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Correlation between risk factors, functional recovery, and the health-related quality of life of stroke survivors

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SUMMARY

Introduction/Objective It has been estimated that 50% of strokes are preventable through the control of modifiable risk factors.
The objective of the paper was to determine the correlation between the risk factors, functional status, and the health-related quality of life (HRQOL) of stroke survivors.

Method The prospective cohort study was used. The study included 136 patients 30–79 years old. Functional recovery was assessed using the Barthel index (BI) and the Modified Rankin Scale (mRS). The HRQOL was evaluated by the generic Short Form 36 (SF-36) questionnaire. BI and mRS were determined at admission at the rehabilitation, one, three and six months after the stroke. The SF-36 was filled out at the same time. The analysis of the repeated measure variance (Repeated Measures ANOVA) was applied, as well as the correlation analysis and Spearman's coefficient of rank correlation.

Results A total number of 136 patients [66 (48.5%) male and 70 (51.5%) female] completed the questionnaire. The average age of stroke survivors was 63.72 ± 8.73. At admission, mRS was 4.75 ± 0.55, and six months after the stroke onset it decreased to 2.60 ± 1.08. The average value of BI at admission was 25 ± 24.66, and within six months it increased to 83.75 ± 18.59 ($p = 0.001$). The ANOVA showed that the values of mRS significantly decreased ($p < 0.001$) and the values of BI significantly increased (ANOVA: $p < 0.001$). All domains of the SF-36 questionnaire, except for the pain domain, significantly increased ($p < 0.001$). The physical function ($r = 0.238$; $p < 0.01$), physical role ($r = 0.199$; $p < 0.05$), and emotional role ($r = 0.237$; $p < 0.01$) were significantly lower among alcohol addicts ($r = 0.199$; $p < 0.05$). Mental health ($r = 0.244$; $p < 0.01$) and social relationships domains were significantly lower among smokers ($r = 0.272$; $p < 0.01$). The general health ($r = -0.290$; $p < 001$) and health condition change domains were significantly lower among smokers ($r = 0.225$; $p < 0.01$).

Conclusion The most important risk factor which was negatively correlated with the HRQOL was smoking. The patients who were smokers and alcohol addicts had a significantly smaller increase of the HRQOL domains compared to other patent groups. Six months after the stroke, all domains of the HRQOL significantly increased. The significant improvement of patients' functional status was positively correlated to the increase of their HRQOL.

Keywords: stroke; health-related quality of life; hypertension; smoking

INTRODUCTION

Stroke is the first cause of disability and the second most common cause of death worldwide [1, 2]. Age, sex, race, ethnicity, and heredity have been identified as markers of risk for stroke. Age is the single most important risk factor for stroke. For each successive 10 years after the age of 55 years, the stroke rate more than doubles in both men and women. An increased incidence of stroke in families has long been noted [3].

Potential reasons are a genetic tendency for stroke, a genetic determination of other stroke risk factors, and a common familial exposure to environmental or lifestyle risks. Earlier studies suggested an increased risk for men whose mothers died of stroke and women who had a family history of stroke [4]**.** In the Framingham Study, an offspring analysis revealed that both paternal and maternal histories were associated with an increased risk of stroke [5].

Hypertension is the single most important modifiable risk factor for ischemic stroke. Most estimates for hypertension indicate a relative risk of stroke of approximately 4 when hypertension is defined as systolic blood pressure ≥ 160 mmHg and/or diastolic blood pressure ≥ 95 mmHg. Various cardiac diseases have been shown to increase the risk of stroke. Atrial fibrillation is the most powerful and treatable cardiac precursor of stroke. The incidence and prevalence of atrial fibrillation increase with age [5, 6].

Diabetes mellitus nearly triples, while current cigarette smoking doubles this risk. Atrial fibrillation, although often asymptomatic and undetected, is an important risk factor for stroke, increasing stroke risk about fivefold throughout all ages so that its relevance could be underestimated [7]. Patients with low concentrations of HDL cholesterol have been found to be at a higher risk of stroke [8].

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Furthermore, depressive symptoms have been increasingly recognized as a risk factor (four-fold higher) for stroke / transient ischemic attack [9].

Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity [10]. This statement defines health-related quality of life (HRQOL) as a construct that focusses on the respondent's subjective perception and consists of physical, mental, and social dimensions [11].

Health-related quality of life (HRQOL) refers to the aspects of the quality of life affected by a disease, or the impact of the health condition or health care intervention on the individuals' subjective experience in functional, cognitive, social and psychological processes [12, 13].

The objective of the paper was to evaluate the correlation between the risk factors, functional status, and the HRQOL of stroke survivors after the first stroke.

METHODS

A prospective cohort study was carried out. Two hundred sixteen patients who had a stroke were randomly chosen out of the total number of 1,598 patients. The prospective study included 216 patients 30–79 years old who lived on the territory of the City of Niš. Ine hundred thirty-six of them finished the study, 11 patients left the study, and nine patients died. The observed period was from January 1, 2011 to August 15, 2013.

The criteria used for including patients in the study were the following: the first acute stroke, 30–79 years old – according to the data from the hospital-based register for stroke, hospital records, and official death certificates, persons from these age-groups have the highest specific age incidence and mortality rate for stroke in the Nišava District; the patient was hospitalized in Niš, communication was possible; written informed consent to be included in the study; inpatient rehabilitation.

The criteria used for excluding the patient from the study were as follows: previous stroke; insufficient ability to communicate; psycho-organic syndrome; aphasia; a new stroke in less than 90 days after the first one; complications after the stroke, another stroke or acute myocardial infarction; patient's death.

All of the patients were completely informed about the aims of the research. In order to include patients in the study it was necessary to receive their written consent (two copies). The permission for making the research was issued by the Ethics Committee of the Faculty of Medicine in Niš on January 18, 2010 (permission No. 01-206-8). Another permission for conducting the research was also issued on February 2, 2011 (permission No. 2280/12).

Stroke was diagnosed by a neurologist at the time the patient was hospitalized at the Neurology Clinic of the Niš Clinical Centre. This study includes the patients who were hospitalized at the Neurology Clinic of the Niš Clinical Centre at this period of time, after which they were hospitalized and treated at the Clinic for Physical Medicine and Rehabilitation of the Niš Clinical Centre.

Their functional recovery was surveyed using Barthel index (BI) and the Modified Rankin Scale (mRS) [13]. Disability was evaluated using the BI and the mRS. The BI measures the degree of autonomy in daily living activities and gives a score ranging from 0 (total dependence) to 100 (total independence). The BI mean scores were categorized as follows: BI < 30 was classified as needing "institutional care"; 30–70 was classified as "help needed," and patients having a BI > 70 were classified as being "functionally independent" [14].

The mRS assesses the patients' ability to perform the activities they carried out previously and any assistance in doing so. It ranges from 0 (no symptoms at all) to 6 (dead). Patients scoring 0–2 on the mRS were classified as independent; patients scoring 3–6 were categorized as experiencing severe disability or death [14].

The quality of life was investigated using a generic questionnaire for estimating the quality of life Short Form 36 (SF-36).

Quantitative statistical analysis was done through computer software. MS Office Excel 2010 (Microsoft Corporation, Redmond, WA, USA) computer program was used for the input, ranking, grouping, table, and graphic presentation of the obtained data. Program R version 2.12.0 (R Foundation for Statistical Computing, Vienna, Austria) was used for calculations.

The analysis of the repeated measure variance (Repeated Measures ANOVA) was applied for testing statistical importance of value changes in the characteristics of the quality of life and the characteristics of the health status during the research. The estimation of the characteristics correlation between the values of the quality of life and the factors of interest was obtained using the correlation analysis, and the values of Spearman's coefficient of rank correlation (r) were also calculated.

RESULTS

A total number of 136 patients were included in the research; 48.5% male, and 51.5% female. Their average age was 63.72 ± 8.73. The ischemic stroke was present among 77.2%, and the hemorrhage was present among 22.8% of the patients. Stroke was most often located in the left brain hemisphere (45.6%), then in the right hemisphere (44.1%), and other locations were present in 10.3% of the patients.

Twenty-seven patients (45%) had two risk factors for stroke, 17 patients (28.3%) had one, nine patients (15%) had three risk factors, four patients (6.7%) had four, and two patients (3.3%) had no risk factors present (Table 1).

Among the patients who had their first stroke, previous transient ischemic attack episodes were present in eight (5.9%), 22 (16.2%) were current and ex-smokers, diabetes mellitus was present in 46 (33.8%) patients, hypercholesterolemia was present in 48.5% of the cases, more than one third, or 48 (35.3%) patients, were alcohol addicts,118 (86.8%) had high systolic and diastolic blood pressure, and carotid stenoses were noted in 38 (27.9%) cases (Table 2).

Table 1. Distribution of risk factors among the patients

Risk factors	n (%)
Previous TIA episode	8 (5.9%)
Current smoker	22 (16.2%)
Ex-smoker	22 (16.2%)
Diabetes mellitus	46 (33.8%)
Cholesterol	66 (48.5%)
Alcohol addict	48 (35.3%)
SYS blood pressure	118 (86.8%)
DIA blood pressure	118 (86.8%)
Carotid stenosis	38 (27.9%)

TIA – transient ischemic attack; SYS – systolic; DIA – diastolic

Table 2. The values of the modified Rankin Scale (mRS) and Barthel index (BI) on admission to the Clinic for Rehabilitation and one, three, and six months after discharge

Time period	Post stroke survivors	
	mRS (n = 136)	BI (n = 136)
On admission to the Clinic for Physical Medicine and Rehabilitation	4.75 ± 0.55	25 ± 24.66
1 month later	3.82 ± 0.73	57.28 ± 24.88
3 months later	3.16 ± 0.92	74.49 ± 20.21
6 months later	2.60 ± 1.08	83.75 ± 18.59

The analysis of the repeated measure variance showed that during the research, the values of the Rankin scale significantly decreased ($p < 0.001$) among the patients, and the values of BI significantly increased, (ANOVA: $p < 0.001$). The average value of BI at admission was 25 ± 24.66, and within six months it increased to 83.75 ± 18.59 ($p = 0.001$)(Table 3).

ANOVA showed that during the investigation, all domains values of the SF-36 questionnaire, except for the pain domain, significantly increased among the patients ($p < 0.001$).

Significant positive correlation was confirmed between the value increase of physical function and the value increase of mRS ($r = 0.346$; $p < 0.01$) during the research, as well the increase of BI values ($r = 0.296$; $p < 0.01$) at admission. Significant negative correlation was confirmed between the value increase of physical function and the decrease of BI values during the research period ($r = 0.457$; $p < 0.01$), as well as the value decrease of mRS ($r = 0.207$; $p < 0.05$). The value increase of the physical function domain is significantly lower among smokers ($r = 0.238$; $p < 0.01$).

Significant negative correlation was confirmed between the value increase of the physical role domain and the value decrease of BI during the research ($r = 0.415$; $p < 0.01$) as well as the value decrease of mRS ($r = 0.397$; $p < 0.01$). Value increase of the physical role domain is significantly lower among smokers ($r = 0.199$; $p < 0.05$).

Significant positive correlation was confirmed between the value increase of the emotional role domain and the value increase of mRS ($r = 0.315$; $p < 0.01$) during the research, as well as the value increase of BI ($r = 0.203$; $p < 0.05$) at admission. Significant negative correlation was confirmed between the value increase of the emotional role domain and the value decrease of BI during the research ($r = 0.423$; $p < 0.1$), as well as the value decrease of mRS ($r = 0.287$; $p < 0.01$). Value increase of the emotional role domain is significantly lower among smokers ($r = 0.237$; $p < 0.01$) and among alcohol addicts ($r = 0.199$; $p < 0.05$).

Significant negative correlation was confirmed between the value increase of the mental health domain and the value decrease of BI during the research ($r = 0.219$; $p < 0.05$). The value increase of the mental health domain was significantly lower among smokers ($r = 0.244$; $p < 0.01$). Significant positive correlation was confirmed between the value increase of the social relationships domain and the value decrease of mRS ($r = 0.262$; $p < 0.01$), as well as the value increase of BI ($r = 0.357$; $p < 0.01$) at admission. Significant negative correlation was confirmed between the value increase of the social relationships domain and the value decrease of BI during the research ($r = 0.440$; $p < 0.01$), as well as the value decrease of mRS ($r = 0.221$; $p < 0.01$). The value increase of the social relationships domain was significantly lower among smokers ($r = 0.272$; $p < 0.01$). No significant correlations between the values of the pain domain and all other investigated factors were confirmed.

Significant positive correlation was confirmed between the general health domain and the value increase of mRS ($r = 0.220$; $p < 0.05$). Significant negative correlation was confirmed between the value increase of the general health domain and the value decrease of BI during the research ($r = 0.256$; $p < 0.01$). The value increase of the general health domain is significantly lower among smokers ($r = -0.290$; $p < 0.01$). Significant positive correlation was confirmed between the value increase of the health condition change domain and the value increase of mRS ($r = 0.443$; $p < 0.01$) during the research, as well as the value increase of BI ($r = 0.203$; $p < 0.05$) at admission.

Significant negative correlation was confirmed between the health condition change domain and the value decrease of BI during the research ($r = 0.446$; $p < 0.01$) as well as the values decrease of mRS ($r = 0.212$; $p < 0.05$). The value increase of the health condition change domain is significantly lower among smokers ($r = 0.225$; $p < 0.01$).

DISCUSSION

According to the presented results, the most frequent risk factors in stroke survivor factors were hypertension, diabetes, and smoking. There were more women among post stroke survivors than men. The stroke survivors of this study were younger at the time they had the first stroke compared to participants in other studies. The average age of stroke survivors in Taiwan was 64.5 ± 11.8 [15]. The average age of post stroke survivors in the Northern Manhattan Study was 69.2 ± 10.3 years, and of participants in Marburg 71.1 ± 11.3 years [16, 17]. In Italy, participants were 70 years old on average (age range 34–85) [18].

Women represented 51.5% of all stroke survivors in this study. In the Northern Manhattan Study, there were 62.9% of women [16]. In Taiwan there were 43.1% of post-stroke women [15].

Table 3. Correlation between the domain value changes of the SF-36 questionnaire from the inpatient rehabilitation up to six months after discharge and the values of the investigated patients' descriptive characteristics

Characteristic	Domains								
	PF	PR	ER	VI	MH	SR	Pain	GH	HCC
Sex	0.039	0.048	0.081	0.174*	0.096	0.113	0.036	0.100	0.164
Age	-0.026	-0.041	-0.001	0.013	0.017	-0.055	0.042	-0.035	0.036
BS type	0.030	0.015	0.081	0.061	-0.106	-0.024	-0.044	0.035	-0.016
Basal ganglia	0.132	0.140	0.006	-0.091	-0.086	0.134	0.127	-0.023	0.121
Right hemisphere	-0.052	-0.086	-0.017	0.060	0.158	0.031	0.005	-0.167	-0.055
Infratentorial	0.044	-0.082	-0.092	-0.122	-0.096	0.086	-0.048	0.100	0.020
Left hemisphere	-0.007	0.037	0.034	0.003	-0.099	-0.104	-0.102	0.095	-0.050
Brain stem	0.078	0.107	0.095	-0.154	-0.096	0.152	-0.048	0.080	0.078
Both hemispheres	-0.145	-0.116	-0.131	0.165	0.067	-0.115	0.100	-0.018	-0.098
Previous TIA episodes	0.011	-0.043	-0.069	-0.097	-0.129	-0.044	-0.097	0.072	0.122
Current smoker	-0.238†	-0.199*	-0.237†	-0.018	-0.244†	-0.272†	0.069	-0.290†	-0.225†
Diabetes mellitus	0.016	-0.039	-0.019	0.034	-0.011	-0.002	0.080	0.023	-0.039
HOL	0.079	-0.166	-0.025	-0.125	0.114	0.029	0.052	0.099	-0.074
Alcohol addict	-0.147	-0.127	-0.199*	-0.089	-0.137	-0.087	-0.015	-0.067	-0.123
SYS blood pressure	-0.110	-0.031	0.035	0.129	0.048	-0.087	0.019	-0.046	-0.050
DIA blood pressure	-0.110	-0.031	0.035	0.129	0.048	-0.087	0.019	-0.046	-0.050
Carotid stenosis	-0.126	-0.137	-0.096	0.094	0.012	-0.095	0.058	-0.108	-0.062
Rankin on admission	-0.207*	-0.397†	-0.287†	0.085	0.087	-0.221†	-0.031	-0.013	-0.212*
Barthel on admission	0.346†	0.341†	0.315†	-0.008	0.037	0.262†	0.167	0.220*	0.443†
Barthel changes	0.296†	0.123	0.203*	-0.032	0.013	0.357†	0.013	0.070	0.203*

PF – physical function; PR – physical role; ER – emotional role; VI – vitality; MH – mental health; SR – social relationships; GH – general health; HCC – health condition changes; HOL – cholesterol
*$p < 0.05$; †$p < 0.01$

According to the national study conducted in 2006, there were 44.5% of adults who suffered from hypertension; it was more frequent in the male population older than 45 years (48.9%), in those who lived in the southeastern part of Serbia (49.9%), those who were less educated (62.7%), and among people with less income (53.1%) In 2000, it was estimated that 40.5% of the adult population in Serbia were smokers, 46.5% being male and 30.9% female adults. Most of the smokers were up to 44 years old. Smoking habit was most frequent among male adults who lived in towns and had graduated from secondary school [19].

A review article by Carod-Artal et al. [10] provides an overview of predictors of HRQOL in stroke survivors reported by longitudinal studies. These are age, sex, stroke severity, physical impairment, functional status, and mental impairment [12].

There are conflicting data regarding sex differences and stroke outcome. While some studies found that men were more likely than women to have a poor outcome after an ischemic stroke, others found that women had worse outcomes, and still others found no significant differences in outcomes according to sex [5, 15].

The patients who had had these risk factors had a stroke two to four times more often than those who didn't [17]. Dwyer et al. [18] emphasize that smoking is a big risk factor for stroke and that stroke among young population who are passionate smokers without any other risk factor is not rare.

Patients who survive stroke need rehabilitation because of their limitations or disabilities to perform their daily activities. The efficiency of performance after stroke is very often represented by measuring the level of ability decrease (functional research). Improving HRQOL is the desired outcome for patients with stroke undergoing inpatient rehabilitation. Recovery in stroke patients receiving rehabilitation primarily occurs in the first three months after stroke and continues in the following three months [20].

In this study, the average value of BI during the inpatient rehabilitation was 25 ± 24.66, and within six months after discharge it increased to 83.75 ± 18.59. According to a similar investigation conducted in Novi Sad, after the inpatient rehabilitation, the average value of BI at the beginning of rehabilitation was 57.53, and it was 78.92 six months after discharge [21].

In this study, the patients had a significantly decreased BI at the time of admission to the hospital rehabilitation, much less than 40 (25 vs. 22). It shows a complete patients' dependence on other people's help. Stroke side predicted 11.6% of the variance in the emotion domain, which was greater than a value explained by depression. Right-hemisphere stroke has a lower HRQOL in the emotion domain than the left-hemisphere stroke in our study [22].

Regarding the sex of the patients, the physical dimension of the quality of life is more pronounced among male patients, but the differences are not statistically significant. The patients who had the increase of BI also experienced the increase of strength, movements, communication, memory, emotions, and hands domain. The increase of physical functions led to the increase of HRQOL. Post stroke survivors have significant physical and psychological sequels, which make their lives difficult or make them completely disable to perform their everyday activities. Extremity motor function predicts various HRQOL domains [22].

The researches of stroke effects that deal with basic daily activities (ADL; activities that must be accomplished

in order to live an independent everyday life) include measuring functional independence; they are the Katz index of ADL and BI [22]. A close correlation was noted between the average values of BI and the physical function, emotional role and mental health domains. Patients suffering from greater disabilities complained about the greater decrease of physical abilities, which was a bigger problem to them because of the limitation in performing their everyday activities and it led to emotional problems and lower average grades for the mental health domain.

In general, even small improvements in rehabilitation yield the feeling and perception of having reached a good level of performance [20].

Concerning the sex of the patients, both men and women experienced the increase of average values of BI after the discharge from the hospital three months after the stroke. Similar investigations made in this area in the neighboring countries showed an increase of BI among men during all of the four periods of the research; yet they become statistically important six months after the stroke ($p < 0.05$) [23].

According to results found by Granger et al. [24], greater values of BI were found among male patients than among female patients. Concerning the lateralization of the hemiplegia at hospitalization, with an average BI value of 64there is a statistically greater value among the right side hemiplegiae, and 51.17 ($p < 0.029$) among the left side ones, whereas at the time of the discharge from the hospital, three, and six months after the discharge, there are no statistically significant differences [25]. A study by Wade and Hewer [26] shows no statistically significant values of BI concerning the side of hemiplegia.

Concerning the etiology of stroke, the values of BI are smaller in hemorrhage stroke patients compared to ischemia stroke patients during all four research periods; however, these differences have no statistical significance. The data concerning the changes in the Rankin scale show that even though rehabilitation is conducted, the recovery of arms is not possible before six months have elapsed and their recovery contributes to the increase of HRQOL [25].

The decreased values of all SF-36 questionnaire domains significantly increased ($p < 0.001$) during the six months of the survey, with the exception of the pain domain. All the values of SF-36 questionnaire domain had a statistically smaller increase among smokers, and the values of the emotional role domain had a smaller increase among the patients who were alcohol addicts. Functional status was the major independent determinant affecting the quality of life [26, 27]. Factors including perceptions of overall stroke recovery are significant for the HRQOL [21, 17].

Women have worse quality of life than men at the end of the study. There are similar results in literature [28, 29, 30].

There are several limitations of this study: a small sample size, which reduces the generalizability of the results; some patients refused to participate or were excluded from the study because of dementia or aphasia; some of the patients died.

Potential limitations of other studies are different sample sizes of stroke survivors; different questionnaires used for the evaluation of the HRQOL; lack of a detailed assessment of depression, as well as the absence of data on cerebrovascular or other main new events; and the use of antidepressant medication during the follow-up.

CONCLUSION

The quality of life of post stroke survivors was significantly decreased on admission to the inpatient rehabilitation and it was lower both at the early stage of the recovery and six months after the stroke. Smoking was the most important factor which was negatively correlated to the HRQOL. The patients who were smokers and alcohol addicts had a significantly smaller increase of all of the domains of the HRQOL. Six months after the stroke, the values of all examined domains significantly increased. The significant improvement of patients' functional status was positively correlated to the increase of their quality of life.

NOTE

This paper is part of a doctoral thesis by Milan Mandić, titled "Quality of life and functional recovery of patients after the first-ever stroke."

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Повезаност фактора ризика, функционалног опоравка и квалитета живота болесника после можданог удара

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САЖЕТАК

Увод/Циљ Процењује се да се око 50% можданих удара може спречити изменом начина живота и контролом фактора ризика.

Рад је имао за циљ да утврди повезаност фактора ризика, функционалног опоравка и квалитета живота болесника после можданог удара.

Методе Примењена је проспективна кохортна студија којом је обухваћено 136 болесника старости 30–79 година. Функционални опоравак процењиван је Бартеловим индексом (БИ) и модификованом Ранкиновом скалом (МРС). Квалитет живота процењиван је генеричким упитником *SF*36. БИ и МРС одређиване су на пријему на болничку рехабилитацију један месец, три и шест месеци после можданог удара. Примењена је анализа поновљеног мерења варијансе (*Repeated Measures ANOVA*), корелациона анализа и одређиван је Спирманов коефицијент корелације.

Резултати Укупно 136 болесника ((66 (48,5%) мушкараца и 70 (51,5%) жена)) комплетно је попунило упитник. Просечна старост болесника била је 63,72 ± 8,73. Вредности МРС на пријему биле су 4,75 ± 0,55, а шест месеци после можданог удара смањиле су се на 2,60 ± 1,08. Вредности БИ на пријему износиле су 25,00 ± 24,66, а унутар шест месеци су се повећале на 83,75 ± 18,59 ($p = 0,001$). Утврђене разлике у промени МРС и БИ су статистички значајне (*ANOVA* је показала значајан пад МРС ($p < 0,001$) и значајан пораст БИ (*ANOVA*: $p < 0,001$). Сви домени квалитета живота значајно су порасли, осим домена бола ($p < 0,001$). Физичка функција ($r = 0,238$; $p < 0,01$), физичка улога ($r = 0,199$; $p < 0,05$) и емотивна улога ($r = 0,237$; $p < 0,01$) биле су статистички значајно ниже међу болесницима који пију ($r = 0,199$; $p < 0,05$). Вредност домена менталног здравља ($r = 0,244$; $p < 0,01$) и социјални односи били су значајно нижи код пушача ($r = 0,272$; $p < 0,01$). Домен општег здравља ($r = -0,290$; $p < 0,01$) и промена здравственог стања били су значајно нижи код пушача ($r = 0,225$; $p < 0,01$).

Закључак Пушење је најважнији фактор који је био у негативној повезаности са квалитетом живота болесника после можданог удара. Значајно поправљање фукционалног статуса болесника позитивно је корелилало са порастом квалитета живота.

Кључне речи: мождани удар; квалитет живота; хипертензија, пушење