains bodily pain a d all examined factors.

Statistically significant negative correlation was found between the increase the domain GH and the decrease of BI score during the study (r=-0.256; p<0.01), and with the decreased MMSE score (r=-0.590; p<0.01) at admission.

Statistically significant positive correlation was found between the domain CGH and the increase of mRS (r=0.443; p<0.01) during the study and with the higher BI score (r=0.203; p<0.05) at admission. Statistically significant positive correlation was found between the domain CGH and the decrease of BI score (r=-0.446; p<0.01) during the study and with the decreased values of mRS (r=-0.212; p<0.05) at admission.

Discussion

In this investigation, HRQOL was assessed using the SF-36, which is accepted as an adequate measure for assessing post-stroke function [8]. The importance of post stroke QOL measurement is increasingly accepted [19]. We investigated possible associations between demographic characteristics, functional status, cognitive function and HRQOL.

During the six months of follow up it was found continued increase of HRQOL. During the investigation all eight domains of SF-36 increased but domain bodily pain, vitality and mental health showed nonsignificant improvement.

Hopman and Verner (2003) found statistically significant declines in 5 domains (role emotional, mental health, social functioning, bodily pain and genaral health perceptions) of the SF-36 in the six months after discharge (except role physical, physical functioning and vitality) [34].

According to the presented results positive changes in physical function and role function were strongly positive associated with increase of the HRQOL. During the six months of follow up a continued improvement of HRQOL was determined.

Physical function was higher at admision in those survivors with right hemisphere stroke but these differences were no longer present

Table 4: Correlation between changes of domain in SF 36 questionnaire from admission up to six months after stroke.

Characteristics	Domains								
	PF	RF	RE	VT	MH	SF	BP	GH	CGH
Sex	0.039	0.048	0.081	0.174*	0.096	0.113	0.036	0.1	0.164
Age	-0.026	-0.041	-0.001	0.013	0.017	-0.055	0.042	-0.035	0.036
Type of stroke	0.03	0.015	0.081	0.061	-0.106	-0.024	-0.044	0.035	-0.016
Right hemisphere	-0.052	-0.086	-0.017	0.06	0.158	0.031	0.005	-0.167	-0.055
Left hemisphere	-0.007	0.037	0.034	0.003	-0.099	-0.104	-0.102	0.095	-0.05
Both hemisphere	-0.145	-0.116	-0.131	0.165	0.067	-0.115	0.1	-0.018	-0.098
mRS at admission	-0.207*	-0.397†	-0.287†	0.085	0.087	-0.221†	-0.031	-0.013	-0.212*
Change of mRS	0.346†	0.341†	0.315†	-0.008	0.037	0.262†	0.167	0.220*	0.443†
BI score at admission	0.296†	0.123	0.203*	-0.032	0.013	0.357†	0.013	0.07	0.203*
Changes of BI score	-0.457†	-0.415†	-0.423†	0.126	-0.219*	-0.440†	0.098	-0.256†	-0.446†
MMSE score at admission	-0.721†	-0.475†	-0.592†	-0.014	-0.352†	-0.631†	0.117	-0.590†	-0.590†
Change of MMSE score	0.255†	-0.037	0.052	0.265†	0.312†	0.281†	-0.151	0.208*	0.115

* - *P*<0,05; † - *P*<0,01; PF – Physical Function; RF –Role Physical; ER – Role Emotional; VT – Vitality; MH – Mental Health; SF – Social Functional; GH – General Health; Change of General Health

one month and six months after the stroke onset. Physical function was higher but nonsignificant in survivors with ischaemic stroke.

Men had higher score of domain physical function than women at admission, but this difference wasn't significant. Hopman and Verner (2003) found that at the time of the six monts follow-up, there were no significant differences between men and women, but the differences in vitality ($p<0.001$) and menthal health ($p<0.001$) became more pronounced [34].

Granger, Deric, Denham found higher BI score in men after the post stroke compared with women [35]. Similar results in post stroke survivors a year after the stroke showed Wilkinson-a [36], Bethoux-a [37], Santus-a [38], Johansson-a [39].

In this study it was found strongly correlation between higher scores of BI and higher scores of physical function, role emotional, menthal health and general health.

The patients in our study had mostly stroke localized in the left side hemisphere. The side of stroke at admission had nonsignificant impact on BI score [32]. The side of hemiplegia had little impact on HRQOL [40]. At admission physical function of SF 36 was higher in patients with right hemiplegia, but one moth and six there weren't statistically significant difference.

A study of 46 stroke survivors 4 years after their first stroke showed that despite a good outcome in terms of discharge from the hospital, ADL, and return to work, the HRQOL of 83% of the patients had not been restored to the pre-stroke level [18].

In one study, the mean QOL scores decreased in the domain of physical function between 4 to 16 months after stroke and important determinants of QOL after 16 months were functional status, age and gender [41]. Another study showed that neither age, gender, comorbidity, nor baseline disability was an important determinant of change in HRQOL from 1 to 6 months following acute stroke [42].

In this study women had significant increased od domain vitality than men.

Hackett, et al (2006) reported a decreased HRQOL in patients 4 years after stroke and found that important determinants were physical state and cognitive impairment [22]. Poor physical health 1 year after stroke was independently associated with being female and having diabetes mellitus, right hemispheric lesions and cognitive impairment. In another study, poor mental health 1 year after stroke was independently associated with being under 65 years, the presence of ischemic heart disease and cognitive impairment [22].

According to data from one study that assessed 63 stroke survivors during inpatient rehabilitation, one month after stroke and again at home 6 months after the stroke onset it was found that functional independence and HQOL improved over time but this improvement was strongly correlated with self-care and self-efficacy [32].

Cognitive impairment (CI) is a frequent complication in stroke survivors and predicts post-stroke death, dependency, and institutionalization [33].

According to presented results there post stroke survivors had mild impairments had only at admission to the Neurological Unit MMSE (<24), and there weren't cognitive disfunction after one and six months after the stroke onset.

There wasn`t statistically significant difference in MMSE score at admission by gender. De Paulo [43] i Folstein [31] stated that in relation to gender a greater decreased of cognitive function was noticed in women.

The social dimension of quality of life was asseeed domain social support, role social and loneliness. In post stroke survivors domain social function was statistically significant increased a month after the stroke onset compared at the admission ($p<0.01$).

Domain social function didn`t show statistically significant differences related to gender, side of hemiplegia, etiology of stroke and localisation of stroke.

Longitudinal data about HRQOL in post stroke survivors are limited [34].

Limitations of the study, must be taken into account when these results are interpreted. One limitation was the sample size, which was relatively small. Another issue was the inpatient rehabilitation which was to short. Inpatients rehabilitation have a strong, positive impact on HRQOL. But, not all of patients could have inpatient rehabilitation. Another 60 post stroke survivals had rehabilitation in their homes or didn't have any. The lack of assessment of depression in post stroke survivals. The cognitive status was assessed only by the MMSE. MMSE is known to be insensitive to mild CI. Although acceptable validity is found in some studies, other studies reported that MMSE is not an appropriate screening test for cognitive dysfunction in cerebrovascular diseases due to shortcomings regarding right-sided lesions [41].

Conclusion

Changes in physical function and role function were strongly associated with changes of BI scores. A strongly correlation between higher BI scores and physical, social domains, role emotional, mental and general health was found. Improvements in motor disability and improvement of cognitive function were statistically significant associated with increase of HRQOL. All domains of SF 36 improved during six month follow up. Bodily pain, vitality and mental health non significant improve during the six months after the stroke onset.

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