

Quality of life after stroke:
the EROS study in urban Lithuania

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– Thesis –

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Abstract

Objectives. This study aimed to assess quality of life in first-onset stroke survivors, and to determine how stroke associates with social and demographic factors, peculiarities of lifestyle, and chronic non-infectious diseases.

Material and methods. As part of the European Register of Stroke study, we recruited 508 stroke survivors aged 25–84 years (case group) in Kaunas city Lithuania, and randomly selected 508 age- and sex-matched residents from the city's stroke-free population (controls). All participants completed the Short Form 12 Health Survey questionnaire. We analyzed participants' physical and mental quality of life regarding social and demographic factors, lifestyle, chronic non-infectious disease morbidity, and the use of medications.

Results. Quality of life among stroke survivors was poorer compared to controls in both the physical (Me=32.8/47.0, $p<0.001$) and mental (Me=55.9/60.5, $p<0.001$) health domains. Stroke survivors and controls with arterial hypertension reported poorer physical health, compared to subjects without hypertension ($p<0.05$ vs. $p<0.001$, respectively). Additionally, physical quality of life among survivors with atrial fibrillation was poorer compared to subjects without this disorder ($p<0.001$). Employed stroke survivors reported better physical health (Me=38.9, $p<0.001$) compared to unemployed survivors (Me=31.5), and we observed a similar pattern among controls (Me=50.8/38.9, $p=0.005$). Survivors and controls who used alcohol reported better physical health ($p<0.001$). Notably, both controls ($p<0.05$) and stroke survivors ($p<0.01$) reported better health if they did not live alone. During the period from the 3rd up to the 12th month after stroke, average physical and mental quality of life increased significantly among survivors (5.1 ± 0.4 points, $p=0.001$ vs. 1.4 ± 0.3 points, $p=0.001$, respectively).

Conclusions. Previous stroke impaired both physical and mental quality of life in survivors. This study revealed that chronic non-infectious diseases experienced prior to stroke significantly influence quality of life. Survivors with arterial hypertension, atrial fibrillation, or diabetes mellitus rated their physical quality of life lower than those who did not have these illnesses. Interestingly, only controls with atrial fibrillation reported decreased quality of life. Both physical and mental health improved 12 months after stroke compared to quality of life 3 months after stroke.

Key words

stroke, quality of life, short form 12 health survey questionnaire.

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ABBREVIATIONS

AF	– atrial fibrillation
AH	– arterial hypertension
CI	– confidence interval
DM	– diabetes mellitus
IHD	ischemic heart diseases
MCS	– Mental component summary
MI	– myocardial infarction
NHP	– Nottingham Health Profile
NIHSS	– National Institutes of Health Stroke Scale
OR	– odds ratio
p	– level of significance
PCS	– Physical component summary
QOL	– quality of life
r	– correlation coefficient
SAU	– standard alcohol units
SF-12	– the 12-item Short Form Health Survey
SIP	– Sickness Impact Profile
TIA	– transient ischemic attack

1. INTRODUCTION

Stroke is the third most frequent cause of death (after death causes by cardiovascular system diseases and cancer) in the industrial countries. Stroke is the main cause of long-term disability in Europe and other industrial states that causes serious personal, social and economic problems (1). Examining stroke patients the main focus lied on the survival after stroke. The treatment results, first of all, were assessed using objective tests which evaluated physical disorders and/or functional limitations (2). However, these data did not provide information how a patient conceived his/her psychological (emotional) disorders. Therefore, more and more attention was being paid on quality of life (QOL) as a supplementary indicator of disease outcome and treatment effectiveness which was connected with the state of health after stroke (3). QOL was apparently connected with subjective emotions, for instance, life content and happiness. As time went by, this concept had been explicated and usually embraced physical, functional, psychological, cognitive and social aspects of life, besides, commonly reflected a subjective perception of functionality and general state of health by each individual (4).

In most countries, QOL of stroke patients and its connection with social and demographic factors (3-9), extent of stroke severity (10), the ability to self-service (10) had been investigated for more than two decades. More and more often the acknowledgment that the assessment of treatment effectiveness had to embrace both treatment term and QOL is faced (11). Assessment of QOL associated with health became significant not only in clinical but also in population researches (12). It was

often defined that QOL of stroke patients was worse in comparison with the control group individuals of the same age (4–6, 13).

In Lithuania there had been done some researches analysing QOL of various people groups (14–16). Nevertheless, the studies on the stroke patients' problems provided us with rather limited knowledge on the stroke's negative impact on most spheres QOL. Asadauskiene et al. investigated incidence of post-stroke depression and its connections with the functional state and QOL of stroke patients (14). Kasiulevicius analysed general practitioner's post-stroke surveillance's impact on the functional independence, cognitive function and post-stroke depression of the patients (16). QOL of the first-stroke patients, its connections with social and demographic factors, the way of life, chronic non-infectious diseases, stroke's type and its extent of severity were not investigated in Lithuania.

Regarding a patient's conception as one of the most essential factors in modern health care system focussing on the patient-oriented surveillance, descriptions of QOL are necessary in assessing and controlling the state of the patients after stroke (17). Thus medics find very important to deepen their knowledge on choosing and applying reliable and reasonable instruments assessing QOL after stroke as well as identifying factors influencing the QOL. Awareness of the most significant QOL aspects of stroke patients and healthy people would enable us to improve system of medicine and social care.

Therefore, while planning health policy, creating strategies and writing health fortification programs, it is important to regard both the objective health indicators and the improvement of QOL subjectively conceived by people (18). Observance of the things significant for a patient in the scientific level allows us to expect that human wellbeing will remain a priority in more and more technologized medicine.

2. SCIENTIFIC NOVELTY AND PRACTICAL SIGNIFICANCE OF THE STUDY

2.1. Practical application and relevance in public health of quality of life research

QOL profiles are applied for epidemiological and clinical researches. They are aimed to: determine the norms of QOL of people of different age, sex, race and education assessed by different tools, compare the impact of different sicknesses or health conditions on patients from their perspective, observe changes in health of groups of people, assess the impact of the carried health care and social policy on the society over time (11). By carrying out clinical researches, QOL, as one of the sicknesses and treatment outcomes, is used to assess effectiveness of different treatment methods and to objectivize their side effects. Within health economics, QOL is used for analysis of price and profitability, during which economical profitability of medical procedure is being analyzed by assessing its impact both on the patient's lifetime and QOL (19).

2.2. Scientific novelty of the study

For the first time in Lithuania there was carried out an investigation and assessment of QOL of stroke patients 3 months after their first stroke and its changes one year after the stroke. For the first time in Lithuania while examining stroke patients a survey of QOL SF-12 was used which is used in investigations of QOL of various people groups in the entire world. For the first time in Lithuania there was analysed QOL's dependence on social and demographic factors, characteristics of the way of life and chronic non-infectious diseases. QOL of stroke patients was compared with randomly chosen control group of population of people who did not have stroke and evaluated which spheres of QOL suffered mostly after the stroke.

3. RELEVANT THEORETICAL FRAMEWORK

3.1. Conception of quality of life, historical development

QOL associates for many people with positive conceptions, such as happiness, success, welfare and satisfaction. The concept *quality of life* includes many components: cultural, political, economic values, education, life standards, health. Aristotle was the first who tried to describe QOL in his works (384–322 BC). He noted that all groups of people comprehend sameness of the conceptions “to live well” and “to be happy”. Pigou mentioned the term of QOL in a book about economics and prosperity in 1920 (19). At that time, this new conception did not interest science society a lot.

QOL was rarely mentioned in medical books until 20th century. The first attempts to objectify not only physiological and clinical human condition were made in 1947. A grading scale of patient's condition was created by Kornovsky (20) in 1953. Apgar offered a grading scale of a newborn (21) and in 1965, created Barthel index of daily functional activity (22). It is interesting that these scientists did not call the tools they created as the tools for evaluation of QOL. However, they considered them as the means to evaluate human condition.

The tools of the newer generation have appeared later. Attention has been drawn to mental health, emotional state and general quality of human life. In 1981, Bergner offered a Sickness Impact Profile (SIP) applicable to assess the extensive spectrum of sicknesses and health of healthy people (23). The same year, a Nottingham Health Profile (NHP) was declared (24). These tools have been used to assess physical and mental functioning as well as satisfaction with life; however, the creators of these methods do not identify their profiles as the tools of investigation of QOL as well.

In medicine, QOL term was mentioned for the first time in journal “Annals of Internal Medicine” in the article of Elkington called “Medicine and Quality of Life” in the middle of seventh decade of 20th century. Responsibility of medical workers for patients' QOL has been analyzed in that article (19). The main evaluation criteria of evaluation of quality of human life are satisfaction and happiness.

QOL became a key word *Medline* within the computerized search system of U. S. National Library of Medicine in 1977 (19). Thence, QOL is rather popular object for examination within different fields of health science. If you search for something within PubMed database and use the key word “Quality of Life”, you can find many postings on, QOL. Interest in issues of, QOL has significantly increased in recent decades.

However, the conception of QOL is still an object for discussions in the field of medicine. The term “Quality of Life” is used in very different ways. One of the most important questions of this field is to determine how this term should be defined and comprehended. “Health” and “Quality of Life” are closely interrelated terms (25). Primary definition of health from many definitions of QOL linked to health is commonly known WHO submitted in 1948: “complete physical, mental and social well-being and not merely the absence of disease or infirmity“ (26). “Well-being” included into the WHO definition created a background for some research workers to understand well-being described by patients themselves by evaluating it as the only important aspect of QOL too narrow (27). In medicine, QOL is mostly called QOL linked to health (28). It is important to specify the aspects of QOL linked to health, which should be included into conception that the conception of “Quality of life” would not be just another term describing “well-being”. It is recognized that spiritual and religious factors as well as physical, mental and social factors should be included by determining QOL linked to health (29). Subjective health condition or QOL linked to health includes different symptoms: pain, physiological data, physical condition, sensory functions, sexual activity, disability, physical impairment, cognitive function and emotional state, i.e. depression, qualm or vice versa, i.e. positive feelings, apprehension of your present and future health; satisfaction with health care. There is no undivided opinion which fields should be included into examination of QOL. Experts working within this field think that necessary parts of QOL assessment method are physical health, mental health, social intercourse, general physical condition and general assessment of your health. Some authors offer to include assessment of pain as a separate field (30). Other authors state that QOL should be defined only as happiness emphasizing aspects of psychological sickness and describing QOL of patient overcoming sickness as reintegration into normal life (31).

There are a lot of definitions of the term “quality of life”, however, in 1993, WHO (29) submitted the following definition of QOL:

“Quality of life is individual comprehension of your place in life in the certain context of the system of culture and values where a person lives linked to his aims, hopes, standards and interests”.

It is a wide conception affected by the factors of person’s physical health, psychological condition, level of independence, social intercourse and relationship with environment holistically (32). This definition concentrates on the subjective assessment of QOL by the person himself.

Because there has been a plethora of QOL scales and questionnaire systems the Organisation for Economic Co-operation and Development (OECD) has developed a

set of guidelines for the collection and analysis of QOL investigation methods. They were published in March 2013 and have been widely accepted and will in the future provide consistency of QOL statistics (33).

Pukrop et al. in their paper of January 1999 attempted to consolidate eight international QOL questionnaires related to psychological health and produced a modular system which is now widely accepted in the field of psychoanalysis (34).

EUROSTAT in their paper dated November 2004 called “Psychosocial well being and psychiatric care in the European Communities: analysis of macro indicators” attempted to provide an overview of QOL findings the the different European Union countries (35).

To conclude it is fair to say that there is a need for standardization of the QOL analysis between the various diseases but this should not lead to overlooking the specific issues related to particular diseases and patient types.

3.2. Reasons of interest in researches of quality of life in the field of medicine

Soon, researches of QOL, started by sociologists and psychologists, have become urgent for health care too. It has gradually begun to rely not only on clinical symptoms and the data of laboratory researches, but the search for the ways allowing to assess the sickness by the patient's point of view has been also started (19). Physiological parameters are informative for clinicians, but do not really interest patients; often they do not correspond to functional capacity and comprehended well-being; often two patients similar in accordance with the clinical criteria react to the sickness in totally different ways. Such change of mind-set has been stimulated by comprehension that due to progress in medical science possible life extension is not always desirable by patients, their families and medical institution (36). In the case of chronic and incapacitating sickness, the more important treatment goal can be not life time, but its quality (37). QOL has started to be valued as the way to assess expediency of treatment. Previously, only doctors shaped patients' destiny. Now patients want to receive answers to questions about treatment opportunity provided for health care in conceptions understood by them (38). The researches of QOL are stimulated by increasing requirement of society to assign the growing costs to health care rationally. QOL linked to health has been started to apply to quality of health care and assessment of effectiveness of treatment (36, 38). In this situation, each field of medicine had to define the results of treatment important for both patients and doctors and to create scientifically based methods for their research. Competing for the funds given to health care, the recommendations based by the analysis of quantifiable facts are the most convincing (38).

Scientists have created the tools for measurement of subjective feeling of functional capacity, health condition and QOL linked to health.

Particularly in the case of patients who have suffered a stroke, the importance of an evaluation of the QOL when faced with the incapacities caused by this disease, is evident. Stroke causes a sudden change in the circumstances of life for a patient which makes it even more important to be guided by an evaluation of the patient's QOL by a reliable and standardised method.

One of the latest studies in this field has been performed by Mayo et al. which was published in December 2013. The study attempted to provide a model of the QOL of stroke patients based on the combination of the already existing scales, such as the Stroke Impact Scale (SIS), 36-Item Short Form Survey (RAND-36) and EuroQol 5-dimension (EQ-5D), among others (39).

3.3. Factors influencing quality of life of those who have suffered stroke

It is often determined that QOL of the patients who have suffered stroke is worse than of the same age control group of people (4, 6, 13). On the other hand, King determined that the patients who have suffered stroke deal with complications caused by stroke well (8). Several factors which seem to influence worsen QOL after suffered stroke have been determined: older age (6, 7), motor disorder severity or paralysis (9, 13), lack of perceptible social support (8), inability to return to work (40), cognitive disorders, others borderline cases (41) and the place of brain areas damage (42).

Synergies between the age, sex and QOL remain unclear. It has been determined that QOL grows worse with age (4, 6), however, many researches have been performed during which there were not found any differences between the younger and older patients (9) or increasing of satisfaction of life with age (4). Saeki et al. performed the research of functional disability and satisfaction of life of persons who have suffered the first stroke long time ago and determined that usually there is a weak positive correlation between functional and social disability and satisfaction of life, but age and sex are not prognostic factors of QOL (43). Anderson et al. determined that women have milder consequences of stroke in respect of social functionality and mental health (5). However, most of authors report that QOL does not depend on sex (9) or women's QOL is worse.

The important factor conditioning bad QOL for patients who have lived out a long period after stroke is to not maintain and re-create social connection, excluding family connection (6), and active social functionality is related to better results (4). On the other hand, too much support of the partner can condition too much care and too low stimulation of the patient, which in turn can cause adverse results (44).

Some researchers determined a strong correlation between physical distress, dependence within everyday activity and QOL after stroke (5, 6, 9). It was determined that dependence on others within everyday activity is related to physical functionality and general health condition in respect of QOL (5, 8). The relation

between decreased functional independence and worsened QOL is determined by many researches (3, 7–9).

It is known that after stroke depression is related to dependence on other persons within everyday activity and neurological disorders acuity (45), however, information about neuropsychological problems related to stroke is limited. Some researches (6) indicate that after stroke depression is related to worsen QOL. Paradiso and Robinson analyzed impact of vital events on the appearance of the after stroke depression. According to the research data women are diagnosed with a bad case of the after stroke depression two time often than men (46). According to the data of several researches correlation between functional results and the after stroke depression was determined for the patients with depressive disorders occurred relatively weakly (47). It was determined that the after stroke depression often occurs to young patients (40, 46). However, older patients can be more inclined to depression because of functional and cognitive deteriorations, staying in medical institutions, and lack of social care.

The research carried out by King showed that DM, AH, movement disorders and aphasia are not predictive factors of quality of life. However, depression, insufficient social support, lower functional status, heart ailment, vascular disease and inferiority of age are linked to QOL after stroke (8).

QOL can change over time and as individual adapts to new circumstances. Impact of time passed after stroke on QOL is ambiguous. The data has been published about worsening of QOL of the patients who have suffered stroke within certain time (from 6 months to two years). Needs of taking care of yourself, personal relationship (6, 8), everyday activity and rest are the areas where worsening of QOL occur mostly often. On the other hand, the data has been published about slight improvement of general QOL within the first 1–3 years after stroke.

4. THE AIM AND OBJECTIVES OF THE STUDY

The aim of the study was to assess first-onset stroke survivors' quality of life, and to indicate its associations with social and demographic factors, peculiarities of lifestyle, and chronic non-infectious diseases.

The objectives of the study:

1. To evaluate relevance of 12-item Short Form Health Survey in assessing quality of life of Kaunas citizens aged 25–84.
2. To compare the differences between the stroke patients group and the control group due to social and demographic factors, characteristics of their way of life, state of health and the use of medicaments.
3. To assess quality of life of stroke patients.

4. To identify connections between quality of life and social and demographic factors, characteristics of their way of life, chronic non-infectious diseases in the stroke patients and the control groups.
5. To assess dynamic of quality of life of stroke patients 3 and 12 months after stroke.

5. MATERIAL AND METHODS OF THE STUDY

5.1. The studied contingent

5.1.1. Time and location of the study

Data for the study were collected during the international biomedical study EROS (*The European Register of Stroke*) (48). This was a multi-centre study that involved seven EU countries (the United Kingdom, Lithuania, Poland, France, Spain, Italy, and Sweden). The Institute of Cardiology at the Medical Academy of the Lithuanian University of Health Sciences was the main participant of the study. The study was carried out after the researchers underwent training in London. Internal and external control of the study was carried out by coordinators from London. The international biomedical study EROS continued from June 1, 2004 to June 1, 2006. The study was carried out in the Laboratory of Population Studies of the Institute of Cardiology at the Medical Academy of the Lithuanian University of Health Sciences. Case group subjects were studied three times. The first detailed examination was undertaken during their inpatient treatment in hospitals of Kaunas city (public establishment Hospital of the Lithuanian University of Health Sciences Kaunas Clinics, public establishment Republican Hospital of Kaunas, and public establishment Kaunas Clinical Hospital), and repeat examinations were carried out at 3 and 12 months after the stroke, conducting an interview at home or by phone.

Control group subjects filled out the questionnaires from September 1, 2006 to March 1, 2007 during their preventive check-ups at public establishment Hospital of the Lithuanian University of Health Sciences Kaunas Clinics, upon invitation by the organizers of the international HAPIEE (*Health, Alcohol and Psychosocial Factors in Eastern Europe*) study. This was a multicentre study that involved four Eastern European countries (Lithuania, Poland, Russia, and the Czech Republic). The international HAPIEE study was carried out after the researchers underwent respective training. Internal and external control of the study was carried out by coordinators from London.

5.1.2. Sample volume and the course of the study

During the international EROS biomedical study, 813 primary questionnaires were filled out for first-onset stroke survivors aged 25 years and older (Figure 1). This

comprised 1/3 of all stroke cases included into the EROS study from seven EU countries.

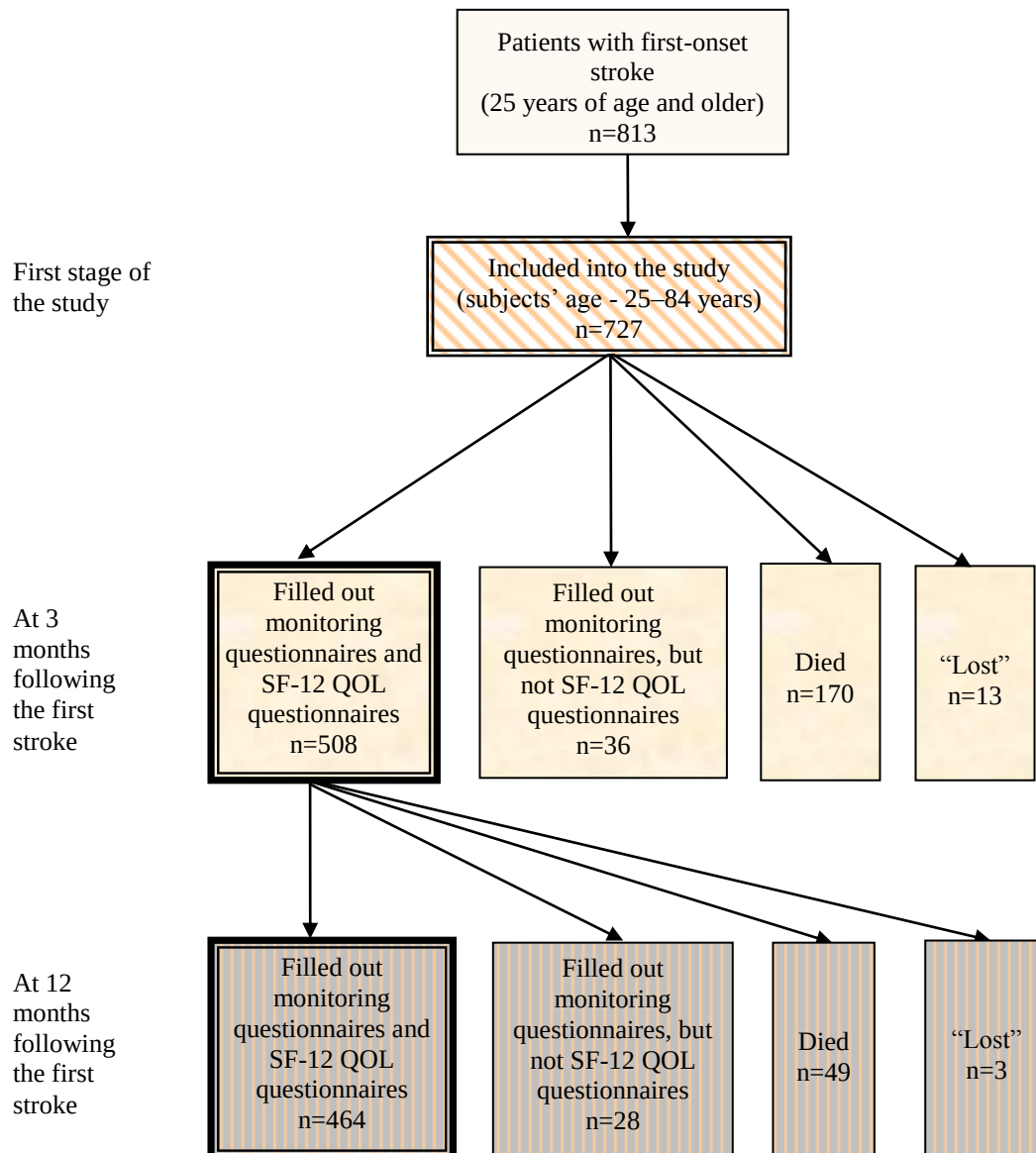


Figure 1. The structure of the study

n – number of subjects, QOL – quality of life.

Was studied 25–84 year-old patients after first-onset stroke. During the period of the study, primary questionnaires were filled out for 727 (336 (46.2%) males and 391 (53.8%) females) (participation rate – 89%) 25–84 year-old first-onset stroke survivors from Kaunas city. Twenty-three first-onset stroke survivors refused to participate in the study. At 3 months after the stroke, monitoring questionnaires and

SF-12 QOL questionnaires were filled out for 508 (245 (48.2%) males and 263 (51.8%) females) case group subjects. After 3 months, in 36 (9 (25.0%) males and 27 (75.0%) females) subjects, the monitoring questionnaires were filled out, but the SF-12 QOL questionnaires were not (if the subjects had speech defects or could not be found at home, the information was collected from their family members or guardians, but the SF-12 QOL was not filled out), and thus these subjects were excluded from further analysis. Within three months after the stroke, of all 727 subjects included into the study, 170 (23.4%) subjects (75 (44.1%) males and 95 (55.9%) females) died, and 13 (1.8%) subjects (7 (53.8%) males and 6 (46.2%) females) were “lost” (their status was unknown, e.g. whether they had moved, or whether they died), and thus they were excluded from further analysis.

At 12 months after the stroke, of the remaining 544 case group subjects, 464 (226 (48.7%) males and 238 (51.3%) females) had monitoring questionnaires and the SF-12 QOL questionnaires filled out, in 28 subjects (10 (35.7%) males and 18 (64.3%) females), the 12-month monitoring questionnaires were filled out, but the SF-12 QOL questionnaires were not, and thus they were excluded from further analysis. During the period of 3 to 12 months after the stroke, of the remaining 544 subjects, 49 (9.0%) subjects (16 (32.7%) males and 33 (67.3%) females) died, and 3 (0.6%) (2 (66.7%) males and 1 (33.3%) female) were “lost”.

The control group consisted of 508 (participation rate – 73%) residents of Kaunas city randomly selected from stroke-free population, who were grouped by age and sex (corresponding to the distribution of male and female stroke survivors in 10-year age groups).

5.1.3. Composition of the case and control groups

The stroke patient (case) group included 25–84 year-old residents of Kaunas city for whom monitoring questionnaires and the SF-12 QOL questionnaires were filled out at 3 and 12 months after the first-onset stroke. Primary questionnaires for case group subjects were filled out during their inpatient treatment in hospitals of Kaunas city.

The registration of the cases was based on symptoms suggesting a stroke:

- Sudden inexplicable weakness in the arm, leg, or face;
- Sudden inexplicable numbness or awkwardness in the arm, leg, or face;
- Sudden speech or language perception disorder;
- Sudden slurring of sounds and words, and unclear pronunciation due to impaired movement of lips, tongue, or larynx;
- Sudden blindness in one eye, loss of a half of visual field in one or both eyes, or double vision.

The duration of these symptoms had to exceed 24 hours, and in all cases, the diagnosis of stroke had to be confirmed by a neurologist.

At 3 and 12 months after the first-onset stroke, case group subjects were interviewed at home or via telephone, using a prepared questionnaire. If the subjects had speech disorders or could not be found at home, the information was collected from their family members or guardians, but the SF-12 QOL questionnaire was not filled out.

The control group consisted of residents of Kaunas city randomly selected from stroke-free population, who were grouped by age and sex (corresponding to the distribution of male and female stroke survivors in 10-year age groups). The Residents' Register Service under the Ministry of the Interior conducted the random selection of residents of Kaunas city. The organizers of the international HAPIEE study sent out letters with invitations to the preventive health check-ups conducted at the public establishment Hospital of the Lithuanian University of Health Sciences Kaunas Clinics. The controls' questionnaires were filled out on their arrival for the check-ups.

5.2. Research ethics

All the examined people gave their written consent to participate in the research. To carry out this biomedical research, licence of Lithuanian bioethics committee was ensured (10 03 2004 № 23, 11 01 2005 № 05/09).

5.3. Methods of the study

The general information about case and control group subjects was collected by using a standardized questionnaire. The subjects' QOL was evaluated by applying the general SF-12 QOL questionnaire. In the study, was analyzed health-related QOL, subsequently referred to as QOL.

5.3.1. A standardized questionnaire-based survey

The survey of the case groups was conducted by using a standardized questionnaire designed by coordinators of the international EROS program in London. During the survey of the case group subjects with the use of the primary questionnaire, we evaluated the subjects' social and demographic status, stroke risk factors, and medication use before the stroke. During the questionnaire survey at 3 and 12 months after the stroke, the SF-12 QOL questionnaire (*Medical Outcomes Study Short Form-12; MOS – SF-12*) (Appendix) was filled out.

The survey of the control group was conducted by using a standardized questionnaire adapted for stroke-free population. During the survey of the control group, was evaluated the subjects' social and demographic status, lifestyle factors, the prevalence of chronic non-infectious diseases, and medication use; the SF-12 QOL questionnaire was also filled out for these subjects. The variant of the questionnaire

for the controls contained an additional question on whether the subject had any previous stroke.

5.3.2. Structure of the SF-12 quality of life questionnaire

SF-12 survey consisted of 12 questions which reflect eight domains of life: physical functioning, role physical, bodily pain, general health, energy/vitality, social functioning, role emotional and mental health. The SF-12 questionnaire contained two questions for the evaluation of each of four categories (from eight) – namely, physical functioning, role physical, role emotional, and mental health (Table 1). The other four categories – namely, bodily pain, general health, energy/vitality, and social functioning – were evaluated with one question for each category.

Table 1. Number of questions in the SF-12 quality of life questionnaire by domains of life

Domains of life	Number of questions in the SF-12 questionnaire
1. Physical functioning	2
2. Role physical	2
3. Bodily pain	1
4. General health	1
5. Energy/vitality	1
6. Social functioning	1
7. Role emotional	2
8. Mental health	2

These domains of life were united into two categories of health: Physical component summary (PCS) and Mental component summary (MCS) (49). To evaluate PCS, physical functioning, role physical, bodily pain and general health evaluation domains are used. To evaluate MCS, role emotional, social functioning, mental health and energy/vitality domains are used. Responses to the questions were evaluated in points.

Both the standard (4-week) and the short-term (1-week) SF-12 questionnaires are used. In our study, we applied the 4-week evaluation questionnaire.

5.4. Grouping of attributes

Trying to systemize the analysis of data, the features were grouped into the following groups:

1. Social and demographic factors: age, sex, nationality, living conditions, education, social status, current or prior work type.

2. Characteristics of the way of life: use of alcohol, smoking habits, nutrition status.
3. Medical state and the use of medications: chronic non-infectious diseases morbidity and the habits of the use of medications.

5.4.1. Social and demographic factors

Social and demographic factors evaluated before the stroke were distributed into the following groups (categories):

- Age of the examined was expressed in years and divided into six intervals: 1) 25–34 years; 2) 35–44 years; 3) 45–54 years; 4) 55–64 years; 5) 65–74 years; 6) 75–84 years.
- Sex was divided into two groups: 1) men; 2) women.
- According to nationality the examined were divided into two groups: 1) Lithuanian; 2) other.
- Living conditions was divided into two categories: 1) do not live alone; 2) live alone.
- Education was divided into the following categories: 1) higher education; 2) secondary, further, unfinished higher education; 3) primary, unfinished secondary education.
- According to the social status the examined were divided into two categories: 1) employed; 2) unemployed.
- According to the current or prior work type the examined due to International standard profession classification (ISCO-88) were divided into two categories: 1) engaged in intellectual work (legislators, senior officials and managers, professionals, technicians and associate professionals, clerks, service workers and shop sales workers, armed forces); 2) engaged in physical work (skilled agricultural and fishery workers, craft and related trades workers, plant and machine operators and assemblers, elementary occupations).

5.4.2. Lifestyle peculiarities

Further on, it was discussed the methods for the evaluation of the QOL life that were applied in our study. The peculiarities of lifestyle in the case group were evaluated prior to the stroke.

Alcohol use. Alcohol drinking habits were divided into two categories: 1) did not use alcohol; 2) uses alcohol.

If the examined person uses alcohol, there were separately registered quantities of beer, wine and strong alcoholic beverages used in a week. The used alcohol quantity per week was recounted into standard alcohol units (SAU) according to the formula: alcohol quantity (in litres) and alcohol strength (in degrees) product; beer – 5%, wine and champagne – 12%, vodka and other strong beverages – 40%. According to the used alcohol quantity the examined were divided into two categories: men who use >14 SAU per week and women who use >7 SAU per week were considered as excessive alcohol users, and the rest of alcohol users we named as moderate alcohol users.

Smoking habits. Smoking habits were divided into three categories: 1) never smoked; 2) gave up smoking; 3) smokes.

Nutritional status. Due to subjective evaluation of the examiner, according to nutrition status the examined were divided into three categories: 1) normal; 2) undernourished; 3) overweight

5.4.3. Health status and medication use

Subsequently, it was discussed the methods for the registration of health status and medication use that were applied in our study.

Health status. After collecting data from the medical documents – histories of in-hospitalized treatment (record form № 003/a), records from the medical documents (form № 027/a), registered morbidity of chronic non-infectious diseases in the cases group before stroke (according to anamnesis data). The prevalence of chronic non-infectious diseases in the control group was evaluated on the basis of the interview data. The chronic non-infectious diseases were divided into five groups 1) arterial hypertension (AH); 2) myocardial infarction (MI); 3) atrial fibrillation (AF); 4) diabetes mellitus (DM); 5) transient ischemic attack (TIA).

Medication use. The case group subjects were asked what medications they were using regularly prior to stroke. Medication use in the control group was evaluated on the basis of the interview data. The used medications were divided into three groups: 1) antihypertensive medications; 2) antithrombotic medications (aspirin/other antiplatelets/warfarin); 3) antidiabetic medications (oral antidiabetic medications/insulin).

5.5. Statistical analysis

Answers to the SF-12 questionnaire were evaluated in points (49). Summaries of QOL in points for analysed spheres were calculated using a special counting algorithm. A higher total point meant a higher QOL. Variants of answers for each of eight domains in SF-12 had been recounted into standardized points with the minimal number 0 and maximal – 100. The higher total point meant a higher QOL.

To evaluate the questionnaire's internal consistency Cronbach's alpha coefficient index was calculated. Convergent validity of the questionnaire was tested by the strength of the direct link within the questionnaire's spheres by estimating Pearson correlation coefficients. Normality assumption of continuous variables was tested using Kolmogorov-Smirnov or Shapiro-Wilk tests. Means, standard errors of mean and medians were used to describe continuous data. Independent-samples t test was performed for comparison of the means between two groups. When data were not normally distributed or ordinal, non-parametric equivalents were used: Mann-Whitney or Kruskal-Wallis test for 3 or more independent groups. The effect size was evaluated by applying Cohen's d; $d \geq 0.8$ indicated a large effect size, $d \sim 0.5$ – a medium effect size, and $d 0.2-0.3$ – a small effect size. Categorical data were compared by using the chi-square or the Fisher exact test. Pearson and Spearman correlations were calculated. Logistic regression was done to determine odds of subjective health in stroke group versus control while controlling for age, sex and chronic non-infectious diseases: odds ratio (OR) and 95% confidence interval (CI) of OR are presented. The analysis was performed with the Statistical Packages SPSS 20.0 and STATISTICA 6.0. A 0.05 levels for significance were used.

6. RESULTS

6.1. Evaluation of the questionnaire's SF-12 validity for investigation of quality of life of Kaunas citizens aged 25–84

Evaluating QOL questionnaire's SF-12 convergent validity, there was identified a substantial connection between the following domains: general health and physical functioning ($r=0.72$), energy/vitality and mental health ($r=0.69$), general health and role physical ($r=0.61$); and a slight connection between the following domains: physical functioning and mental health ($r=0.29$), physical functioning and role emotional ($r=0.29$).

Good questionnaire's SF-12 internal consistency was noticed in both PCS and MCS: Cronbach alpha indices pro rata – 0.83 and 0.82. The correlations between items in PCS and MCS were respectively – 0.55 and 0.56 (Table 2).

Table 2. Quality of life questionnaire's SF-12 evaluations of internal consistency in Physical component summary (PSS) and Mental component summary (MCS) spheres

Spheres	The correlations between items inside the spheres	r		Cronbach alpha index
		min.	max.	
PCS	0.55	0.43	0.72	0.83
MCS	0.56	0.40	0.69	0.82

r – correlation coefficient, min. – minimal meaning, max – maximal meaning.

6.2. Assessment of social and demographic and risk factors in the stroke patients

6.2.1. Assessment of social and demographic factors in the stroke patients

There were 508 examined people after first stroke: 245 (48.2%) men and 263 (51.8%) women. The control group consisted of 508 randomly chosen Kaunas citizens from population without stroke (corresponding to stroke patients' men and women in 10 years age groups). Age of the examined people – 25–84 years (average age of stroke patients – 66.0 ± 0.5 years, respectively in the control group – 65.7 ± 0.5 years). As far as nationality is concerned, groups were rather similar (Table 3).

Table 3. Distribution of the examined contingent regarding social and demographic factors

Factors	Cases (n=508)		Control (n=508)		p
	n	%	n	%	
Average age in years	66.0±0.5		65.7±0.5		0.67
Sex:					
men	245	48.2	245	48.2	1
women	263	51.8	263	51.8	
Nationality:					
Lithuanian	465	91.5	457	90.0	0.39
other	43	8.5	51	10.0	
Living conditions:					
do not live alone	418	82.3	388	76.4	<0.001
live alone	90	17.7	120	23.6	
Education:					
higher education	80	17.8	177	34.8	0.02
secondary, further, unfinished	198	44.0	192	37.8	
higher education primary, unfinished secondary	172	38.2	139	27.4	
Social status:					
employed	118	23.2	288	56.7	<0.001
unemployed	390	76.8	220	43.3	
Current or prior work type:					
intellectual work	180	35.4	370	72.8	<0.001
physical work	328	64.6	138	27.2	

n – number of cases, p – significance level of chi-square test, when comparing cases and control group.

According to research findings, among stroke patients 64.6% did intellectual work as their professional activity, but only 27.2% in the control group. The difference was statistically significant. Statistically significant difference of clusters was found between education of stroke patients and the control group: among stroke patients there were more people with primary and unfinished secondary education and less people of higher education. 76.8% of stroke patients were unemployed, whereas in the control group unemployed people form only 43.3%, and the difference was statistically significant.

6.2.2. Assessment of the life styles in the stroke patients

While analysing the way of life we assessed smoking and drinking alcohol habits and nutrition status before stroke. When giving questions to the stroke patients and the examined of the control group, a registration had been made whether they use alcohol. If the registered used alcohol, next questions were what kinds of alcohol they used and what quantities they took during a week. From the analysis we could state that the stroke patients group statistically significantly less ($p < 0.001$) used alcohol in comparison with the control group (32.3% and 66.9%, accordingly).

Analysing separately men and women who used alcohol, statistically significantly both men and women used less alcohol in the stroke patients group in comparison with the control group: 112 (45.7%) men used alcohol in the cases group and 198 (77.1%) in the control group ($p < 0.001$), while the shares among women were – 52 (19.8%) and 151 (57.4%) ($p < 0.001$).

In the further analysis we labelled men who used >14 SAU per week and women who used >7 SAU per week as excessive alcohol users, and the rest of alcohol users we considered as moderate alcohol users. According to our data, there were more excessive alcohol users' men in the case group than in the control group: 9.6% and 1.1% ($p < 0.001$) respectively. For women, the proportions of excessive alcohol users' were similar in both stroke patients (5.6%) and the control group (5.3%).

Interviewing the stroke patients and the control group, questioning had been made whether the examined smoked. In both cases and the control group, smoking was more common among men than among women ($p < 0.01$). Analysing men and women in the cases and the control group according to smoking habits, there were statistically significantly more ($p < 0.001$) smoking men (29.0%) in the stroke patients group in comparison with the control group (19.6%). In the stroke patients group there were statistically significantly ($p < 0.001$) less smoking women (4.2%) in comparison with the control group (9.1%), although there were more of women who gave up smoking in the control group (14.8%) comparing to the cases group (4.2%) (Table 4).

Table 4. Comparison of the stroke patients and the control groups regarding the smoking habits

Sex	Smoking habits	Cases (n=508)		Control (n=508)		p
		n	%	n	%	
Men	never smoked	85	34.7	128	52.2	<0.001
	gave up smoking	89	36.3	69	28.2	
	smoke	71	29.0	48	19.6	
Women	never smoked	241	91.6	200	76.0	<0.001
	gave up smoking	11	4.2	39	14.8	
	smoke	11	4.2	24	9.1	

n – number of cases, p – significance level of chi-square test, comparing the cases and the control group.

In this study the assessment of the nutrition status of the examined in the stroke patients and the control group had been made. No statistically significant differences were found between the case and the control groups (Table 5).

Table 5. Distribution of the contingent of the examined regarding the nutrition status

Nutrition status	Cases (n=508)		Control (n=508)		p
	n	%	n	%	
Normal	376	74.0	392	77.1	0.50
Undernourished	11	2.2	10	2.0	
Overweight	121	23.8	106	20.9	

n – number of cases, p – significance level of chi-square test, comparing the cases and the control group.

6.2.3. Assessment of the use of medications and morbidity of chronic non-infectious diseases in the stroke patients

The analysis had been done on the morbidity of chronic non-infectious diseases in the stroke patients and the control group (Table 6). Morbidity of the chronic non-infectious diseases in the cases group was registered before stroke. The majority of stroke patients (69.6%) and the examined in the control group (58.0%) had AH, the difference was statistically significant ($p < 0.001$). AF was statistically significantly ($p = 0.039$) common to 19.8% stroke patients and 13.8% of the examined in the control group. 13.8% of the cases group examined and 9.7% of the control group examined had MI ($p = 0.039$), and TIA was the problem of the least part of the

examined – 10.9% in the cases group and 7.1% in the control group ($p=0.036$). 12.7% of stroke patients had DM, respectively in the control group – 8.9% ($p=0.051$).

Table 6. Distribution of the contingent of the examined regarding the morbidity of chronic non-infectious diseases

Chronic non-infectious diseases	Cases (n=508)		Control (n=508)		p
	n	%	n	%	
Arterial hypertension	352	69.6	294	58.0	<0.001
Myocardial infarction	70	13.8	49	9.7	0.039
Atrial fibrillation	100	19.8	70	13.8	0.011
Diabetes Mellitus	64	12.7	45	8.9	0.051
Transient ischemic attack	55	10.9	36	7.1	0.036

n – number of cases, p – significance level of chi-square test, comparing the cases and the control group.

It was analysed the distribution of the examined according to the number of the above mentioned chronic non-infectious diseases. It was investigated that the majority of stroke patients (39.6%) and the control group examined (60.2%) had at least were one chronic non-infectious disease, the difference was statistically significant ($p=0.0005$). Only few stroke patients (1.0%) and the control group examined (0.2%) had four out of five analysed diseases.

Table 7. Distribution of the contingent of the examined regarding the use of medications

Medications groups	Cases		Control		p
	used medications/had illness	%	used medications/had illness	%	
Antihypertensive medications	234/352	66.5	198/294	67.3	0.815
Antithrombotic medications	84/390	21.5	95/386	24.6	0.31
Antidiabetic medications	64/64	100.0	45/45	100.0	1

n – number of cases, p – significance level of chi-square test, comparing the cases and the control group.

In this research was investigated the use of medications in the stroke patients and the control group (Table 7). The use of medications in the cases group was assessed before stroke. It was found out that the majority of AH cases in the stroke patients group 234 (66.5%) and in the control group 198 (67.3%) used antihypertensive

medications ($p=0.815$). 84 (21.5%) of the stroke patients and 95 (24.6%) of the control group, who had at least one chronic non-infectious disease (AH/MI/AF/TIA), used antithrombotic medications ($p=0.31$). All examined who had DM used oral and/or injection antidiabetic medications.

6.3. Quality of life of stroke patients

The assessment of QOL of stroke patients (3 months after stroke ($n=508$)) and the examined of the control group ($n=508$) had been made using SF-12 questionnaire.

6.3.1. Comparison of the quality of life among stroke patients according to separate domains of the questionnaire SF-12

It was analysed PCS and MCS of the examined stroke patients and the control group. The results of the analysis showed that PCS and MCS of the stroke patients were lower than of the examined of the control group. Considering SF-12 questionnaire's data, median of PCS of the stroke patients was 32.8 points and of the examined of the control group – 47.0 points ($p<0.001$). Median of MCS of the stroke patients was 55.9, whereas of the examined of the control group – 60.5 points ($p<0.001$).

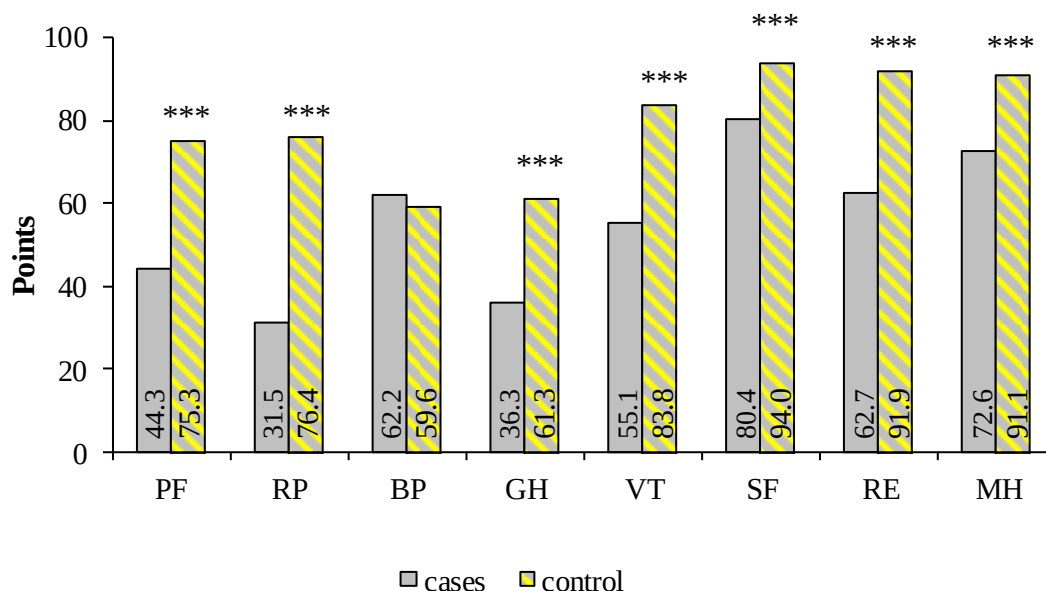


Figure 2. Quality of life of the examined of the stroke patients and the control groups according to separate domains of the questionnaire SF-12

PF – physical functioning, RP – role physical, BP – bodily pain, GH – general health, VT – energy/vitality, SF – social functioning, RE – role emotional, MH – mental health, *** – $p<0.001$ comparing quality of life of the stroke patients and the examined of the control group by Mann-Whitney test.

Previous stroke significantly impaired the QOL in the PCS health domain (Cohen's $d=1.5$) and moderately – in the MCS health domain (Cohen's $d=0.51$).

On the basis of the research, after having compared the stroke patients and the control groups, statistically significant differences have been found in seven QOL's domains, except bodily pain domain, where difference between groups was not statistically significant ($p=0.117$). Stroke survivors presented the poorest evaluations in the role functioning physical domain (31.5) and in general health (36.3). The domains that distinguished least from the ideal (100 points) of the stroke patients were social functioning domain (80.3) and mental health (72.6) domain (Figure 2).

6.3.2. Comparison of quality of life among stroke patients and the examined of the control group

According to the data, in both PCS and MCS regarding social and demographic factors, stroke patients assessed QOL lower than the control group examined and the set differences were statistically significant except MCS in 25–34 and 35–44 age groups in which there were 8 and 11 stroke patients respectively (Table 8).

Regarding risk factors, chronic non-infectious diseases morbidity and the use of medications in both PCS and MCS, stroke patients assessed QOL as low as the examined people in the control group and the found differences were statistically significant, except MCS by those who smoke, had at least one of the analysed (AH/MI/AF/TIA) diseases and used antithrombotic medications in groups and MCS and PCS by those who had AH and did not use antihypertensive medications in group (Table 9).

Table 8. Comparison of Physical component summary (PCS) and Mental component summary (MCS) medians in the stroke patients and the control groups regarding social and demographic factors

Factors	PCS (median)			MCS (median)		
	cases	control	p	cases	control	p
Contingent of the examined (median)	32.8	47.0	<0.001	55.9	60.5	0.0005
Age in years:						
25–34	47.6	55.2	0.001	56.1	57.4	0.05
35–44	50.3	53.6	<0.001	59.8	60.8	0.15
45–54	35.4	53.5	<0.001	56.9	59.6	0.001
55–64	37.2	50.8	<0.001	57.4	60.7	<0.001
65–74	32.0	43.5	<0.001	55.2	60.5	<0.001
75–84	29.0	39.4	<0.001	50.8	59.8	<0.001
Sex:						
men	33.3	49.3	<0.001	56.1	59.9	<0.001
women	32.5	43.8	<0.001	55.9	60.7	<0.001
Nationality:						
Lithuanian	33.1	47.0	<0.001	55.8	60.6	<0.001
other	28.7	47.3	<0.001	57.9	59.5	0.045
Living conditions:						
do not live alone	33.8	47.3	<0.001	55.9	60.3	<0.001
live alone	30.8	44.1	<0.001	55.9	60.7	<0.001
Education:						
higher education	36.1	50.4	<0.001	55.5	60.7	<0.001
secondary, further, unfinished higher education	34.6	47.3	<0.001	57.0	60.7	<0.001
primary, unfinished secondary	30.3	38.8	<0.001	53.1	59.4	<0.001
Social status:						
employed	38.9	50.8	<0.001	57.2	60.7	<0.001
unemployed	31.5	38.9	<0.001	55.2	59.9	<0.001
Current or prior work type:						
intellectual work	34.5	47.7	<0.001	55.9	60.6	<0.001
physical work	31.9	39.3	<0.001	55.9	59.8	<0.001

p – for Mann-Whitney test.

Table 9. Comparison of Physical component summary (PCS) and Mental component summary (MCS) medians in the stroke patients and the control groups regarding risk factors, morbidity of chronic non-infectious diseases and the use of medications

Factors	PCS (median)			MCS (median)		
	cases	control	p	cases	control	p
Use of alcohol:						
do not use alcohol	30.5	40.6	<0.001	54.3	59.8	<0.001
use alcohol	34.6	49.3	<0.001	56.2	60.7	<0.001
Smoking habits:						
never smoked	32.7	47.4	<0.001	56.0	60.5	<0.001
gave up smoking	31.4	43.4	<0.001	53.6	61.5	<0.001
smoke	38.2	46.8	<0.001	56.3	57.9	0.07
Nutrition status:						
normal	33.2	47.5	<0.001	56.0	60.6	<0.001
undernourished	27.5	47.3	<0.001	46.7	60.3	0.005
overweight	33.0	38.9	0.001	55.8	59.8	<0.001
AH:						
do not have AH	34.3	50.0	<0.001	55.9	59.8	<0.001
have AH	32.2	44.2	<0.001	55.9	60.7	<0.001
MI:						
have not had MI	33.0	47.0	<0.001	55.9	60.5	0.0005
have had MI	32.5	46.6	<0.001	55.6	60.2	0.0005
AF:						
do not have AF	33.9	47.0	<0.001	56.1	60.7	<0.001
have AF	29.7	45.5	<0.001	54.9	59.1	<0.001
DM:						
do not have DM	33.4	47.0	<0.001	56.0	60.5	<0.001
have DM	30.0	45.9	<0.001	53.5	60.3	<0.001
TIA:						
have not had TIA	32.8	47.0	<0.001	55.7	60.5	<0.001
have had TIA	34.5	46.9	<0.001	57.5	60.7	<0.001
With AH:						
use antihypertensive medications	31.0	46.6	<0.001	55.2	60.7	<0.001
do not use antihypertensive medications	31.7	50.8	0.18	53.9	56.7	0.91
Have/had AH/MI/PV/PSIP:						
use antithrombotic medications	30.8	49.0	0.001	57.8	60.6	0.37
do not use antithrombotic medications	34.3	41.7	<0.001	56.2	60.7	<0.001

p – for Mann-Whitney test, AH – arterial hypertension, MI – myocardial infarction, AF – atrial fibrillation, DM – diabetes mellitus, TIA – transient ischemic attack.

6.4. Quality of life's dependence on social and demographic factors, the way of life and chronic non-infectious diseases morbidity

The assessment of QOL of stroke patients (3 months after stroke) and the examined of the control group had been made using SF-12 questionnaire. The social and demographic factors, the way of life and chronic non-infectious diseases morbidity were evaluated for case group before their first stroke.

6.4.1. Quality of life's dependence on social and demographic factors

Quality of life's dependence on age. There was determined a statistically significant reverse PCS's dependence on age: Spearman correlation coefficients in the stroke patients and the control groups: $r=-0.34$ ($p=0.03$) and $r=-0.64$ ($p=0.02$). After comparing the received correlation coefficients, we determined a statistically significant difference ($p=0.02$). According to the data, age less influenced PCS in the stroke patients group than in the control group. PCS of the elderly patients was worse, and statistically significant slight correlation link was set: Spearman correlation coefficient – $r=-0.12$ ($p=0.03$), whereas in the control group statistically significant dependence was not found ($r=0.024$, $p=0.12$).

Quality of life's dependence on sex. Comparing men's and women's PCSs, the PCSs of men were statistically significantly higher than those of women ($p<0.001$) only in the control group, and among stroke patients a statistically significant difference was not found. After comparing men's and women's MCSs, a statistically significant difference was not found in either the stroke patients or the control group.

Quality of life's dependence on nationality. It was analysed QOL in PCS's and MCS's dependence on nationality. Lithuanian stroke patients had better PCS than stroke patients of other nationalities ($p=0.008$), whereas in the control group PCSs were not statistically significantly different. Having compared MCS's dependence on nationality, we have not fixed any statistically significant difference in either cases, or the control group.

Quality of life's dependence on living conditions. A statistically significant living conditions' dependence on PCS has been observed in both the control ($p=0.01$), and the stroke patients group ($p=0.008$): those who did not live alone assessed their PCS higher than those who lived alone (Figure 3). A statistically significant living conditions' dependence on MCS was not found in either group.

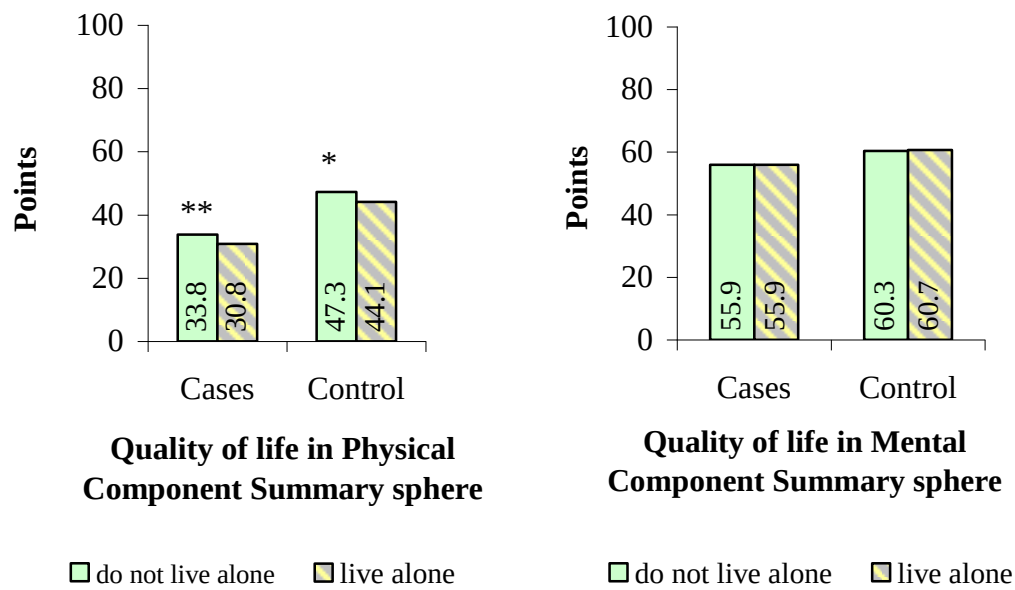


Figure 3. Quality of life's dependence on living conditions in the stroke patients and the control group using the SF-12 questionnaire's data

p – significance level comparing to living conditions by Mann-Whitney test, * – $p < 0.05$, ** – $p < 0.01$.

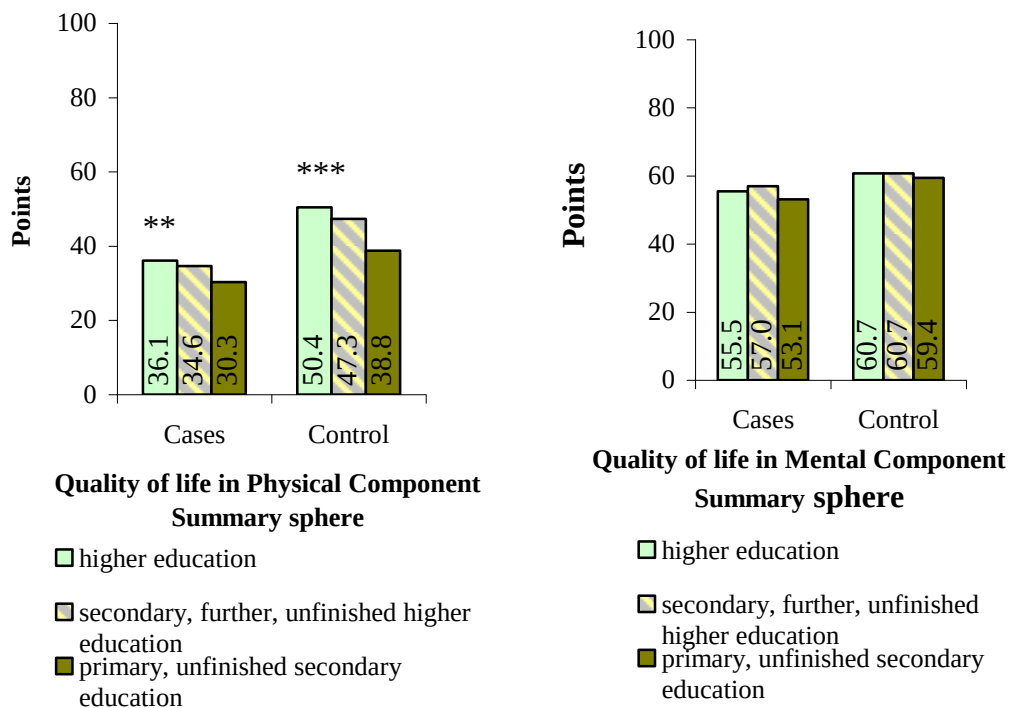


Figure 4. Quality of life's dependence on education in the stroke patients and the control group using the SF-12 questionnaire's data

p – significance level comparing to education by Kruskal-Wallis test, ** – $p < 0.01$, *** – $p < 0.001$.

Quality of life's dependence on education. It was assessed QOL in PCS's and MCS's dependence on education. Having analysed the MCS's differences among the examined that had primary/unfinished secondary, secondary/further/unfinished higher and higher education, statistically significant differences were found in the control or stroke patients group. Meanwhile in PCS, in both the control ($p<0.001$), and the stroke patients ($p=0.001$) groups there were noted statistically significant differences among all education groups: the higher education, the better PCS (Figure 4).

Quality of life's dependence on social status. It was analysed QOL in PCS's and MCS's dependence on the social status. PCS of the employed was better in both the stroke patients and the control group, and the differences were statistically significant ($p=0.005$ in both groups) (Figure 5). No statistically significant social status' dependence on MCS was observed in stroke patients or in the control groups.

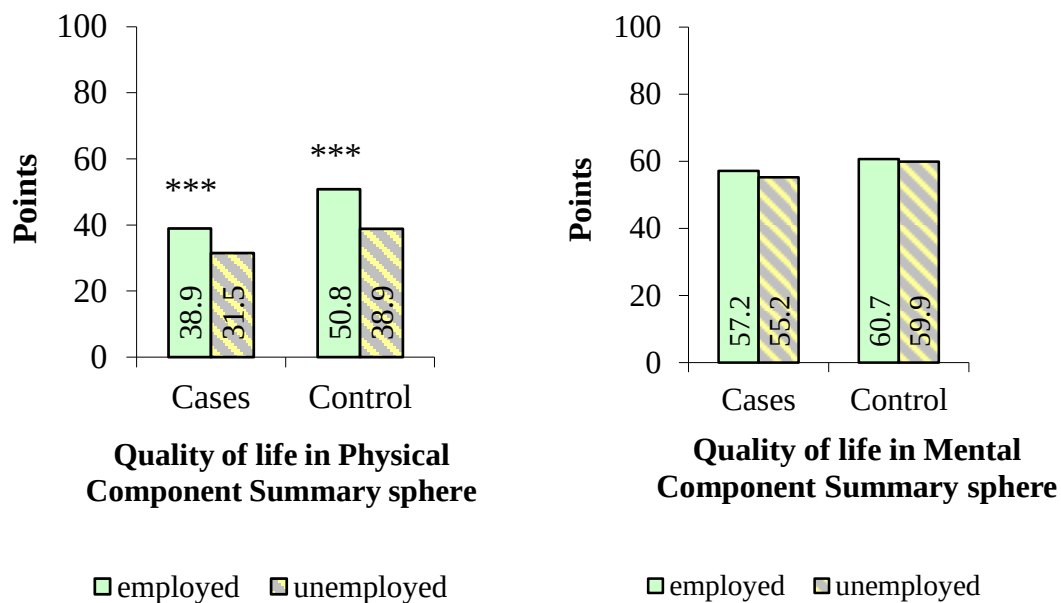


Figure 5. Quality of life's dependence on social status in the stroke patients and the control group using the SF-12 questionnaire's data

p – significance level comparing employed to unemployed by Mann-Whitney test, *** – $p<0.001$.

Quality of life's dependence on work type. Regarding the current or prior work type, the results were as following: PCS was higher among people doing or having experience of brainwork in the control group ($p=0.005$), and in the stroke patients group only a tendency was observed ($p=0.075$), whereas MCSs clusters did not differ statistically in the stroke patients and the control groups.

In the stroke patient group, medium effect size was observed on education and social status in the PCS health domain (Cohen's $d=0.7$ and 0.6 , accordingly). The effect size of other analyzed social and demographic factors on the QOL was small.

Meanwhile, in the control group, education level, the type of work, and social status significantly influenced the QOL in the PCS health domain (Cohen's $d=1.1$, 0.84 , and 1.2 , accordingly), and medium effect size was observed on sex (Cohen's $d=0.55$).

6.4.2. Quality of life's dependence on the way of life

It was analysed possible dependence of some factors of the way of life such as addictions (alcohol use, smoking) and nutrition status on QOL.

Quality of life's dependence on alcohol use. In the carried out survey PCS and MCS of alcohol users to the examined who did not drink alcohol in the stroke patients and the control groups were combined (Figure 6). In the stroke patients and the control group among alcohol users PCS was statistically significantly better than PCS of abstainers ($p<0.001$). A large effect size of alcohol on the QOL was observed in the PCS health domain, while in the stroke patient group, the effect size was small (Cohen's $d=0.87$ and 0.41 , respectively). As far as MCS was concerned, in neither the cases nor the control group statistically significant difference was found.

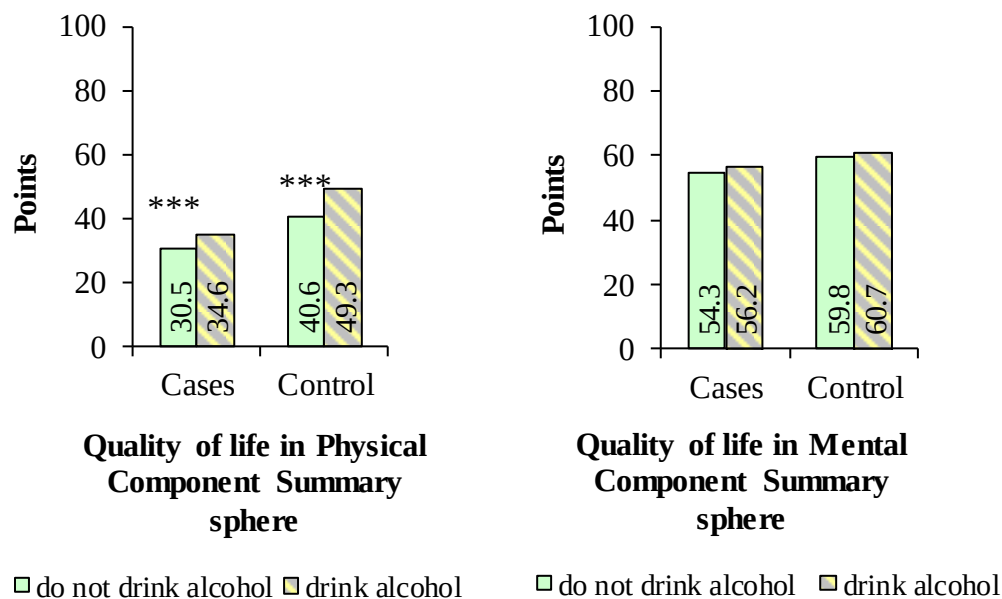


Figure 6. Quality of life's dependence on alcohol use in the stroke patients and the control groups using the SF-12 questionnaire's data

p – significance level comparing alcohol users with the abstainers by Mann-Whitney test, *** – $p<0.001$.

Comparing PCS and MCS among alcohol users' men and women, statistically significant dependence on the used quantity of alcohol in PCS among women was

found: in the control group moderate alcohol women users (≤ 7 SAU per week) assessed PCS higher than excessive alcohol women users (> 7 SAU per week), ($p=0.009$). In the control group moderate alcohol men users (≤ 14 SAU per week) assessed MCS higher than excessive alcohol men users (> 14 SAU per week), ($p<0.001$). In the stroke patients group in neither PCS nor MCS statistically significant difference of the used quantity of alcohol between men and women was found.

Quality of life's dependence on smoking habits. In the stroke patients and the control groups a connection between smoking and QOL in PCS and MCS was found. As smoking habits statistically significantly differed between men and women, the impact of smoking habits on QOL was analysed separately for men and women. PCS was assessed highest by non-smoking men who had never smoked in the control group in comparison with the examined who gave up smoking ($p<0.001$), and among stroke patients – smoking men in comparison with the patients who gave up smoking ($p=0.049$) (Table 10). MCS was assessed highest by men who gave up smoking in the control group in comparison with smoking men ($p<0.001$), and in the stroke patients group – smoking men in comparison with the ones who gave up smoking ($p=0.049$). PCS was assessed higher by women who had never smoked in the control group in comparison with smoking women ($p=0.003$), and MCS was assessed higher by women who gave up smoking in comparison with smoking women ($p=0.002$). In the stroke patients group among women PCS and MCS did not statistically significantly differ regarding smoking habits.

Table 10. Comparison of Physical component summary (PCS) and Mental component summary (MCS) medians in the stroke patients and the control groups among men and women regarding smoking habits

Sex	Smoking habits	PCS (median)				MCS (median)			
		cases	p	control	p	cases	p	control	p
Men	have never smoked	34.8	0.049	51.0	<0.001	56.2	0.049	60.2	<0.001
	gave up smoking	30.9		44.2		53.6		60.8	
	smoke	38.2		48.7		56.7		57.7	
Women	have never smoked	31.9	0.11	44.2	0.003	55.9	0.75	60.5	0.002
	gave up smoking	35.2		40.7		5.6		62.7	
	smoke	38.2		36.8		55.3		59.4	

SAU – standard alcohol units, p – significance level comparing groups regarding smoking habits for Kruskal-Wallis test.

Quality of life's dependence on nutrition status. In the stroke patients and the control groups the assessment has been made of PCS's and MCS's dependence on nutrition status. It was found out that nutrition status statistically significantly influenced only PCS in the control group: PCS was lower of overweight people in comparison with the rest groups (Cohen's $d=0.84$) ($p<0.001$). In the stroke patients

group neither PCS nor MCS statistically significantly differed regarding nutrition status.

6.4.3. Quality of life's dependence on chronic non-infectious diseases morbidity and the use of medications

Quality of life's dependence on the chronic non-infectious diseases morbidity. It was analysed the dependence of QOL in PCS and MCS on the chronic non-infectious diseases (AH/MI/AF/TIA) in the stroke patients and the control groups. It was stated that in the cases ($p=0.018$) and in the control ($p<0.001$) groups, PCS of the examined who had AH was lower in comparison with the ones who did not have AH (Figure 7). In the control group MCS was higher of the examined who had AH in comparison with the examined who did not have AH ($p=0.02$), and in the cases group statistically significant difference was not found.

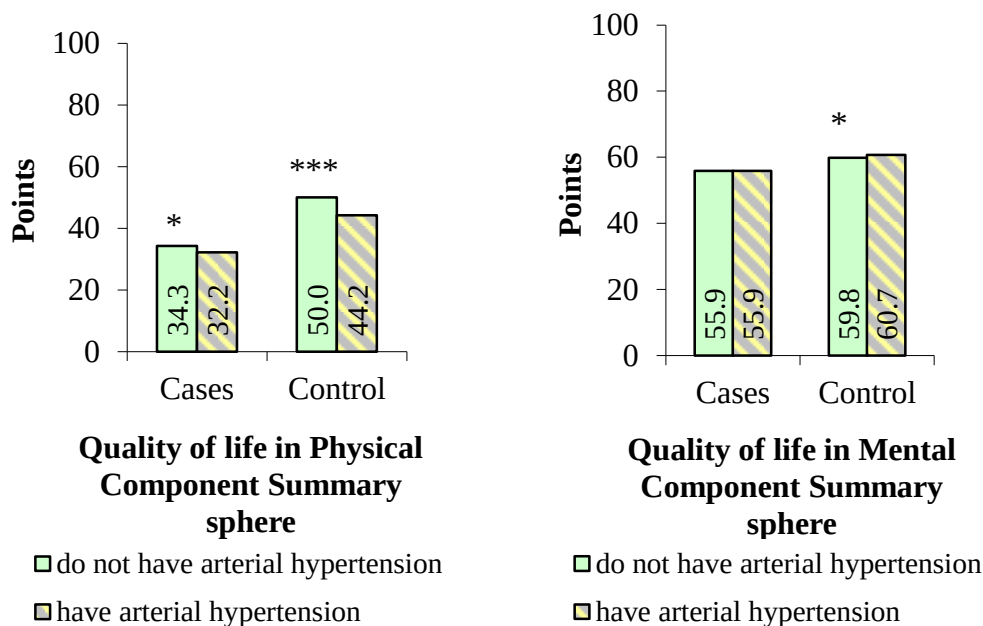


Figure 7. Quality of life's dependence on arterial hypertension in the stroke patients and the control groups using the SF-12 questionnaire's data

p – significance level for Mann-Whitney test comparing people who have arterial hypertension with people who do not have arterial hypertension * – $p<0.05$, *** – $p<0.001$.

The analysis had shown that neither PCS nor MCS in both stroke patients and the control groups statistically significantly differed regarding MI.

It was found out that comparing people with AF to people without AF, PCS was statistically significantly lower in the cases group ($p<0.001$), and MCS – in the

control group (Figure 8). In MCS of the stroke patients group and in PCS of the control group, AF was not statistically significant.

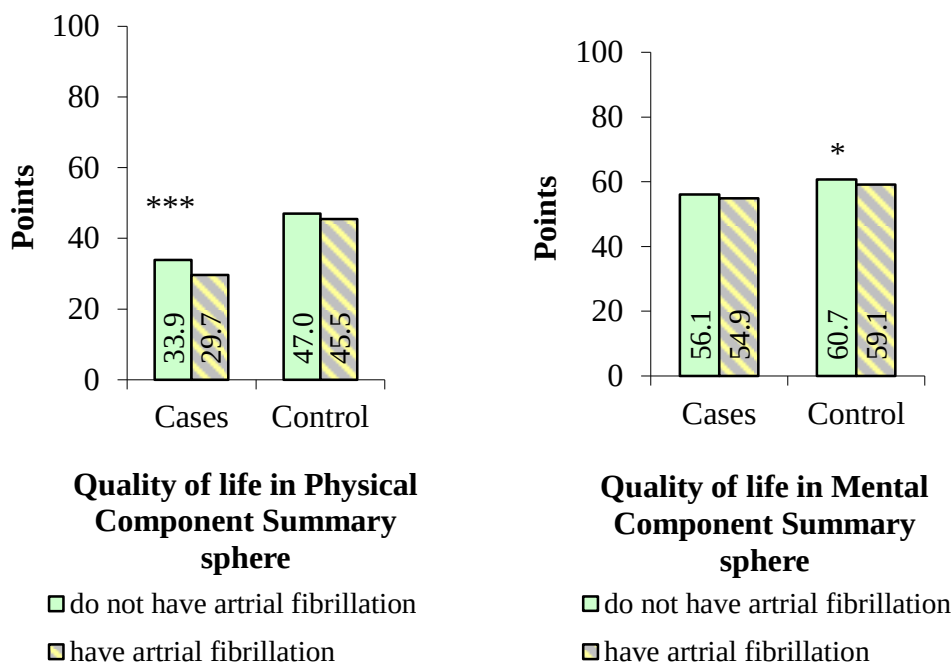


Figure 8. Quality of life's dependence on atrial fibrillation in the stroke patients and the control groups using the SF-12 questionnaire's data

p – significance level for Mann-Whitney test comparing people who have atrial fibrillation with people who do not have atrial fibrillation, * – $p < 0.05$, *** – $p < 0.001$.

The analysis has shown that PCS of people who had DM in comparison with people who did not have DM was statistically significantly lower in the cases group ($p < 0.001$), meanwhile, in the control group statistically significant difference was not found. In neither the cases, nor the control group MCS was not statistically significantly influenced by DM.

TIA's statistical dependence on either PCS or MCS was not found in either group.

In the stroke patient group, a small effect size of previous chronic non-infectious diseases (AH, AF, and DM) was observed on the QOL in the PCS health domain. Meanwhile, in the control group, the effect size of AH was moderate (Cohen's $d = 0.58$).

Quality of life's dependence on the use of medications. It was assessed the dependence of QOL in PCS and MCS on the use of medications in the stroke patient and the control groups. It was analysed PCS's and MCS's of the people, who had AH, dependence on the use of antihypertensive medications in the case and the control groups. The analysis showed that neither PCS nor MCS among AH patients

in both the cases and the control groups statistically significantly differed because of the use of antihypertensive medications.

When comparing to the age, in the control group QOL in PCS was estimated as statistically significantly higher among the examined who had AH and used antihypertensive medications: for men 4.0 points on the average ($p=0.006$), for women 4.7 points on the average ($p<0.001$) in comparison with the examined who did not use antihypertensive medications. In MCS for both men and women in the cases and the control group statistically significant difference between having AH and using or not using antihypertensive medications was not found.

It was assessed PCS's and MCS's dependence on the use of antithrombotic medications among the examined who suffer/suffered from at least one of the analysed chronic non-infectious diseases (AH/MI/AF/TIA) in the stroke patients and the control groups. It was investigated that PCS was statistically significantly higher among the examined who did not use antithrombotic medications and suffer/suffered from at least one of the analysed chronic non-infectious diseases (AH/MI/AF/TIA) in the cases group ($p=0.033$), whereas in the control group – PCS was higher among the group that used antithrombotic medications ($p<0.001$) (Figure 9). In neither cases, nor the control group among the examined who suffer/suffered from at least one of the analysed chronic non-infectious diseases (AH/MI/AF/TIA) QOL in MCS was not statistically significantly influenced by the use of antithrombotic medications.

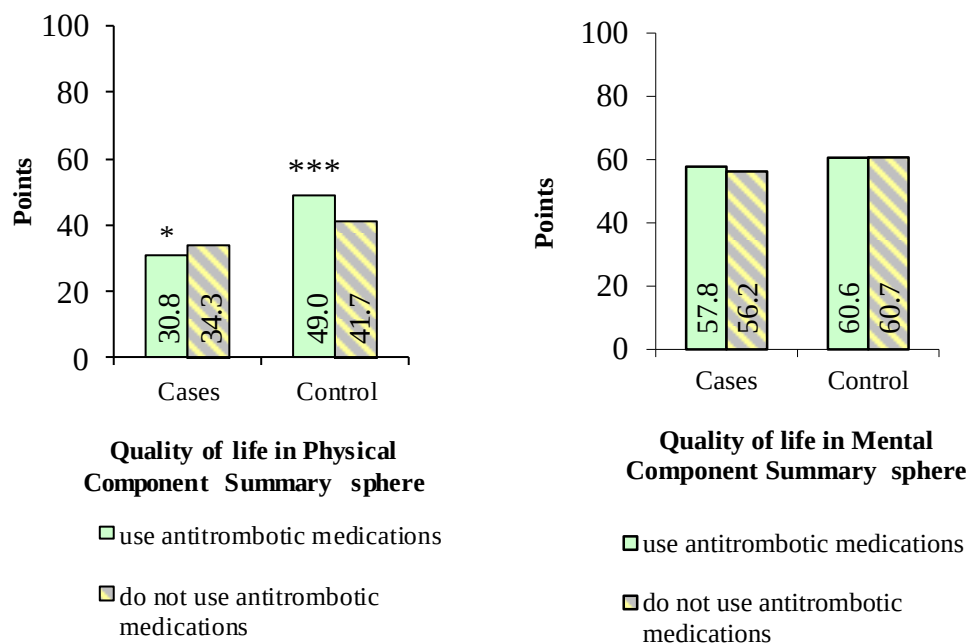


Figure 9. Quality of life's dependence on the use of antithrombotic medications suffering/having suffered from arterial hypertension, myocardial infarction, atrial fibrillation or transient ischemic attack in the stroke patients and the control groups using the SF-12 questionnaire's data

p – significance level for Mann-Whitney test comparing the examined who use antithrombotic medications with the examined who do not use antithrombotic medications, * – $p<0.05$, *** – $p<0.001$.

In the control group among the examined who suffer/suffered from at least one of the analysed chronic non-infectious diseases (AH/MI/AF/TIA) comparing to the age, the use of antithrombotic medications improved QOL in PCS for men 3.8 points on the average ($p=0.004$), for women – 5.3 points on the average ($p=0.0005$). Comparing QOL in MCS among the examined who suffer/suffered from at least one of the analysed chronic non-infectious diseases (AH/MI/AF/TIA) and the ones who used antithrombotic medications and who did not use antithrombotic medications, statistically significant difference was found in neither the cases, nor the control group for both sexes.

In the stroke patient group, a small effect size of antithrombotic drugs on the QOL was seen in the PCS health domain, whereas in the control group, this effect size was medium (Cohen's $d=0.35$ and 0.77 , accordingly).

6.5. A comparison of the case and the control groups with respect to social and demographic factors, peculiarities of lifestyle, and chronic non-infectious diseases

In order to classify the examined into the stroke patients and the control groups regarding the factors associated with QOL (social and demographic factors, the way of life, chronic non-infectious diseases morbidity), a logistic regression model was made. With the help of this model, a common percent of the properly classified was 75.1. In the stroke patients group proper prognoses made 73.0% and in the control group – 76.9%.

The QOL before stroke was not examined, but we had information about the number of indications connected with the QOL before stroke: social and demographic factors, the way of life, chronic non-infectious diseases morbidity. Since the collection of these indications relatively well distinguished the stroke patients group from the control group, we could draw a conclusion that QOL of stroke patients before stroke already differed from the healthy. The factors that distinguished the two groups most were: social status (unemployed), manual work, use of alcohol, AH and AF morbidity (Table 11).

Table 11. Odds ratio that the examined belongs to the stroke patients group or the control group

Factors	β	OR	95% CI	p
Age (in years)	-0.10	0.91	0.90–0.93	<0.001
Sex: (men/women)	0.44	1.56	1.10–2.20	0.012
Nationality: (other/Lithuanian)	-0.30	0.74	0.44–1.26	0.274
Living conditions: (live alone/do not live alone)	-0.48	0.62	0.42–0.92	0.018
Education (≤unfinished higher education /higher education)	-0.10	0.91	0.59–1.38	0.641
Social status: (unemployed/employed)	2.24	9.37	5.87–14.95	<0.001
Current or prior work type: (manual work/brainwork)	1.45	4.25	2.94–6.14	<0.001
Use of alcohol: (do not use alcohol/use alcohol)	1.52	4.56	3.21–6.47	<0.001
Smoking habits (smoke/do not smoke)	-0.09	0.91	0.58–1.43	0.685
Nutrition status: (overweight/normal)	-0.48	0.62	0.42–0.92	0.016
AH: (have AH/do not have AH)	0.69	1.99	1.41–2.81	<0.001
AF (have AF/do not have AF)	0.50	1.65	1.05–2.58	0.028
DM (have DM/do not have DM)	0.45	1.57	0.94–2.61	0.086

β – logistic regression coefficient, p – level of significance, OR – odds ratio, CI – confidence interval, AH – arterial hypertension, AF – atrial fibrillation, DM – diabetes mellitus.

6.6. Perspective assessment of quality of life of the stroke patients

QOL of the cases group was investigated 3 and 12 months after stroke. 464 examined were interviewed and their QOL was assessed 12 months after stroke. During the period from the 3rd up to the 12th month after stroke QOL in PCS became statistically significantly higher by 5.1 ± 0.4 points on the average ($p=0.001$), and QOL in MCS became statistically significantly higher by 1.4 ± 0.3 points on the average ($p=0.001$) (Figure 10).

Having compared evaluations of QOL in the analysed eight domains, a positive statistically significant improvement 12 months after stroke has been observed in comparison with the results 3 months after stroke.

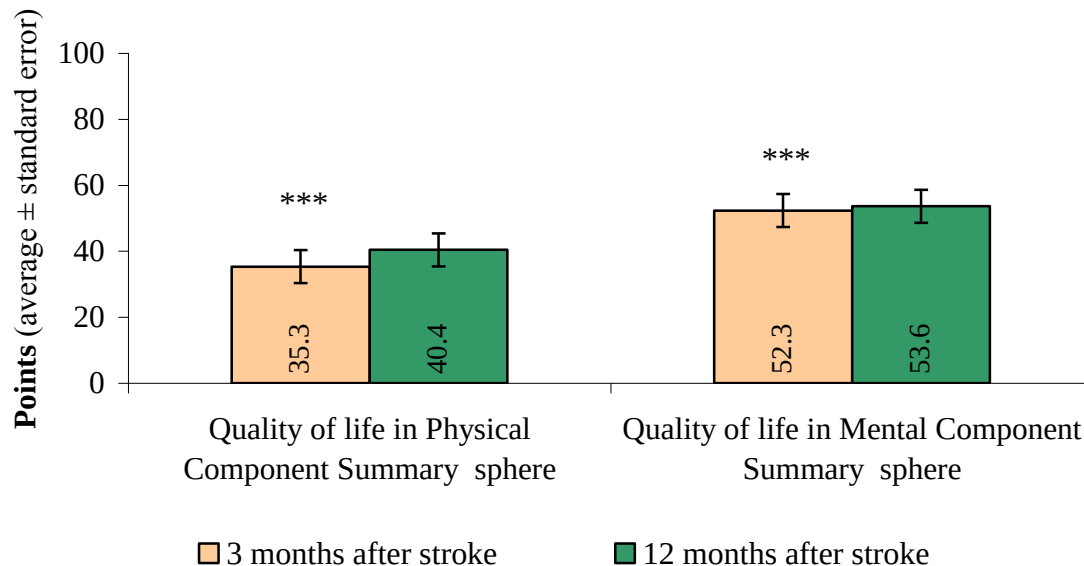


Figure 10. Comparison of quality of life in Physical component summary and Mental component summary spheres 3 and 12 months after stroke

*** – $p < 0.001$, comparing quality of life 3 months after stroke with quality of life 12 months after stroke for Mann-Whitney test .

7. DISCUSSION

The research carried out is one of the first studies in Lithuania that analyses QOL of those who have suffered stroke. The research is carried out participating in the international EROS project. Whereas, the patient's perception is one of the essential factors within the current health care system emphasizing the care oriented to the patient, therefore QOL researches are necessary in assessment and control the condition of the patient after stroke. Comprehensive assessment of QOL of Kaunas residents aged 25–84 who have suffered the first stroke allowed to look at many factors related to welfare and satisfaction with life in details and moving beyond the health indexes.

In order to investigate QOL of those who have suffered stroke many profiles investigating different aspects of QOL, different scales and methods of interpretation of the results are used. The greatest attention is paid on the studies within which SF-12 QOL profile or its uncut form SF-36 and researches of QOL of those who have suffered stroke within population of different countries were used.

7.1. Stroke survivors' quality of life and its evaluation tools

The suitability of the SF-12 questionnaire for the evaluation of the quality of life in 25-84 year-old population of Kaunas city. SF-12 QOL profile (short form of SF-36 profile) recognized as general (generic) in the world scientific literature has been applied in our research. It describes health and subjective opinion of respondent assessing eight life categories (49, 50). Obligatory methodical part of psychometric research is assessment of profile suitability for the group of those under test. Novik et al. investigated 2114 residents aged 15–85 using SF-36 profile by the data of population research carried out in Russia. The suitable indexes of inner consistency, feasibility and stability have been determined (51). Lopez-Garcia et al. investigated Spain residents aged 60 and older (n=3949) and determined strong stability of all fields of SF-36 profile (index of Cronbach alfa is 0.84–0.95). The highest scores of QOL were within the following fields: emotional, social relations and physical (52). It is stated in literature that inner consistency of the profile is good when the index of Cronbach alfa is more than 0,7 (53). We have determined that SF-12 QOL profile is suitable to assess QOL of Kaunas residents. There has been determined good inner consistency of SF-12 profile both in physical and mental health fields: accordingly the indexes of Cronbach alfa were 0.83 and 0.82. Good inner consistency of SF-12 profile allows continuing comprehensive analysis of the received data.

Quality of life's dependence on social and demographic factors. A number of studies show that the QOL of the majority of the examined worsens after stroke (3, 4, 6, 7, 13, 54, 55), this is applicable even to the survivors of mild stroke (3, 41, 55). Several factors that appeared to have influence on a worse QOL after stroke were determined: older age (6, 7), severity of motor disorders or paralysis (9, 13), lack of felt social (8), inability to return to work (40), cognitive disorders, other co-morbidities (41) and location of brain area lesion (42). In contrast to these data, the study carried out by King revealed that stroke survivors coped with health disorders after stroke well (8). According to the data of our study, both in the role physical and mental health domains stroke survivors evaluated their QOL worse than those in control groups.

The connection between age, sex and QOL remains unclear. Anderson et al. determined that in respect of social functioning and mental health milder consequences of stroke remained in women (5). However, the majority of authors report that QOL does not depend on sex (9) or that women's QOL is worse (54). We have determined that women evaluated their QOL in the role physical domain worse only in the control group, and the evaluation of QOL in the mental health domain of stroke survivors and in the control group did not differ between men and women.

It was found out that the QOL worsens by age (4, 6), however a lot of studies have been carried out that showed no differences between younger and older patients (9) or the increase of satisfaction with life when aging (4). Kwa et al. determined that aphasia, impaired motor function, disability in everyday activity, also impaired role physical and cognitive functions are significantly related to worse QOL. Age, sex, education, co-morbidities and stroke localization were not related to the QOL (9).

Fatoye et al. carried a study on stroke survivors in Nigeria. During this study the scientists analyzed 109 stroke survivors and impairments of cognitive power and QOL of 109 stroke survivors in the control group. Each group consisted of 64 (58.7%) men and 45 (41.3%) women. The researchers concluded that previous mental illnesses, partial paralysis, low level of education and shorter period after stroke determined worse QOL in one or more spheres of QOL, presented in a questionnaire shortened by PSO-100 (WHOQOL-BREF), however, the age of the analyzed stroke survivors were not connected with their QOL neither with the cognitive functions (56). During our study it was determined that the QOL in the role physical domain was worsening with age in stroke survivors and the control group.

While carrying out a study Hartman-Maeir et al. determined that after first year since stroke, stroke survivors remained unsatisfied with their QOL due to the limitation of participation in society's activity. The results of this study show that rehabilitation services directed towards the participation in the necessary activity of everyday life and spare time are needed in order to improve the satisfaction with their QOL (57). According to the data of our study, stroke survivors evaluated the category of activity limitation due to physical disorders and general health as the worst, and they evaluated the categories of social relations and emotional state as the best.

In addition, work is an important source of satisfaction with life in stroke patients who can do their previous work (8). Satisfaction with work can be evaluated as an index of QOL in patients returning to their previous work (54). In our study, only 57% of the employable persons had a work before stroke. Angeleri et al. carried out a study, the purpose of which was to evaluate the QOL of stroke survivors and to analyze the possibilities of employable persons to return to work surrounding. 180 stroke survivors hospitalized for the first time, who were discharged at least one year before the study was started, participated in the study. The examined group consisted of 65% of men and 35% of women, their average age was 65.3. The control group consisted of 167 subjects of the same age. A strong correlation among depression, social activity and stress causes to the relatives was noticed. The evaluations of the examined group were significantly worse than the respective data of the examined in the control group. Differences emerged between men and women with respect to depression and social activity: the data of women were worse. The majority of patients were retired. 20.6% of the studied returned to their work; however not always to the one they had before the illness and therefore they often had to adapt to new work conditions. 31.5% of them were women. Only 21.4% of the examined younger than 65 returned to work (54).

In Southeast England Alaszewski et al. examined the brain recovery of stroke survivors aged 43 to 60. The participants of the study, who had their first stroke less than 3 month ago before the study and who were able to participate in thorough conversations, were selected from three stroke treatment and care institutions. At the time the examined had stroke, only a small part of them were not active in the labour market and did not return to work while the study was being carried out. 13 out of 31 subjects, who were employed at that time they had stroke, did not return to work, 6 of them returned to work after 3 months and 9 returned earlier than after 3 months and in some cases almost immediately after stroke. All the participants of the study appreciated work and thought that to work, especially a paid work, was better than

being unemployed. This opinion was supported by the examined that were unemployed at the time they had stroke and who did not return to work while carrying out the study. The participants of the study thought that return to work was an important index of recovery after stroke. The examined who did not start working again thought that a paid work is a target; however, they were not able to overcome obstacles preventing from work (58). While carrying out a study, Treger et al. concluded that return to work in stroke survivors should be assumed as one of the signs showing successful rehabilitation, since it has influence on self-concept, welfare and satisfaction with life of such patients (59). According to the data of our study, those people, who had higher education, did not live alone, were working men and women in both stroke patients and control groups evaluated their QOL in physical health sphere higher than those who had lower education, lived alone and who were unemployed.

Quality of life's dependence on the way of life. When analysing the influence of the habits of alcohol use, it has to be stressed that excessive use of alcohol has negative influence on the QOL and health. A study carried out by Volk et al. showed that usually the general QOL of those used alcohol moderately and often was better than that of other groups of the examined using alcohol. The results of respondents who used a lot of and excessive amounts of alcohol and used it often were highly lower in the role physical domain. The examined (n=1333) filled in an Alcohol Use Disorder and Associated Disabilities Interview Schedule. The QOL was assessed using SF-36 questionnaire (60). According to the data of our study the number of alcohol users was lower in the stroke group than in the control group; however, men who used alcohol used it in higher quantities.

Blow et al. studied the effect of alcohol to the QOL among older individuals. In the USA 8578 responder ranging in age 55-97 were surveyed and grouped according to the use of alcohol to abstainers (61%), low risk users (31%) and risky alcohol users (7%) (women using ≥ 9 SAU per week; men using ≥ 12 SAU per week). It was determined that the QOL of abstainers was assessed worse in the majority of SF-36 questionnaire spheres compared to the users of low risk. This could be explained by the fact that abstinence is very often related to poor health in older patients. Individuals using alcohol risky had a better physical health but worse psychical health than those of the users of lower risk (61). In Finnish population a "J" type dependence was found between the use of alcohol and satisfaction with life: a higher satisfaction was felt by moderate alcohol users and lower satisfaction was felt by abstainers or excessive alcohol users. In our study it was determined that women and men belonging both to the stroke group and the control group who used alcohol assessed their QOL in physical functioning domain better than those who did not use alcohol.

Strine et al. evaluated the influence of smoking of the QOL. In the USA, Guam, Puerto Rico and Virgin Islands carried out a survey of individual of 18 and over by dialling a random telephone number. It was found out that 22.4% of the respondents smoked, 24.1% had smoked before and 53.9% of the respondents had never smoked (62). According to the data of our study, there were statistically more smoking men in the stroke group and less smoking women in the control group. While carrying out

the study, the QOL of the smoking individuals was significantly worse than that who had never smoked, they were more likely to use a lot of alcohol and to have more complaints about depression and anxiety. In addition, comparing non-smokers, smokers were less physically active, had more complaints about sleep disorders and bodily pain (62). According to the data of our study, smoking men belonging to the stroke group assessed their QOL in the physical functioning domain worse than men who had given up smoking.

Banegas et al. surveyed 3567 respondents to find out the relation between the QOL determined by the SF-36 questionnaire and obesity, AH and DM. Obesity among old women and DM among old men were the most significant factors having negative influence on the QOL of the studied. The relation to worse QOL was especially noticed in women who had all of the three factors (63). In Spain having studied 3605 persons aged 60 and over it was found out that obese individuals assessed their QOL in the physical sphere worse than men and women with normal body weight. Meanwhile, there was no difference in the assessments of the QOL of individuals with overweight and normal body weight. The QOL of obese women was worse in the psychological sphere than that of women with normal body weight, and that of men was better (64). According to our data, obese individuals belonging to the control group only assessed their QOL as worse in the physical sphere.

In the USA Yancy et al. analysed the relations between overweight and obesity of men ranging in age 45–64 and the QOL. In addition, the influence of age, AH, heart, nerve and other chronic non-infectious diseases on the QOL was taken into consideration. The authors noticed that the assessments of QOL only of obese men were worse in physical sphere compared with those whose body weight was normal. It has to be noted that while carried out the study smoking, its intensiveness, use of alcohol and DM were not taken into consideration (65). When analysing the relations between chronic non-infectious diseases and obesity, the strongest ones are found out to be with DM.

Quality of life's dependence on chronic non-infectious diseases morbidity. With the increasing lifetime, the occurrence of chronic non-infectious diseases which cause disability and have negative influence on the QOL of people is increasing in the population (66). In Canada, having examined 73402 adults, it was determined that even 58% had indicated at least one chronic non-infectious disease. It was determined that in the early age the QOL was getting worse mostly due to joint diseases and in the older age it was getting worse mostly due to Alzheimer's disease and residual effects of stroke (67).

In the International Quality of Life Assessment Project Alonso et al. carried out a study on mail survey and interview in eight countries (Denmark, France, Germany, Italy, Japan, Norway and the USA) during which they assessed the influence of frequently repeated chronic non-infectious diseases on the QOL of the general population. The scopes of participants varied from 2031 to 4084. The data about the occurrence of chronic non-infectious diseases (heart failure arthritis, AH, ischemic heart diseases (IHD) and DM) indicated by the studied themselves and social and demographic situation of the studied was collected. The QOL of the studies was assessed by using SF-36 survey the results of which were compared among three

countries. The age, sex, marital status, level of education of the patients and the way the SF-36 survey was filled in were taken into consideration. More than a half (55.1%) had at least one chronic non-infectious disease and 30.2% had more than one chronic non-infectious disease. AH and arthritis were the most common diseases. DM had a great influence on the results of the general health assessment and pain areas provided in the SF-36 survey. IHD had more influence on the results of physical health spheres and the influence of AH on the QOL was not great (compared to the typical results obtained from those who do not have chronic non-infectious diseases) (68). It was determined that the majority of the studied stroke patients (39.6%) and control group patients (60.2%) had at least one chronic non-infectious disease (AH/MI/AF/DM/TIA) ($p < 0.05$). According to our data, only some stroke patients (1.0%) and control group patients (0.2%) had four out of five chronic non-infectious diseases under study (AH/MI/AF/DM/TIA). In the stroke group more patients had AH/MI/AF/TIA than in the control group. Hyder et al. note that due to the general influence of several diseases on the general health and QOL of people it is very difficult to distinguish only one disease and talk about its influence (69).

According to the data provided by various authors, AH has a negative influence on the QOL (70, 71). According to the data of our study, men and women belonging to the stroke group who have had AH evaluated their QOL in PSC worse than those who have not had AH. Bardage et al. have carried out a studying order to find out a relation between AH and the QOL. The study was carried out in the general population of Sweden by applying the SF-36 QOL Survey which was posted to 8000 random citizens of Uppsala (Sweden) region aged between 20 and 84. The frequency of the response was 68%. The study revealed after having compared the results by age, sex and social and demographic factors, those who had AH had lower means in the majority of the eight SF-36 survey spheres when compared to respondents whose blood pressure was normal. DM and angina pectoris were related to worse results in the majority of the spheres of the SF-36 survey. Previously experienced MI was related to worse general health and energy. The results of stroke patients were worse in the spheres of physical activity, general health evaluation, energy/vitality and social relations. The data of this study show that people with AH are a vulnerable population which needs a special attention from health care professionals. It is extremely important when taking into consideration that poor QOL can be a risk factor determining the development of heart and vascular diseases and their complications (70).

Some authors claim that the QOL worsens by the side effects of the medication used for AH treatment rather than the disease itself (e.g. they cause fatigue, weakness, depression, men's potency decreases) (72, 73). On the other hand, Furmonavicius claims that antihypertensive treatment has a positive influence on some aspects of the QOL, i.e. improves mood, and this effect can be dependent on the group of the prescribed medication (73). In our study there were no differences in the use of antihypertensive, antithrombotic and antidiabetic pharmaceuticals between the stroke group and the control group.

In Stockholm, using SWED-QUAL, a survey adapted to Sweden, Wandell et al. analysed the influence of DM and IHD on the QOL (aged between 45–84). Compared to the general population, the QOL of patients with DM and more or less

severe form of IHD was significantly worse. The QOL of patients who had DM and did not have IHD was worse only in some spheres than those in the control group, and the points of the QOL of patients who were diagnosed with both the diseases were substantially lower. It is supposed that such results were influenced by the dependence of patients on medication, their lower working capacity and functional capacity and this limits the possibilities of everyday activity (74).

Frost et al. created a method to calculate years of life lost due to AF. The authors of this method made a conclusion that usually the average of the loss of the years of life related to stroke diagnosed within 20 years from the first AF was lower than 5 years; however, there were cases when the average of the lost years of life was even 10 years. It was determined that most years of life were lost by women, younger patients as well as patients who had stroke just after they had been diagnosed with AF. The relative loss of the years of life was up to 90% from the determined expected lifetime if stroke did not occur within 20 years from the diagnosis of AF and was highest among elderly patients (75).

Glasgow et al. carried out a review where 2056 USA citizens with DM participated. The average of age was 59 (the age of the studied varied from 18 to 92); 53% of the studied had secondary or lower education; 86% had DM type II; 62% of the studied were women. In general, the QOL of the studied varied from average to poor. Factors relating to poor QOL were the following: low level of education, lower income, older age, female sex, the number of complications of DM and concomitant diseases and lack of physical activity (76).

A classical study carried out by King showed that DM, AF, mobility disorders and aphasia were not the factors of the prognosis of the QOL. However, depression, insufficient social support, lower functional status, heart and vascular diseases and younger age are related to the QOL after stroke (8). According to our study, women and men belonging to the stroke group who have had AF and DM assessed their QOL in the physical health sphere as worse than those who have not had these diseases; and the QOL in the mental health sphere was assessed as worse by men and women who have had AF in the control group only.

Comparison of the quality of life among stroke patients according to separate domains of the questionnaire SF-12. Depression is closely related to QOL and impact it's worsening after stroke (6, 8, 13, 16, 40, 54, 55). Gross of the patients who have suffered stroke (23–41%) experience acute depression with the first several months after stroke (77).

Eriksson et al. determined within the research carried out, where 15 747 patients who have suffered stroke participated, that 1999 patients (12.7%) stated they started suffering depression after three months of observation (12.4% of men and 16.4% of women). After univariate analysis, female sex, repeated stroke and impaired consciousness at the moment of hospitalization were related to depression expressed by the patients who stated it. Patient's dependence on other people within everyday activity, life in care institutions 3 months after stroke, life at home alone were also related to experienced depression indicated by the patients. Age, stroke type, fact whether the patient was treated in the hospital during the period of acute stroke did

not impact depression a lot. It should be emphasized that it is complicated to diagnose depression if there are such disorders as aphasia, anosognosia and other post-stroke cognitive disorders (78). According this research, those who have suffered stroke assess QOL within mental health field worse than those under test within control group.

It was determined that usually young patients experience after stroke depression (40, 46). However, older patients can be more prone to depression due to functional and cognitive disorders, staying in the medical institutions, and lack of social care (79).

Epidemiological data show that women experience severe depression more often than men (80). The same connection between depression and female sex was determined for the patients who have suffered stroke (45–47). Paradiso and Robinson analyzed the impact of vital events on occurrence of after stroke depression. According to the data of the research, severe depression after stroke was diagnosed for women twice often than for men. Whereas female sex was related to severe, but not mild depression, characteristics of those who have suffered and have not suffered severe depression are compared. Those under test who suffer severe depression were younger, their social and economic status was usually poor, and they used to experience mental deterioration more often. Besides, impact of abuse of alcohol was determined. Specific factors predicting severity of depression symptoms were also analyzed. Age, race, education, previous mental deterioration of the person under test and his/her family members, sociologic and economic status, marital status, use and abuse of alcohol were used as independent variables. More severe form of depression of women was related to left brain damage, earlier mental and cognitive deteriorations. And for men risk factors of depression were as such disorder of everyday activity and social functionality (46). These conclusions can be very important for treating persons of both sexes.

Connection between depression and impaired social functionality was determined according to the data of several researches (46). Worsen social relations of people who have suffered stroke and experience depression can both cause depression and be its consequence.

Hackett et al. compared QOL of patients who have suffered stroke long ago and general population using SF-36 QOL profile. The patients who have suffered stroke were dependant on their everyday activity more often in comparison with control group. Average estimates of QOL of the patients who have suffered stroke were statistically lower than of those under test from control group. There were no differences in the cases of mental health and body pain between patients and control group after standardization according to age and sex (7). According to the data of our studies, those who have suffered stroke assessed QOL worse in all categories of SF-12 QOL profiles excluding pain category in comparison with the control group.

Prospective evaluation of the quality of life in stroke survivors. QOL can change over time and as individual adapts to new circumstances. Impact of time that passed after stroke on QOL is ambiguous. The data about worsen QOL of the patients who have suffered stroke was published within certain time period (from 6 months to two years) (81). Need to look after yourself, personal relations (48) and everyday activity

is the field where the greatest worsening of QOL is experienced. On the other hand, the data on minor improvement of general QOL within 1-3 years after stroke has been published. Long-term observation of the patients who have suffered stroke is necessary in order to assess the data about QOL more precisely (17). Åström et al. determined by perspective research that the persons who have totally regained satisfaction with life after stroke maintained such condition up to 3 years, and little satisfaction with life within the first year of other persons remained the same for the further 3 years of observation (6). Worsening of QOL over time shows that care provided to the patients in order to help them to be involved into society and return to productive life is improper and efforts should be directed to the ways of post-stroke care improvement. According to this study, positive dynamics of QOL 12 months after stroke were determined in the fields of both physical and mental health in comparison with QOL after 3 months.

The results of the study correspond with the expectations, yet it would have been interesting to have data on stroke patients' QOL prior to the stroke – this would have allowed for evaluating stroke-induced changes in their QOL.

7.2. Limitations of the study

In this study, the QOL was evaluated by using the general QOL questionnaire, where the results depend on the data provided by the patients. Such data accumulation techniques are not very suitable for patients with cognitive or communicative impairment. One of the ways to avoid such methodological problem is to use data obtained from individuals who provide care for such patients, although their information is frequently controversial (30, 42). Because of a significant bias in the data obtained from such patients' healthcare providers (41), the general tool should be used with caution in patients with an impaired communicative function.

Another shortcoming is that general questionnaires have a lower power to discriminate between individuals or groups who evaluate their QOL either as very high or very poor (i.e. individuals or groups that present evaluations at the extremes of the scale). It has also been noted that the use of a specific instrument may result in the so-called “floor effect” if a large number of individuals present the lowest scores. Instruments whose application results in the “floor effect” are insufficiently sensitive in determining differences between individuals who present the lowest scores - even when such differences are possible. The so-called “ceiling effect” emerges if a large number of individuals present the highest scores in the evaluation of their general QOL. Instruments to which the “ceiling effect” is characteristic are insufficiently sensitive in determining differences between individuals who present the highest scores.

Studies have shown that the “floor effect” and/or the “ceiling effect” are characteristic of various domains of the SF-12 questionnaire. For this reason, this questionnaire has a poorer accuracy when evaluating the QOL in individuals with very high or very low scores, and may incorrectly reflect the effect of treatment in these two groups of subjects. The accuracy also differs significantly between various

instruments of evaluation. For instance, SIP and NHP questionnaires only have 2 response options, while in SF-12, the respondent may choose between 2 to 6 responses, depending on the domain (42, 49).

Finally, the general instruments of the QOL are criticized concerning their content validity when adapting these instruments for post-stroke patients. Content validity is defined as the ability of the instrument to detect relevant and significant problems or symptoms in a certain group of the population (55). To solve this issue, improvement and validation of instruments for the evaluation of the QOL in stroke survivors has recently been initiated (5).

The use of a simpler SF-12 questionnaire instead of the SF-36 questionnaire is especially significant in the evaluation of stroke survivors' QOL. Using a shorter questionnaire included into a series of longer questionnaires may save time and costs, and the information obtained is essentially the same as that abstracted from a longer questionnaire. A survey using a shorter SF-12 questionnaire saves time both to the respondent and the interviewer. In addition to that, in patients with more severe stroke sequela, a shorter and simpler questionnaire may facilitate the evaluation of differences between groups because more respondents may be interviewed, which compensates for a slight reduction of accuracy. Most respondents fill out the SF-12 questionnaire within less than 2 minutes (49), while filling out the SF-36 questionnaire takes 10–12 minutes. It is likely that stroke survivors would require even more time for filling out these questionnaires. The mean time of filling out the general QOL questionnaire ranges between 2 and 30 minutes. The SIP questionnaire, which is characterized by good data accuracy and social and psychological aspects of the evaluation of the QOL, is significantly more time-consuming. Compared to the SF-36, the downside of the SF-12 questionnaire is a less accurate evaluation of an individual's health status and failure to calculate the total score even if only one question remains unanswered (12). Thus, data collection requires a trade-off between costs and the number of responses, the level of partiality with respect to unanswered questions, and the quality of the obtained data.

During this study, pre-stroke QOL was not evaluated in the stroke patients' group. Information on pre-stroke QOL would allow for a direct evaluation of the effect of stroke on QOL. It would also be interesting to evaluate how rehabilitation affected stroke patients' QOL.

8. CONCLUSIONS

1. The 12-item Short Form Health Survey was proper to evaluate quality of life of Kaunas citizens. Proper internal consistency was estimated in both physical and mental health spheres: Cronbach alpha indices were respectively 0.83 and 0.82.
2. In the stroke patients group among both men and women in comparison with the control group there were more people with lower education and unemployed but less of alcohol users. In the stroke patients group there were more men but less women who smoked than in the control group. Frequency rate of arterial hypertension, myocardial infarction, atrial fibrillation and transient ischemic attack was higher in the stroke patients group than in the control group. The compared groups did not differ regarding the use of antihypertensive, antithrombotic and antidiabetic medicaments.
3. Stroke patients evaluated their quality of life lower in all spheres except the sphere of pain. The spheres which were evaluated worst by stroke patients were the limitation of everyday activities because of physical disorders and general health, whereas the spheres which were evaluated most favourable were the social links and emotional state. In both physical and mental health spheres the examined stroke patients evaluated quality of life lower than the examined of the control group.
4. Quality of life in the physical health sphere in both stroke patients and the control groups decreased with age. Those people, who had higher education, did not live alone, were currently working and used alcohol in both stroke patients and control groups evaluated their quality of life in physical health sphere higher than those who had lower education, lived alone, were currently unemployed and did not use alcohol. Smoking men in the stroke patients group assessed quality of life in physical health sphere higher than those who gave up smoking. In the stroke patients' group men and women who had arterial hypertension, atrial fibrillation or diabetes mellitus assessed quality of life in physical health sphere lower than those who did not have these illnesses, whereas quality of life in mental health sphere was assessed lower only by the control group men and women who had atrial fibrillation.
5. In both physical and mental health spheres positive dynamics of quality of life was found 12 months after stroke compared to the quality of life 3 months after stroke.

9. RECOMMENDATIONS

- Evaluating the state of stroke patients and its dynamics it was expedient to evaluate QOL of the patients using the questionnaire SF-12.
- Choosing a further treatment plan for stroke patients it was necessary to regard not only a general state of health of the patient, but also to pay more attention to separate SF-12 parts that concerned QOL. It was necessary to improve not only physical health of the patient, but also his QOL. It was important with the help of medications, psychological and social means to correct their QOL domains of general health and the role physical.
- Trying to improve mental and social health, it was expedient to encourage adequate physical activity of stroke patients, housework, communication with family members and society.
- It was expedient to expand the circle of specialists while treating and further observing the state of stroke patients. Doctors neurologists, family doctors, psychologists, psychotherapists, social workers, physiotherapists and health educators should make a group of specialists that would ensure a better health and QOL of the patients.

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12. APPENDIX

THE U.K. SHORT FORM 12 HEALTH SURVEY QUESTIONNAIRE (SF-12)

The following questions ask for your views about your health, how you feel and how well you are able to do your usual activities. If you are unsure about how to answer any questions please give the best answer you can and make any of your own comments if you like. Do not spend too much time on answering as your immediate response is likely to be the most accurate.

1. In general, would you say your health is (please tick one box)

Excellent	Very good	Good	Fair	Poor
☐	☐	☐	☐	☐
1	2	3	4	5

HEALTH AND DAILY ACTIVITIES

2. The following questions are about activities you might do during a particular day. Does your health limit you in these activities? If so, how much?

(please tick one box on each line)

<u>ACTION</u>	Yes, limited a lot	Yes, limited a little	No, not limited at all
a. Moderate activities, such as moving a table, pushing a vacuum, bowling or playing golf	☐	☐	☐
b. Climbing several flights of stairs	☐	☐	☐

3. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

(please answer Yes or No to each question)

<u>ACTION</u>	Yes	No
a. Accomplished less than you would like	☐	☐
b. Were limited in the kind of work or other activities	☐	☐

4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

(please answer Yes or No to each question)

<u>ACTION</u>	Yes	No
a. Accomplished less than you would like	☐	☐
b. Didn't do work or other activities as carefully as usual	☐	☐

5. During the past 4 weeks how much did pain interfere with your normal work (including work both outside the home and housework)?

(please tick one box)

Not at all	A little bit	Moderately	Quite a bit	Extremely
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

YOUR FEELINGS

6. These questions are about how you feel and how things have been with you during the past month. For each question, please indicate the one answer that comes closest to the way you have been feeling.

(please tick one box only)

<u>ACTION</u>	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
a. Have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐
b. Did you have a lot of energy?	☐	☐	☐	☐	☐	☐
c. Have you felt down-hearted and low?	☐	☐	☐	☐	☐	☐
d. Has your health limited your social activities (like visiting friends or close relatives)?	☐	☐	☐	☐	☐	☐

