

PREDICTORS OF QUALITY OF LIFE AMONG HYPERTENSIVE PATIENTS WITH AND WITHOUT STROKE

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Abstract: Compliance with the pharmacological and non-pharmacological therapeutic regimen is essential to prevent occurrence and worsening hypertension and stroke. This study aimed at the identification of predictors of Quality of Life (QOL) among hypertensive patients without stroke and hypertensive patients with stroke. Self-reported QOL was obtained from 112 patients with hypertension and stroke and 224 patients with hypertension only with the WHO-QOL-BREF questionnaire and compliance with the pharmacological and non-pharmacological therapeutic regimen was assessed with a standardized questionnaire. Means of QOL were compared with ANOVA procedures and predictors were estimated using multiple linear regression models. The results of this study showed that self-reported QOL is poorer in patients with stroke than in hypertensive patients. Male gender appears to be a strong predictor of quality of life in patients either with hypertension or stroke. Follow up health care programmes are essential for good quality of life among both patient groups. Diet, physical exercise, low level of stress are important factors for enhanced QOL. Current smoking seems to enhance

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the psychological and social dimensions for both patients groups. Multiple linear regression models indicate that low level of stress and male gender are genuine predictors of all dimensions of QOL among hypertensive patients, but not in stroke patients. It is concluded in this study that compliance with the pharmacological and non-pharmacological therapeutic regimen is strongly linked with a better QOL among patients with stroke and hypertension or hypertension only.

Key word: *quality of life, hypertension, stroke, compliance*

Introduction

Hypertension is the most prevalent health problem among adult primary care patients, but its recognition and treatment are suboptimal. Although awareness about the disease has improved in the past two decades, the reality is that many people remain untreated or not adequately controlled. The treatment of hypertension is usually long term, and its success will depend on the effects of the drug regimen on the patient's quality of life [1/462-465]. Optimal therapy requires careful attention to patients' age, sex, race, diet, exercise, tobacco use, co-morbid conditions, choice of antihypertensive drug treatment, compliance with treatment, and achievement of blood pressure control [2/794-801]. The use of health-related quality of life assessment in antihypertensive studies and in routine clinical practice provides another opportunity to optimize a patient's regimen for short- and long-term hypertension control in a cost-effective manner [3/510-514].

Drug properties, including mechanism of action and pharmacokinetics, have been shown to influence the impact of drug side effects and the degree to which patients tolerate therapy. Researchers have attempted to standardize the construct of quality of life to have broad applications in health care policy and management; however, clinical research in hypertension should focus on the components of health-related quality of life that influence patient outcomes with regard to behaviours affecting adherence. Antihypertensive agents that maximize patient acceptance and quality of life are now available. Future quality-of-life research should be directed toward learning more about human behaviour so that adherence to non-pharmacologic interventions such as diet and exercise will be enhanced [4/530-537].

Little empirical based data has been obtained as to whether pharmacological, non-pharmacological treatment options, life-style and regular health care follow-up are associated with enhanced quality of life either in hypertensive patients and patients with stroke. In this study we measured quality of life, compliance with the pharmacological and non-pharmacological therapeutic regimen (diet, exercise, health care follow-up

and healthy life-style) either in patients with hypertension and patients with stroke. The goal of this study was to investigate compliance with the pharmacological and non-pharmacological therapeutic regimen and life-style factors to predict quality of life either in hypertensive patients and patients with stroke.

Material and Methods

The study population of 336 patients consists of 112 subjects with stroke and hypertension and 224 patients with hypertension only. All patients were recruited from the same geographical area in Gaza Strip [5/76-77, 6/1029-1041]. Three main hospitals in Gaza Strip (Shefa, Naser, and European Hospital) and the geographically and administratively related primary health care clinics were pinpointed for the selection of the study population. Patients were aged between 35 and 69 years. The study was approved by the ethical committee of the Ministry of Health and patients gave written informed consent.

Selection of patients

All available discharge data of patients who had been hospitalized in three main hospitals in Gaza Strip (Shefa, Nasser, and European Hospital) between 1st January and 31st December 2001 were screened for patients with stroke by using non-probability purposive sampling. The response rate was 96 percent. The total number of cases was 180 subjects with stroke and history of hypertension. According to exclusion criteria 68 (38%) patients were excluded from the study: 19 (28%) died after first stroke; eighteen (26%) had a second stroke; 7 subjects (10%) were over 69 years old; 10 (15%) participated in the pilot study; 7 (10%) patients had no computer tomography head scan; 4 (6%) refused to participate in the study; 3 (4%) patients started their therapeutic regimen less than one year. Ten patients participating in the pilot study and test-retest study were excluded to reduce response bias. The main reason of exclusion of the subjects is to control for confounding factors and enhance the internal and external validity of the study. The exclusion criteria for the cases applied to the controls as well, subsequently to the matching process. Ultimately, 112 (62%) patients with stroke were selected from the registers. The diagnosis of stroke was confirmed by a physician and a head CT scan was performed. Stroke was defined as "a sudden loss of brain function resulting from disruption of the blood supply to a part of the brain" [7/1725-1726].

During the same study period 224 patients with hypertension only (no stroke) were selected from primary health care clinics related to the three main hospitals in Gaza Strip. Hypertension was defined when the threshold levels of 140mmHg systolic and 90mmHg diastolic were reached. Diagnosis

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was made and confirmed by a physician. Further grading into mild, moderate, severe hypertension was not made. All patients were selected only, if a history of other physical diseases (diabetes, myocardial infarction, atrial fibrillation, pulmonary oedema, asthma) was ruled out.

Study design and questionnaire

A one to two matched case-control study was carried out. The case group consists of 112 subjects with stroke and hypertension only, and the control group consists of 224 subjects with hypertension only. Cases and controls were matched by age, sex, starting point of therapeutic regimen for both pharmacological and non-pharmacological treatment, time of hypertension, enrollment location of hospital related health care clinics and calendar time. For each case two identical controls were recruited to detect small differences between the two groups [5/76-77] and to compensate potential loss of controls. The control group was selected from the same primary health care centers, where the cases subjects used to make medical follow-up before the development of stroke. To test feasibility, validity and reliability of the instrument a small-scale study was carried out by using a small sample consisting of 10 cases of stroke with history of hypertension (5 males and 5 females), and 20 patients with hypertension only as a control group. Minor adjustment of the questionnaire was done. Probands of the pilot study were excluded from the study population.

The first part of the questionnaire gives information on age, sex, marital status, number of children, and socio-economic status. Quality of life 2 weeks prior to the interview was assessed with the brief version (26-items) of the WHO Quality of Life Questionnaire which is a valid and reliable short version of the 100-item version "WHOQOL-100" [8/551-558]. This instrument yields five dimensions of quality of life: physical, psychological, social relations, environmental and global. Patients self-reported answers are classified into these five dimensions of quality of life on a range from 0 (lowest) to 100 (highest) for each dimension.

The intensity of psychological stressors two weeks prior to interview was assessed using five items on a 5-level scale ranging from none to very strong (0-4) adapted from the Symptom Check List by Derogatis (SCL-90) with regards to nervousness, paranoia, social phobia, criticism and loneliness [9]. To estimate level of stress, a sum score was created out of the five items. Patients scoring 8 or higher out of 20 on the five items were regarded as having high level of stress. All other patients were considered experiencing low level of stress.

A certified translation of the questionnaire from English into Arabic language was performed twice independently and the results were checked

for inconsistencies.

Statistical analysis

The proportions of compliance and non-compliance with the therapeutic regimen were compared for both patient groups with Pearson's Chi-square test. Means of quality of life are cross-tabled for all dimensions of quality of life and all factors of the pharmacological and non-pharmacological regimen stratified for both patient groups and differences in means were analysed with ANOVA statistics with a significance level set at $p < 0.05$. Multiple linear regressions models were applied for the analysis of predictors of quality of life separate for both groups of patients using backward selection. Each dimension of quality of life was considered as dependant variables and all factors of the pharmacological and non-pharmacological therapeutic regimen were regarded as independent variables using backward selection method. All multiple regression models were adjusted for covariates, such as age, sex, income and level of education because each single factor tended to show an univariate association with quality of life.

Results

Gender and age proportion among cases and controls is identical due to matching by age and sex. Males (51.8%) are only slightly more frequent than females in the study population (48.2%). Among the registered patients none was younger than 40 years and none older than 69 years of age. Two larger age groups (52-57 years; 58-63 years) accounted for 57% of the age distribution. The elder probands (64-69 years) showed a proportion of 24%. Probands aged 45 years old or younger were the smallest group in the study. Factors of compliance and non-compliance with the therapeutic regimen and life style factors are presented in **Table 1**. Factors of compliance are listed in the left column. Patients answered questions with either "yes" or "no". Alternative answers are classified as factors of compliance or non-compliance with the therapeutic regimen. The results are stratified for patients with stroke and patients with hypertension only.

Results show that more than 75% of stroke patients were compliant with the therapeutic regimen regarding medication and about 62% had regular health care follow-ups. Almost two-third of patients with stroke was neither smoker (64.3%) nor had high levels of stress (61.6%).

In contrast, patients with hypertension show a different pattern. The majority of them were compliant with the therapeutic regimen (antihypertensive medication 95.5%), and they used diets regularly. Exceptional for the areas of weight reduction (15.6%) and exercise program (48.7%) a majority showed non-compliant behaviour.

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Table 1: Frequencies of factors of compliance and non-compliance with the therapeutic regimen and life style factors among patients with hypertension or stroke

Factors of compliance with therapeutic regimen and life style factors	Stroke		Hypertension		Chi ² -test P
	Compliance	Non-compliance	Compliance	Non-compliance	
<u>Anti-hypertensive medication</u>	Yes	No	Yes	No	
Taking medication as prescribed	N=84 (75.0%)	N=28 (25.0%)	N=214 (95.5%)	N=10 (4.5%)	0.000
Taking medication at proper times	N=78 (69.6%)	N=34 (30.4%)	N=209 (93.3%)	N=15 (6.7%)	0.000
Not running out of pills even for a single day	N=43 (38.4%)	N=69 (61.6%)	N=136 (60.7%)	N= 88 (39.3%)	0.000
<u>Diet</u>	No	Yes	No	Yes	
Using excessive salt	N=46 (41.1%)	N=66 (58.9%)	N=182 (81.3%)	N=42 (18.8%)	0.000
Family preparing a low salt diet	N=37 (33%)	N=75 (67%)	N= 116 (51.8%)	N=108 (48.2%)	0.001
Eating diet high in fat	N=42 (37.5%)	N=70 (62.5%)	N=165 (73.7%)	N=59 (26.3%)	0.000
<u>Physical exercise</u>	Yes	No	Yes	No	
Regular program of weight reduction	N=4 (3.6%)	N=108 (96.4%)	N=35 (15.6%)	N=189 (84.4%)	0.000
Involvement in regular program of physical exercise	N=18 (16.1%)	N=94 (83.9%)	N=109 (48.7%)	N=115 (51.3%)	0.000
<u>Follow-up health care</u>	Yes	No	Yes	No	
Regular follow-up clinic or physician appointment	N=70 (62.5%)	N=42 (37.5%)	N=187 (83.5%)	N=37 (16.5%)	0.000
Regular measurement of blood pressure	N=61 (54.5%)	N=51 (45.5%)	N=177 (79%)	N=47 (21%)	0.000
(RR)					
<u>Stress level</u>	No	Yes	No	Yes	
High level of stress	N=69 (61.6%)	N=43 (38.4%)	N=142 (63.4%)	N=82 (36.6%)	0.000
<u>Current smoking</u>	N=72 (64.3%)	N=40 (35.7%)	N=176 (78.6%)	N=48 (21.4%)	0.002
<u>Obesity</u>	Yes	No	Yes	No	
<30 BMI	N=30 (26.8%)	N=82 (73.2%)	N=91 (40.6%)	N=131 (59.4%)	0.013

Comparing both groups we see a similar prevalence of low level of stress in hypertensive patients and in patients with stroke. Hypertensive patients (83.5%) had more often regular health care follow-up appointments than stroke patients (62.5%). Smoking was less prevalent in hypertensive patients than in patients with stroke. Proportions of all factors of compliance differ statistically significant (Pearson's Chi²-test) between patients with stroke

and patients with hypertension.

Quality of life is expressed in five dimensions: psychological, physiological, social relations, environmental and global. All dimensions of quality of life are statistically significant higher in patients with hypertension compared to stroke patients. Thus, all statistical analyses were determined to both disease groups.

Table 2 presents means of quality of life dimensions by factors of gender, compliance, follow-up health care, diet, exercise, life style and obesity stratified for patients' disease status (hypertension vs. stroke). Bold figures indicate statistically significant differences which are shown in detail in

Table 3 by F-statistics of ANOVA procedure. Male patients either with hypertension or stroke rate quality of life statistically significant higher than female on all dimensions of quality of life, with an exception for male stroke patients who rate higher on the psychological and global dimension than female counterparts without statistical significance.

Interestingly, all analyzed factors of gender, compliance with medication, follow-up, diet, physical exercise, and lifestyle do modify self-rated quality of life to a certain extend. Compliance with medication seems to be related with higher physiological quality of life, quality of social relations and the global quality of life either for patients with hypertension or stroke. Furthermore, regular follow-up health care improves ratings on psychological and environmental dimension of quality of life for both groups of patients, with the exception of hypertensive patients who associated regular blood checks with lower psychological quality of life (**Table 2 and 3**).

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Table 2: Quality of life domains by compliance, follow up health care, diet, exercise, life style and obesity

Dimensions of Quality of Life*		Physiological		Psychological		Social relations		Environment		Global	
		hyper-tension	stroke	hyper-tension	stroke	hyper-tension	stroke	hyper-tension	stroke	hyper-tension	stroke
<u>Gender</u>	M**	70.81	44.34	70.51	42.24	75.07	54.31	65.63	49.78	69.07	48.92
	F**	63.89	37.96	58.56	38.58	67.13	47.53	57.50	42.01	61.57	41.20
<u>Compliance</u>											
Medication taken as prescribed	No	62.14	39.92	54.58	44.05	61.67	52.08	59.38	43.86	52.50	47.32
	Yes	67.72	41.71	65.23	39.29	71.69	50.69	61.81	46.76	66.06	44.50
Medication taken at proper times	No	70.71	40.75	61.94	44.36	67.78	50.25	65.00	44.21	62.50	46.32
	Yes	67.24	41.48	64.95	38.78	71.49	51.39	61.47	46.83	65.67	44.71
Run out of pills	No	67.59	46.51	65.75	38.86	71.02	51.94	62.52	49.42	64.98	47.97
	Yes	67.29	37.99	63.21	41.49	71.59	50.48	60.44	43.93	66.19	43.48
<u>Follow up care</u>											
Regular check of blood Pressure	No	71.96	38.10	63.48	41.99	67.90	50.82	57.65	39.89	60.11	45.34
	Yes	66.28	43.91	65.09	39.21	72.13	51.23	62.78	51.18	66.88	45.08
Regular follow up appointments	No	72.30	36.31	63.63	39.09	68.47	49.80	61.15	40.33	63.18	46.13
	Yes	66.52	44.24	64.97	41.31	71.79	51.79	61.81	49.46	65.91	44.64
<u>Diet</u>											
Excessive use of salt	No	67.60	43.32	66.21	39.13	72.21	51.45	62.71	49.12	66.96	45.38
	Yes	66.92	39.83	58.43	41.41	67.06	50.76	57.37	43.89	58.93	45.08
Diet low in salt (by family)	No	67.33	39.81	62.42	41.06	70.76	49.11	60.65	42.67	64.24	42.67
	Yes	67.61	44.21	66.92	39.30	71.70	54.96	62.69	52.87	66.59	50.34
Diet high in fat	No	66.30	42.60	64.92	39.68	71.57	53.97	62.08	48.21	65.53	52.08
	Yes	70.76	40.46	64.27	40.95	70.34	49.29	60.65	44.73	65.25	41.07
<u>Physical exercise</u>											
Program of weight reduction	No	66.23	40.97	63.23	40.24	70.19	50.93	60.33	45.31	64.55	44.79
	Yes	74.18	49.11	72.98	46.88	76.90	54.17	69.11	65.63	70.36	56.25
Program of exercise	No	66.21	40.35	61.16	41.45	69.71	50.35	59.59	44.78	63.80	45.61
	Yes	68.81	46.03	68.54	35.42	72.86	54.63	63.93	52.60	67.20	43.06
<u>Lifestyle</u>											
<u>Stress</u>											
Stress-Level	Low	69.34	43.44	66.20	37.40	73.06	47.09	63.07	47.75	67.96	47.09
	High	64.24	39.91	62.25	42.39	68.09	53.50	59.34	44.97	61.13	44.02
<u>Current smoking</u>	No	66.21	38.72	63.59	39.52	70.03	48.21	61.22	43.53	65.13	41.96
	Yes	72.10	45.49	69.01	42.06	75.69	55.75	63.48	50.22	33.67	50.60
<u>Obesity: BMI</u>	<30	70.09	39.64	67.49	36.11	72.53	49.44	62.16	46.46	66.48	48.33
	≥30	65.68	41.86	62.88	42.07	70.36	51.63	61.40	45.89	64.76	44.05

* Means of quality of life dimensions on a range from 0 to 100 (0=lowest quality of life; 100=highest quality of life);

** M=male; F=female;

bold figures indicate significant differences between groups

Table 3: Comparison of means (F-Statistics) of quality of life dimensions by compliance, follow up health care, diet, exercise, life style and obesity

Dimensions of Quality of Life		Physiological		Psychological		Social relations		Environment		Global	
	F* P**	hyper-tension	stroke	hyper-tension	stroke	hyper-tension	stroke	hyper-tension	stroke	hyper-tension	stroke
Gender	F	11.4	4.9	30.6	1.6	16.7	4.4	17.0	5.8	9.4	3.2
	P	0.001	0.029	0.000	0.208	0.000	0.038	0.000	0.018	0.002	0.078
Compliance											
Medication taken as prescribed	F	1.2	0.3	3.7	2.1	4.3	0.1	0.2	0.6	5.2	6.3
	P	0.273	0.600	0.055	0.155	0.039	0.716	0.623	0.448	0.024	0.578
Medication taken at proper times	F	0.7	0.1	0.4	3.2	0.9	0.1	0.8	0.5	0.4	0.1
	P	0.409	0.821	0.514	0.076	0.357	0.750	0.388	0.466	0.524	0.736
Run out of pills	F	0.02	8.6	1.2	0.8	0.1	0.2	1.0	2.7	0.2	1.0
	P	0.887	0.004	0.281	0.379	0.781	0.668	0.320	0.165	0.635	0.321
Follow up care											
Regular check of Blood pressure	F	5.0	4.0	0.3	0.9	3.0	0.02	4.3	12.9	5.0	0.004
	P	0.027	0.047	0.568	0.340	0.087	0.901	0.040	0.000	0.026	0.953
Regular follow-up-appointme enll	F	4.3	7.3	0.2	0.6	1.5	0.3	0.06	7.7	0.7	0.1
	P	0.40	0.008	0.664	0.460	0.220	0.561	0.809	0.007	0.415	0.743
Diet											
Excessive use of salt	F	0.1	1.4	7.2	1.6	4.1	0.04	4.2	2.5	6.6	0.01
	P	0.801	0.242	0.008	0.440	0.045	0.837	0.041	0.119	0.011	0.946
Diet low in salt (by family)	F	0.02	2.0	3.9	0.3	0.2	2.9	1.0	9.1	0.9	2.8
	P	0.893	0.159	0.05	0.571	0.641	0.094	0.316	0.003	0.343	0.099
Diet high in fat	F	3.6	0.5	0.1	0.2	0.3	1.9	0.4	1.1	0.01	6.2
	P	0.061	0.481	0.801	0.673	0.592	0.168	0.536	0.308	0.922	0.014
Physical exercise											
Program of weight reduction	F	7.8	1.1	9.9	0.7	6.0	0.1	10.2	5.5	2.9	1.0
	P	0.006	0.305	0.002	0.397	0.015	0.716	0.002	0.021	0.089	0.333
Program of exercise	F	1.5	2.1	10.8	2.4	2.5	0.9	4.6	3.1	1.8	0.2
	P	0.217	0.155	0.001	0.126	0.117	0.341	0.033	0.081	0.172	0.670
Lifestyle											
Stress											
Stress-Level	F	5.6	1.4	2.8	2.9	5.8	3.7	3.1	0.7	7.2	0.5
	P	0.019	0.234	0.097	0.094	0.017	0.057	0.078	0.415	0.008	0.497
Current Smoking	F	5.4	5.2	3.8	0.7	5.5	5.1	0.8	4.0	0.3	3.7
	P	0.021	0.025	0.053	0.398	0.020	0.025	0.365	0.048	0.612	0.056
Obesity: BMI	F	4.3	0.4	4.0	3.4	1.1	0.3	0.1	0.02	0.5	0.8
	P	0.038	0.506	0.048	0.068	0.291	0.558	0.715	0.878	0.495	0.389

* F= F-Statistics of ANOVA; ** p= level of significance $p < 0.05$;
bold figures indicate significant differences between groups;

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Although restrictions in diet mostly have a positive influence on quality of life of all patients, statistical significant differences are remarkably more often in patients with hypertension (psychological and environmental dimension, social relations, global value) than in patients with stroke (environmental dimension and global value). Physical exercise, especially aiming at weight reduction, seems to improve nearly all dimensions of quality of life in hypertensive patients. Stroke patients seem to benefit more from programs of physical exercise in terms of psychological and environmental dimension of quality of life. Low level of stress is statistical significantly associated with improved quality of life (psychological dimension, social relations and global value) in hypertensive patients, and not at all in patients with stroke. Current smoking seems to enhance the psychological dimension of quality of life and social relations for both patients groups, and partly for stroke patients on the environmental dimension of quality of life. Hypertensive patients with obesity report statistically significant lower physiological and psychological quality of life than obese hypertensive patients. Obesity and stroke seem to be related in a different pattern: without statistical significance obese patients tend to rate higher scores on the physiological, psychological and social dimensions of quality of life than non-obese patients with stroke.

Generally, patients with hypertension tend to associate certain factors of compliance, follow-up, diet, physical exercise and life style with higher quality of life stronger than patients with stroke do.

Tables 4 and 5 present results of a multiple linear regression analysis

Table 4: Predictors of quality of life dimensions estimated by multiple linear regression models (backward selection) among patients with hypertension

Dimensions of quality of life	Predictors of quality of life*	R	T	95%-CI		p
				LL	UL	
Physical	Male gender	0.4	3.2	2.5	10.4	0.002
	Diet high in fat		2.7	1.5	10.5	0.009
	Regular program of weight reduction		2.6	1.6	12.7	0.012
	Low level of stress		2.6	1.3	9.4	0.010
Psychological	Male gender	0.5	5.1	6.6	14.9	0.000
	Taking medication as prescribed		2.1	0.5	20.4	0.040
	No excessive use of salt in meals		2.2	0.5	11.1	0.033
	Regular program of weight reduction		3.0	2.1	10.5	0.003
	Low level of stress		2.0	0.01	8.6	0.049
Social relations	Male gender	0.3	4.5	4.8	12.4	0.000
	Regular checks of blood pressure		2.1	0.4	9.7	0.034
	Low level of stress		2.5	1.0	8.8	0.015
Environment	Male gender	0.4	4.0	3.9	11.7	0.000
	Regular program of weight reduction		2.5	1.3	11.9	0.015
	Regular checks of blood pressure		2.6	1.6	11.0	0.009
Global	Male gender	0.4	2.9	2.3	11.6	0.004
	Taking medication as prescribed		2.3	1.8	24.4	0.023
	No excessive use of salt in meals		2.3	0.9	12.9	0.024
	Low level of stress		2.6	1.6	11.3	0.009

R=Regression coefficient;

T=T-Statistics; 95%-CI = 95% confidence interval; LL= lower limit; UL= upper limit;

* All models were adjusted for age, sex, income and level of education;

aiming at identifying predictors of quality of life. Searching for a best fit model predicting quality of life, all variables presented in **Table 1** (gender, compliance, follow-up health care, diet, exercise, lifestyle) were regarded as potential predictors of quality of life dimensions. In a univariate linear regression analysis male gender, higher level of education and income were associated with increased quality of life among both patient groups. All factors of compliance with the pharmacological and non-pharmacological treatment regimen including age, gender, level of education and income as covariates were considered in a multiple linear regression model as independent variables applying backward selection. Dimensions of quality of life were defined as dependent variables. **Table 4** shows results of the regression analysis for patients with hypertension and **Table 5** for patients with stroke.

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Table 5: Predictors of quality of life dimensions estimated by multiple linear regression models (backward selection) among patients with stroke*

Dimensions of quality of life	Predictors of quality of life*	R	T	95%-CI		p
				LL	UL	
Physical	Not taking medication at proper times	0.4	2.1	0.5	14.6	0.037
	Not running out of pills		3.1	3.4	15.9	0.003
	Keeping up follow up appointments		2.8	2.4	14.8	0.007
Psychological	No statistical significant predictors	-	-	-	-	-
Social relations	Diet prepared by family	0.4	2.4	1.2	14.3	0.020
	Current smoking		3.2	4.2	17.3	0.002
	High level of stress		3.0	3.5	16.6	0.003
Environment	Male gender	0.4	2.0	0.2	12.6	0.044
	Diet prepared by family		2.1	0.3	14.2	0.040
	Regular checks of blood pressure		2.2	0.8	14.2	0.029
Global	No diet high in fat	0.2	2.5	2.3	19.8	0.014

R=Regression coefficient;

T=T-Statistics; 95%-CI = 95% confidence interval; LL= lower limit; UL= upper limit;

* All models were adjusted for age, sex, income and level of education;

The regression coefficients of all multiple regression models range around R=0.4 which is a sufficient value. An exception is the value of R=0.2 for the global dimension among patients with stroke. Therefore we need to be careful interpreting this result. A statistical significance was set at a level of <0.05. Male gender and low level of stress are common factors predicting quality of life in all domains except for the environmental dimension (male gender only) among patients with hypertension. Medication issues contribute to quality of life on the psychological and global dimension among hypertensive patients. All other factors contributing to quality of life stem from diet, follow-up health care and exercise in these patients.

Different predictors of quality of life are found for stroke patients. Medication issues, follow-up appointments and physical exercise play an important role in predicting quality of life in these patients. Diet prepared by the family becomes an important predictor for social relations and environmental quality of life among stroke patients. No statistically significant model was found for factors predicting the psychological dimension in patients with stroke.

Interestingly, the multiple linear regression analysis showed that age had no significant influence on any dimension of quality of life neither for patients with hypertension nor with stroke.

Discussion

The aim of this study was to find predictors of quality of life among modifiable factors of compliance with the pharmacological and non-pharmacological therapeutic regimen in patients with hypertension compared to patients with stroke. We found major differences in compliance with the pharmacological and non-pharmacological therapeutic regimen and life style among both patient groups. Hypertensive patients were more compliant, showed better adherence with the pharmacological and non-pharmacological therapeutic regimen and had low risk health behaviour (smoking, obesity) compared to stroke patients.

With regards to the pharmacological regimen, these study results are similar to a study by Beto et al. who reported beneficial effects of antihypertensive drugs on quality of life [10/125-133]. However, the many antihypertensive drug treatments now available have varying impact on quality of life, which should be taken into account when developing a rational approach to antihypertensive intervention in the elderly patient [11/26-39]. Nevertheless, these positive results need to be discussed controversial in light of methodological issues and limitations in studies on quality of life in hypertension. Physicians generally are guided in their selection of a particular drug for a particular patient by results of clinical trials. A claim to clinical trials is still difficult to achieve with quality of life studies pertaining to drug management of hypertension. Few studies have been done, and some do not yield clear results. One needs to study carefully the duration of the trial, the validation of the quality of life instruments used, the approach to confounding factors such as inclusion and stratification by decade of life, inclusion of females in requisite numbers and prior symptoms of patients who, more likely than not, suffer from a host of intercurrent diseases and have been placed on multiple drugs [12/113-121].

In this study we tried to reduce the potential influence of some of these limitations by selecting patients without a history of other physical diseases (diabetes, myocardial infarction, atrial fibrillation, pulmonary oedema, asthma). The fact that we did not exclude patients suffering from psychiatric diseases such as depression is a source of selection bias in this study.

Another main finding of this study was that patients with hypertension rated quality of life higher on all dimensions than stroke patients. This is most likely related to the physically and psychologically disabling consequences of stroke on all areas of life. Dam reported that depression occurs more often in patients with stroke than in healthy controls [13/287-293]. Since depressed post-stroke patients experience more impairment of concentration and memory function than non-depressed stroke patients this might have an

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impact on self-reported quality of life [13/287-293, 14/696-705]. In this study we could not differentiate for depressed and non-depressed stroke patients. Depression and negative thinking on life events might be a reason for the difference of self-rated quality of life between stroke and hypertensive patients observed in this sample. Future studies on quality of life in hypertension and stroke would need to address psychological and psychiatric co-morbidity as important covariates.

Another explanation for the differences between stroke patients might be related to the onset of stroke. The studied patients were may be not well adapted to their first stroke that had occurred during the study year (inclusion criteria). Thus, these results on quality of life of stroke patients could be different in patients with onset of stroke longer than one year before interview. This study lacks the exact period of time between onset of stroke and measurement of quality of life which would be important for an estimation of the impact of length of time after stroke on quality of life.

In hypertensive patients we found a different set of factors of compliance and life style associated with enhanced quality of life than in stroke patients. Results of this study suggest that hypertensive patients make most use of non-pharmacological therapeutic interventions (diet, exercise) and regular health care follow-ups in terms of good quality of life. This result matches with studies supporting a major role for lifestyle interventions as the initial treatment for stage 1 hypertension [15/378-388]. Grimm et al. showed that not only weight loss is associated with an improvement in quality of life among hypertensive patients, but physical activity as well [16/8-14].

Another disadvantage of this study is the lack of more detailed information on blood pressure of the hypertensive patients. These data would generate the possibility to relate the level of hypertension (mild, moderate, severe) to the use of pharmacological and non-pharmacological treatment options and its influence on quality of life.

In support of the importance of non-pharmacological interventions, a double-blind randomized placebo controlled trial for the treatment of systolic hypertension in the elderly (Syst-Eur-Trial) showed that active treatment of systolic hypertension in the elderly patient was associated with an adverse impact on quality of life [17/2069-2079]. In that study patients receiving active treatment were more likely to report problems on the Social Interaction Scale than were placebo-treated patients.

Enhanced quality of life in stroke patients seems to rely more on a belief in the medical system. This might be influenced by the fact that patients with acute stroke are in need for more intensive medical input than hypertensive patients without stroke. Stroke patients in this study felt physically much

better when following medical advice regarding regular intake of medication and follow-up health care. Furthermore, support from the family seems to have an important influence on quality of life in stroke patients.

It appears that stroke patients may have little ability to improve quality of life by exercise and diet. The lack of exercise could be explained by the disease itself as stroke is a upper motor neuron disease and results in partly loss of voluntary control over motor movement [7/1725-1726]. Controversy, stroke patients appreciate smoking and stress as indicators of good quality of life in the environmental domain. The results are unexpected for both smoking and stress. Smoking is considered as a major risk factor of stroke [18/344-347] and stress increases blood pressure which is the main risk factor for stroke as well [19/40-42].

Though results of this study support the notion to prevent progress of disease in hypertensive patients by applying all pharmacological and non-pharmacological therapeutic options, we would advocate a focus on non-pharmacological interventions for hypertensive patients where applicable, because this approach is related to good self-rated quality of life.

These results do not support the same conclusion for stroke patients. Medical input seems to be very important to stroke patients' quality of life. Further options to increase quality of life for stroke patients should be developed in health promoting programmes for these patients by addressing both pharmacological and non-pharmacological treatments. In future intervention studies, the effects of non-pharmacological therapeutic interventions on quality of life among stroke patients in combination with pharmacological approaches could be investigated more in detail. Therefore, aspects of patient well-being, including physical, emotional, and social status, should become important treatment considerations, which can be achieved by a patient-specific approach [12/113-121].

Conclusions

Quality of life is a complex measure. Better compliance with the therapeutic regimen seems to enhance quality of life and vice versa for patients with stroke and hypertension or with hypertension only. As implication for clinical practice, health professionals should promote compliance and healthy life styles aiming at increasing quality of life and compliance with the therapeutic regimen for these patient groups.

Recommendations

Healthy lifestyles, patient education, family counseling, and social support networks should be strengthened in health promotion programs in order to enhance compliance with the therapeutic regimen and to improve quality of life.

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