

Tertiary Prevention: lifestyle risk factors Modification on prevention of stroke recurrence

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Abstract :

Background Stroke is a leading cause of disability and death worldwide. Effective rehabilitation interventions initiated early following stroke can enhance the recovery process and minimize functional disability. **Aim:** was to determine risk factors of recurrence of stroke episodes and evaluate the influence of lifestyle risk factors modification on patient's outcomes and the frequency of stroke recurrence. **Subject & methods: Research design:** A Quasi-experimental design was used. **Setting:** The study was carried out in out-patient clinic of Neurology department, Shebin Elkom university hospital. **Subjects:** 86 stroke patients were included. **Tools of data collection:** Three tools are used, a structured interviewing questionnaire, Barthel index scale, physiologic measures. **Results:** the common risk factors of recurrence of stroke were sex, age, active smoking, cholesterol level, and hypertension. Clear improvement was noticed related to hypertension, blood glucose, cholesterol levels of study group compared to controls at 3rd, 6th, 12th months. Significant positive effect of the interventions was demonstrated immediately in terms of stroke knowledge immediately after intervention and 3 months later. A significant improvement in function of daily activities at 3rd, 6th and at the end of one year of follow up. A significant relationship between study and control group regarding occurrence of stroke episodes at the end of one year of follow-up where, 4 cases of stroke recurrence (9.1%) were occurred among study group compared to 11 cases (26.2%) for controls. **Conclusion:** identification of risk factors and its modifications is urgent need for stroke patients. Appropriate tertiary stroke prevention needs adherence with lifestyle risk factors changes that make important contributions for further reductions in stroke occurrence. **Recommendations:** Nurses and allied health professionals should ensure that they provide current, evidence-based information regarding lifestyle risk factors for recurrent stroke to patients and their families. Tertiary prevention interventions should start immediately after hospital patient's discharge.

Key words: Tertiary; Stroke; Recurrence; episode; lifestyle; Risk factors; Modification.

Introduction:

Stroke is emerging as a leading cause of death and disability in adults in many developing nations.⁽¹⁾ World Health organization⁽²⁾ defined stroke as, a focal neurological deficit: loss of function affecting a specific region of the nervous system due to disruption of its blood supply.

Worldwide, each year approximately 15 million people have a stroke; of these, 5 million die and another 5 million are chronically disabled, resulting in considerable burden for individuals, families, wider communities and government exchequers.⁽³⁾

In Egypt, according to few epidemiological studies, the incidence of stroke in Upper Egypt was 1.8/1000, while prevalence in Upper Egypt was 508/100 000 and in Lower Egypt was

91/100 000 the mortality after stroke in Egyptian patients was found to be 19.92.⁽²⁾ The Central Agency for Public Mobilization and Statistics in Egypt, indicated that diseases of circulatory system including stroke are the primary cause of deaths in Egypt, and account for one third of all deaths.⁽⁴⁾

Meta-analysis of Egyptian studies revealed that, ischemic stroke constituted 64.5 while hemorrhagic stroke constituted 35.5 of stroke. Male are more risky for stroke than women in Egypt. The number of new strokes in Egypt per year may be around 150,000 to 210,000. Although speculative, these figures highlight the importance of prioritizing stroke on the national health care agenda and assert the clear need to establish an active national surveillance registry to

provide necessary information on the incidence of stroke & largely unknown outcomes of stroke patients.⁽⁵⁾

Risk factor modification remains as the principal aspect of care for stroke prevention. However, effective treatment remains a challenging task in clinical practice. Prevention begins with awareness of risk factors by patients and clinicians. Risk factor assessment along with overall stroke risk estimation should be part of evaluation of these patients, and used with careful clinical judgment.⁽⁶⁾ Major modifiable risk factors for stroke include hypertension, abnormal blood lipids, tobacco use, obesity, unhealthy diet and physical inactivity. Other significant modifiable risk factors include alcohol use, and psychosocial stress.⁽⁷⁾

Stroke rehabilitation begins during the acute hospitalization, as soon as the diagnosis of stroke is established and life-threatening problems are under control. The highest priorities during this early phase are to prevent a recurrent stroke and complications, ensure proper management of general health functions, mobilize the patient, encourage resumption of self-care activities, and provide emotional support to the patient and family.⁽⁸⁾

Nurses have important roles to educate the public, patients on healthy lifestyles.⁽⁹⁾ However, provision of educational intervention from nurses and other health care practitioner (HCP) regarding lifestyle modification of risk factors for recurrent stroke prevention were lacking in routine practice.⁽¹⁰⁾

Lifestyle modifications through educating stroke patients to understand the significance of healthy lifestyle is important to achieve the benefits of management. Patient education on prevention of recurrent stroke through lifestyle modification is a core business of rehabilitation nursing. It is recommended that rehabilitation intervention should be started sooner to facilitate neuro-cognitive regeneration. Rehabilitation process usually begins as early as

possible of ward admission once patient hemodynamic status and general condition are stable.⁽¹¹⁾

Significance of study:

Stroke is a sudden and devastating illness - however many people are unaware of its widespread impact. Previous studies highlighted there is still inadequate informational provision on lifestyle modification after stroke assisting the standard care during acute phase among healthcare professionals including nurses.⁽¹²⁾

Aim of the study:

The aim of the present study was to determine risk factors of recurrence of stroke episodes and evaluate the influence of life style risk factors modification on patient's outcomes and frequency of recurrence episodes.

Study hypotheses:

- The study group who will receive the lifestyle modification interventions will have lower stroke parameters including (blood pressure ,cholesterol , glucose level) after intervention compared to controls.
- The study group who will receive the lifestyle modification interventions will have higher stroke's knowledge and will improve activity of daily living and mobility compared to controls.
- The study group who will receive the lifestyle modification interventions will have lower frequency of recurrence episodes after one year of intervention.

Subjects and methods:

Research design:

A quasi-experimental (case-control) research design was used.

Setting:

The study was conducted in out-patient clinics of neurology at Menoufia University Hospital, Shebin Elkom-Egypt

Subjects:

A purposive sample of 100 diagnosed stroke patients in all age groups (50 study group and 50

controls) were selected at baseline phase. With proceeding in the study, the patients were either dropped out or died. The final total number of stroke cases were 86, 44 study group and 42 controls.

Group assignment:

Initial group: A purposive sample of 86 diagnosed stroke patients participated in the study. They were assigned according to their waist circumference and the affected part of the brain then they were matched randomly into two groups.

The study group (Group I): included 44 participants who were received the lifestyle modification intervention in addition to medication therapy.

Control group (Group II): included 42 patients who were received the routine hospital care.

Inclusion criteria included:

Only conscious diagnosed patients with ischemic stroke were included. All Patients have hypertension and diabetes. Recent discharged from hospital. Patients with mild complications (hemi paresis /mild muscle weakness.

Exclusion criteria included:

Hemorrhagic stroke type, patients no adhere with the prescribed medication regimen or/and the intervention instructions, dead cases. A waist circumference of <80 centimeters for women and <94 centimeters for men were excluded.⁽¹³⁾

Tools of data collection:

Tool (1): A Structured interviewing questionnaire which included:

- **Part I:** Questions about basic data including age, sex, smoking, education, questions about present & past medical history.
- **Part II:** Assessment of stroke knowledge: it included 10 questions. The minimum scores was 0 and maximum scores was 100, the cutoff point was considered 50 for scoring system. ≥ 50 considered having good knowledge, <50 considered having poor knowledge.

Tool (2): Barthel index scale (BIS):⁽¹⁴⁾ It measures a person's daily

functioning specifically the activities of daily living and mobility. It consists of 10 items assessing the ability to achieve certain activities without assistance. It evaluates the ability of feeding, moving from wheelchair to bed and returning, doing personal toilet, getting on and off toilet, bathing self, walking on level surface, ascending and descending stairs, dressing, controlling bowels and controlling bladder. Scoring ranges from 0 (completely dependent) to 100 (completely independent) with intervals of 5 alternatives.

Tool (3): Physiologic measures:

current laboratory investigations for blood glucose level, and cholesterol level, systolic & diastolic blood pressure measurement will be assessed at baseline and at repetitive measures in follow up period.

Content validity and reliability:

The Barthel Index scale (BIS) was translated by the researcher to Arabic language and tested for its content validity by group of five experts in the psychiatric, community and medical surgical medicine and nursing. The required modification was carried out accordingly. Then test-retest reliability was applied. The tool proved to be strongly reliable ($r = 0.8222$).

Pilot Study:

Pilot study was carried out before starting data collection; this was done to check the content validity, clarity, applicability, relevance of the tools. The pilot study was conducted on 8 subjects and then they were excluded from the total sample. Based on the results of the pilot study, the necessary corrections and modifications were carried out.

Field Work:

The study started from May 2013 till October 2014. Data collection and filling of questionnaires took 6 months then follow up for one year for all patients (study & control groups). The intervention with instructions and guidelines for modification of life style

risk factors started immediately after finishing baseline assessment while the patient was in neurology outpatient clinic during monthly medical follow up and receiving their medication from hospital.

The intervention included nursing instructions and guidelines about modification of life style risk factors regarding hypertension, diabetes, diet, cholesterol, smoking and physical activity. The disease outcomes including (hypertension, blood glucose levels, cholesterol levels, patient's daily functioning, the activities of daily living (ADLs) and mobility were evaluated. The frequency of episodic recurrence were evaluated for one year at 3rd, 6th and 12th months. The knowledge for all stroke patients (study and control groups) was evaluated at base line, immediate and after 3 months of intervention.

Intervention components: The researchers depended on the "Canadian Best Practice Recommendations for Stroke Care (CBPRSC)(2012-2013) (15) to prepare their intervention's components "Modifiable risk factors interventions"

Interventional sessions: The intervention session was conducted in the form of lecture .It is a highly structured method by which the nurse verbally transmits information directly to groups of stroke patients⁽¹⁶⁾.An effective method of teaching in the lower level cognitive domain to impart content knowledge to inform stroke patients and family members about stroke information. A handout booklet was prepared by the researchers and distributed to study group. An educational videos was selected from the internet educational websites and was explained for psychomotor domains. The educational topics included, early detection of warning signs of stroke, measuring blood pressure and blood glucose level, medication and diet adherence. ⁽¹⁷⁾

Follow up Sessions: Regular nursing follow-up for one year starting at baseline with repetitive measures (3rd, 6th, 12th months) were conducted at

out-patient clinic (individually or in groups) either by interviewing the patients (during hospital follow up visits or refilling the medications) or by telephone.

Administrative and ethical considerations:

An official written approval was obtained from the Dean of Faculty of Nursing forwarded to the director of Menofia University Hospital and Shebin El kom Teaching Hospital.

Official permissions to conduct the study were obtained from the medical and nursing directors of neurology. Participation in the current study was voluntary oral consents were obtained from patients who met the inclusion criteria after informing them about the purpose and nature of the study. All data collected was strictly confidential and the data would be used for scientific purposes only.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS software version 16. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison between two groups and more was done using Chi-square test (X^2). For comparison between means of two groups of parametric data of independent samples, student t-test was used. For comparison between means of two groups of non-parametric data of independent samples, Z value of Mann-whitney test was used.

As the dependent variable is dichotomous, binary regression analysis was done, where Logistic regression coefficients (B) are calculated and used to estimate Odds ratios (EXP (B) for each of the independent variables as risk factors for recurrence of stroke episodes after one year of follow up. Significance was adopted at $p < 0.05$ for interpretation of results of tests of significance. ⁽¹⁸⁾

Results:

At base line assessment of studied stroke sample, **table (1)** illustrates the

basic data of studied stroke patients .There was no statistically significant difference between stroke patients (study and controls) regarding all basic data ($P > 0.05$) .The higher percentage of stroke group were in age 50-<70 yrs with mean age 60.61 ± 11.54 . Also, (59.1%) were males, 79.5% were married and 47.7% were illiterate. 31.8% were households, 65.9% were smokers, smoking was found in 45.4% of study group and finally 66.7% of females were assumed to use contraceptive methods.

Table (2): Reveals stroke medical data of stroke cases and control group. Hypertension was found in 52.3% of study patients. Diabetes mellitus (DM) was found in 52.3%..High cholesterol level in 47.7% of study group. This table also showed , Most of stroke cases (68.2%) were had a family past history of stroke, 72.7 % had two times frequency of stroke attacks, half of them (50%) had a difficult speech & right side hemiparesis.

By using Binary regression analysis, **table (3)** shows that, the common risk factors of recurrence of stroke episodes after one year of follow up were sex, age in years, active smoking, blood cholesterol level, systolic blood pressure, diastolic blood pressure ($P < 0.05$).

Concerning systolic & diastolic blood pressure, **figure (1)** illustrates that, there were no statistically significant difference between mean score of stroke patients and control group at baseline phase ($p > 0.05$) .While a significant relationship was clearly appeared in the 3rd, 6th and 12 months of follow up ($p < 0.05$) i.e. the blood pressure of study group scores (systolic & diastolic) was improved and returned to normal levels. A significant relationship was clearly appeared in the 3rd, 6th and 12th months of follow up.

As regards to cholesterol levels, **figure (2)** reveals that, at study baseline, there was no statistically significant difference between mean score of stroke patients and control

group ($p > 0.05$). While after the 3rd, the 6th and the 12th months of follow up, the high mean score of cholesterol (231.57 ± 55.49) was decreased and improved to become 162.04 ± 12.86 among intervention group.

As regards to, random blood glucose levels **figure (3)** shows that, on study baseline there was no statistically significant difference between stroke patients scores and control group ($p > 0.05$). While after the 3rd, the 6th and the 12th months of follow up .The higher mean score of cholesterol was controlled and improved from 152.59 ± 48.73 to become 112.11 ± 16.74 among intervention group.

Figure (4): Shows knowledge level among studied groups. The higher mean scores of study group was appeared immediately after intervention (9.29 ± 0.82), then after 3 months post intervention it was 8.93 ± 1.40 . While the lowest knowledge level was at baseline assessment 0.52 ± 1.37 . A significant relationship appeared immediate intervention and 3 month post intervention.

According to patient's functioning level and mobility (Barthel index) as seen in **table (4)**, it revealed that, at study baseline there was no statistically significant difference between mean scores of stroke patients and control group ($p > 0.05$). While after 3rd, 6th and 12th months of follow up. The higher percentage of patient's daily functioning, activities of daily living (ADLs) and mobility were improved gradually among intervention group and reversely among control and .

Table (5): Illustrates that there were a statistically significant difference between study and control groups regarding occurrence of stroke episodes at the end of one year of follow-up where, 4 cases of stroke recurrence (9.1%) were occurred among study group compared to 11cases (26.2%) were among control group. It means, the occurrence of episodes of stroke recurrence were

clearly higher among control compared to study group. The difference was insignificant at the 3rd and the 6th months of follow up ($p>0.05$).

Discussion:

Stroke is the third cause of death, ranking behind the diseases of the heart and all forms of cancer. Data from previous studies show that about 795, 000 people suffer anew or recurrent stroke each year. About 600,000 of these are first attacks and 180,000 are recurrent attacks. ⁽¹⁹⁾ The study aimed at determining risk factors of recurrence of stroke episodes and evaluates the influence of life style risk factors modification on patient's outcomes and frequency of recurrence episodes.

Regarding to sex the majority of stroke patients were males, this was in line with Block and Jacobs ⁽²⁰⁾ they emphasized that, the males are affected more than females this may be due to the role of protective hormone among women. About half of the sample was illiterate. This percent was similar with Hart et al., ⁽²¹⁾ who reported that low educated men associated with higher rate of stroke. Moreover, Huhges ⁽²²⁾ reported that, the educated people are more likely to care for themselves and practice healthy life style as healthy food, exercise better than others. While, Fang et al., ⁽²³⁾ reported that, persons at higher educational level were more likely to be aware of individual stroke warning symptoms and more likely to make proper decision.

Age is the single most important risk factor for stroke, for each successive 10 years after the age of 55, the stroke rate more than doubles in both men and women (24) . The range of age in our stroke patients ranged from 16 to 90 years with mean age of 57.74 ± 12.9 and this age is in accordance with most of national studies. ⁽²⁵⁾ This findings was in line with current study where the higher percent of study group were in age 50- <70 yrs with mean age 60.61 ± 11.54

The effect of cigarettes smoking has significant effect with incidence of stroke after adjustment of other factors; and stroke risk is increased two folds in the heavy smokers. ⁽²⁶⁾ It was also agreed with Kelly et al., ⁽²⁷⁾ who had studied the relationship between cigarette smoking and stroke incidence and mortality in Chinese population and they had identified a positive and close response relationship between cigarette smoking and risk of stroke. All of these findings were consistent with the present study where, more than half of studied sample were smokers. The causal effect between smoking ,cardiovascular diseases and stroke can explained as follow; smoking cause disturbance in the blood lipids a slight elevation of total plasma lipid was found to be associated with cigarette smoking and increases the tendency for blood to clot. ⁽²⁸⁾

The higher percentage of stroke cases (65.9%) were diagnosed with ischemic stroke, 68.2% were had a family past history of stroke, 72.7 % had two times of stroke attacks, half of them (50%) had a difficult speech & right side hemi-paresis. This was agreed with Ong and Raymond ⁽²⁹⁾ who reported that ischemic stroke is more common than hemorrhagic stroke in Malaysia population. Study done in Penang Hospital, shows that both ischemic and hemorrhagic stroke had counted for 74.8% and 25.2% respectively Commonly ischemic stroke involved large vessel atherosclerosis and small vessel occlusion. ⁽³⁰⁾

The present study appeared that, the common risk factors of recurrence of stroke episodes after one year of follow up were sex, age in years, active smoking, blood cholesterol level, systolic/ diastolic blood pressure. Many researchers are working on these risk factors like Lloyd-Jones et al. ⁽¹⁹⁾, they reported that the risk of stroke increase over the age of 55 years and are doubled in each successive decade.

Regarding to sex, Block and

Jacobs⁽²⁰⁾, emphasized that the male are affected more than females. Regarding smoking the heart is strong risk factors for stroke and it is directly affected by changes in the lung (especially the right side). More aggressive pulmonary obstruction, pulmonary hypertension, right ventricular hypertrophy and deterioration of right ventricular function were noticed among heavy cigarette smokers by comparison with non smokers.⁽³¹⁾

Regarding blood cholesterol level as risk factor for stroke, Mozaffarian⁽³²⁾ reported that stroke is strongly linked with dietary saturated fat and cholesterol. Regarding to hypertension as risk factor for stroke, Greenlund⁽³³⁾ reported that high blood pressure puts unnecessary stress on blood vessel walls causing the blood vessel to thicken and break down, eventually leading to stroke. It can also accelerate several common forms of heart disease which can also lead to stroke.

Concerning hypertension, a significant relationship was clearly appeared at the 3rd, 6th and 12 months of follow up ($p < 0.05$) i.e. the blood pressure of study group (systolic & diastolic) was improved and returned to normal level. This finding was consistent with Sacco *et al.*⁽³⁴⁾ and Ederle and Brown⁽³⁵⁾ who reported that lifestyle modifications are associated with blood pressure reduction and should be included as part of a comprehensive antihypertensive therapy. Moreover Systolic BP reduction has been associated with exercise level and optimum nutritional status.⁽³⁶⁾ Thus, it is highly recommended for stroke patients to maintain normal BP level to prevent recurrent stroke.

The Integrated Care for the Reduction of Stroke (ICARUSS)'s primary aim was to promote the management of vascular risk factors through ongoing patient contact and education. In this study conducted on stroke patients ($n=186$) were randomized to either ICARUSS

or usual care and were followed up over 12 months. ICARUSS was found to significantly reduce systolic blood pressure and BMI, and participants had significantly increased physical activity relative to controls, sustained over 12 months.⁽³⁷⁾

In the present study, the cholesterol level was improved among intervention group compared to control group starting from 3 months to 6 months till one year of follow up. This finding was agreed with Rafidah *et al.*⁽³⁸⁾ who mentioned that monitoring diet, exercise regularly and compliance towards statin agents prescribed by the physician will further control HPL. Therefore it is worth to educate the stroke patients and their family on lifestyle issues especially on dietary management since it has association in reduction of blood pressure, managing obesity and reduction of blood cholesterol level.

The current study, the blood glucose level was improved among intervention group compared to control group starting from 3 months to 6 months till one year of follow up. To date, it is unknown whether reduction of blood glucose levels by either pharmacological or non-pharmacological methods will reduce the risk of stroke. Tight glycemic control ($Hb A1c < 6\%$) is important and supported by epidemiology and a meta-analysis review to reduce microvascular and possibly macrovascular complications.⁽³⁹⁾ Furthermore, patients with DM should aim for less than 140 mg/dL for blood sugar level, BP less than 130/90 mmHg, $LDL < 2.6$ mmol/L and being physically active in order to reduce recurrent stroke.⁽⁴⁰⁾

According to activity of daily living, the high percent of dependency levels were appeared among intervention group than control group during and after one year of follow up. This may be attributed to, the lifestyles modification intervention improve patient's physiological, clinical outcomes and dependency level in daily activity. As supported by

Kozakova et al.,⁽⁴¹⁾ who reported that, with careful monitoring of lifestyles of stroke patients, the majority of patients are improved because of the improvement of neurological deficit and consequently in functional dependency and mobility levels.

Through lectures the researchers in the present study adopted a healthy lifestyle intervention's messages to the study group. The level of knowledge was improved immediately and after 3 months of follow up. This was inline with Choi-Kwon et al.,⁽⁴²⁾ who mentioned that, stroke patients and their families are wanted to know what they can do to decrease the risk for second stroke. When patients understand stroke risk factors and can identify their own risks, they are better able to apply the information to their lives.⁽⁴³⁾ Thus, lifestyles modification intervention is a fundamental area of the rehabilitation process as it has been highlighted among nine key performance indicators (KPI) that requires improvement in stroke management.⁽⁴⁴⁾

On the other hand, a Scottish randomized controlled trial investigated the efficacy of a lifestyle intervention delivered in an outpatient clinic in preventing recurrence of stroke.⁽⁴⁵⁾ In the intervention group (n=100), this nurse-led intervention demonstrated increased levels of satisfaction regarding the receipt of lifestyle information, but had no demonstrable positive impact on lifestyle risk factor modification at 3-month follow-up.

Moreover, patients' choice to make a healthy change is motivated by their knowledge about the risks of susceptibility towards the disease and knowledge about the seriousness of the disease. Patients' willingness to change usually influences by their understanding of the benefits of change and of their perceived of the barriers to change. After a person has had a stroke, they need to be aware of the threat or seriousness of their risk for a second stroke.

The occurrence of stroke

episodes after one year of follow-up was more clear among controls than study group, where, 4 cases (9.1%) were occurred among study group compared to 11 cases (26.2%) were among control group. But this significant relationship was not cleared after 3rd and 6th months. This is in line with Kirshner⁽¹⁾ who stated that first ever stroke patient is estimated around 30% to 40% chances to encounter further stroke within five years. There are studies mentioned that support and advice from healthcare professionals are helpful to increase adherence on secondary stroke prevention therapy.⁽⁴⁶⁾ Nurses and other healthcare professionals (HCP) are responsible to understand the psychological process, cognitive status and use appropriate behaviour change's theories to inform and deliver the educational content of lifestyle intervention.⁽⁴⁷⁾

Conclusion:

Identification of risk factors and its modifications is urgent need for stroke patients. Appropriate tertiary stroke prevention combined with adherence in lifestyle changes related to hypertension, diabetes, tobacco and diet, cholesterol, physical activity, might make important contributions to further reduction in the incidence of stroke.

Recommendation:

- Nurses and allied health professionals should ensure that they provide current, evidence-based-information regarding lifestyle risk factors for recurrent stroke to patients and their families.
- Lifestyle advices should be personalized (individualized) and based on a thorough lifestyle assessment; achievable, practical goal and negotiated with patients and/or their families.
- Tertiary prevention interventions should start immediately after hospital patient's discharge and should be followed up and

supported in the community, over long periods.

Acknowledgement:

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Table (1): Basic data of the studied stroke patients (study and control groups) (n=86)

Basic data of stroke patients	Stroke patients (n=44)		Control group (n=42)		X ²	P
	n	%	n	%		
Sex:						
▪ Males	26	59.1	24	57.1	0.034	0.855
▪ Females	18	40.9	18	42.9		
Age (years):						
▪ 30-	4	9.1	4	9.5	1.081	0.782
▪ 50-	31	70.5	29	69.0		
▪ 70-	8	18.2	9	21.4		
▪ ≥ 90	1	2.3	0	0		
Range	30-95		34-80		t-test	
Mean±SD	60.61±11.54		64.19±11.10		1.464	0.147
Marital status:						
▪ Married	35	79.5	32	76.2	0.288	0.866
▪ Widow	7	15.9	7	16.7		
▪ Divorced	2	4.5	3	7.1		
Education:						
▪ Illiterate	21	47.7	16	38.1	5.792	0.122
▪ Primary/Preschool educ.	12	27.3	8	19.0		
▪ Intermediate	11	25.0	14	33.3		
▪ High	0	0	4	9.5		
Occupation:						
▪ Farmer	3	6.8	0	0	5.173	0.270
▪ Employee	9	20.5	6	14.3		
▪ Trader	2	4.5	2	4.8		
▪ Household	14	31.8	11	26.2		
▪ Not working	16	36.4	23	54.8		
Smoking:						
▪ No	15	34.1	15	35.7	0.025	0.875
▪ Yes	29	65.9	27	64.3		
Using contraceptives:						
	(n=18)		(n=18)			
▪ No	6	33.3	9	50.0	0.460	0.499
▪ Yes	12	66.7	9	50.0		

*Significant (P<0.05)

Table (2): Stroke medical data of studied stroke patients (study and control groups) (n=86)

Stroke medical data	Stroke patients (n=44)		Control group (n=42)	
	n	%	n	%
Base line Blood pressure:				
▪ Pre-hypertension	5	11.4	4	9.5
▪ Hypertension stage 1	16	36.4	24	57.1
▪ Hypertension stage 2	23	52.3	14	33.3
Base line Random blood glucose (mg/dl):				
▪ Normal	16	36.4	11	26.2
▪ Pre-diabetic	5	11.4	21	50.0
▪ Diabetic	23	52.3	10	23.8
Base line Blood cholesterol levels (mg/dl):				
▪ Normal	14	31.8	13	31.0
▪ Moderate	9	20.5	9	21.4
▪ High	21	47.7	20	47.6
Family past history of stroke:				
▪ Present	30	68.2	15	35.7
▪ Absent	14	31.8	27	64.3
Number of stroke attacks:				
▪ One time (1 st attack)	5	11.4	12	28.6
▪ Two times	32	72.7	24	57.1
▪ Three & more times	7	15.9	6	14.3
Stroke complications:				
▪ Facial and mandible problems	1	2.3	2	4.8
▪ Difficult speech & Rt. Side hemiparesis	22	50.0	23	54.8
▪ Difficult speech & Lt. side hemiparesis	11	25.0	15	35.7
▪ Upper hemiparesis	5	11.4	2	4.8
▪ Lower hemiparesis	2	4.5	0	0
▪ Face, mandible complications & Rt. Side weakness	1	2.3	0	0
▪ Arm weakness	1	2.3	0	0
▪ Rt. Side weakness	1	2.3	0	0

*Significant ($P < 0.05$)**Table (3): Binary regression analysis of different risk factors of stroke recurrence (n=86)**

Risk factors of recurrence of stroke episodes	B	SE	P	Exp (B)	95% confidence interval for Exp (B)	
					Lower limit	Upper limit
▪ Sex	1.344	0.648	0.038*	0.261	0.073	0.929
▪ Age in years	1.501	0.215	0.041*	1.235	0.652	1.971
▪ Marital status	0.112	0.333	0.737	0.894	0.465	1.718
▪ Education	0.339	0.382	0.375	0.713	0.337	1.506
▪ Occupation	0.392	0.236	0.096	1.480	0.932	2.349
▪ Active smoking	0.219	0.649	0.036*	0.803	0.225	2.865
▪ Contraceptives use	0.619	0.346	0.073	0.358	0.273	1.060
▪ Blood cholesterol level	0.787	0.329	0.017*	0.455	0.239	0.868
▪ Systolic blood pressure	3.114	1.169	0.008*	0.044	0.004	0.439
▪ Diastolic blood pressure	2.636	0.841	0.005*	0.095	0.018	0.492
▪ Blood glucose level	0.076	0.487	0.876	1.079	0.415	2.800

*Significant ($P < 0.05$)
P=SignificanceB=Logistic Regression Coefficient
Exp (B)=Estimated Odds Ratio

SE=Standard Error of B

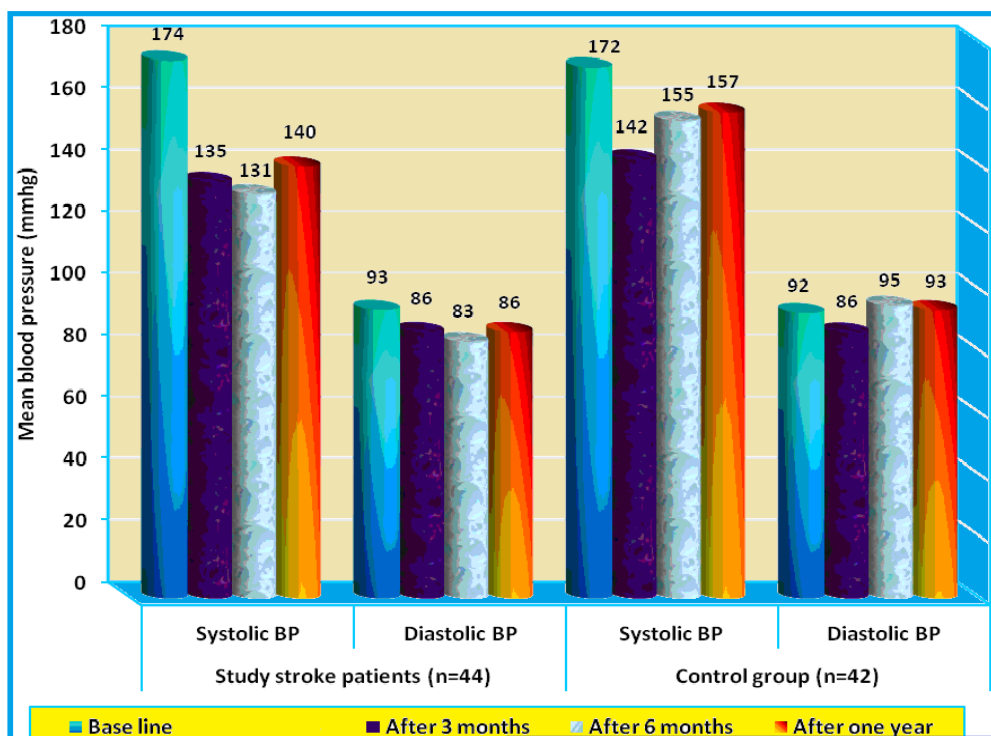


Figure (1): Mean systolic and diastolic blood pressure during one year follow-up of studied stroke patients (study and control group) (n=86)

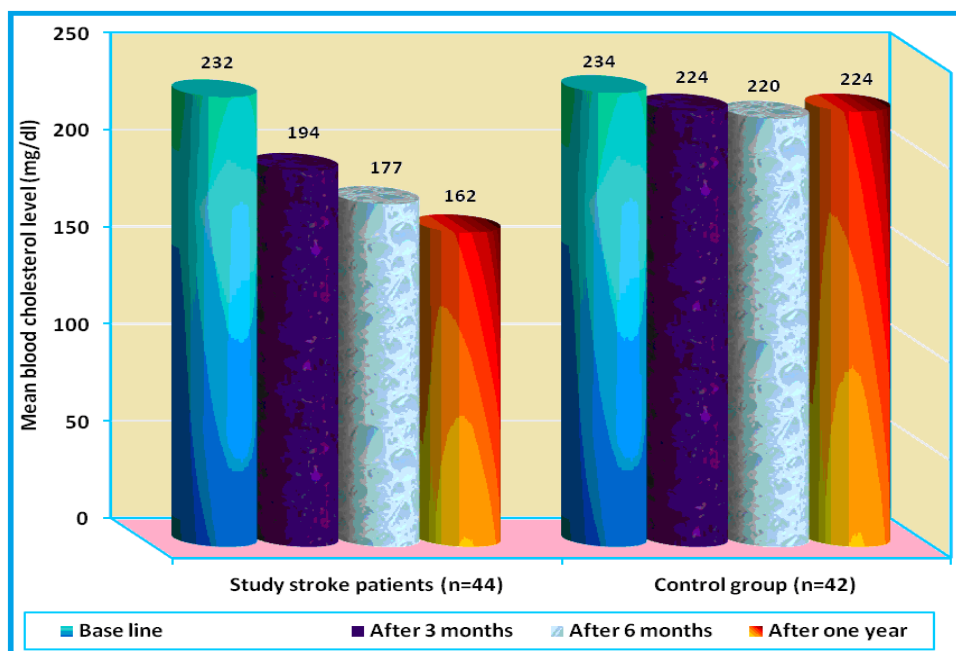


Figure (2): Mean cholesterol levels during one year follow-up of studied stroke patients (study and control groups) (n=86).

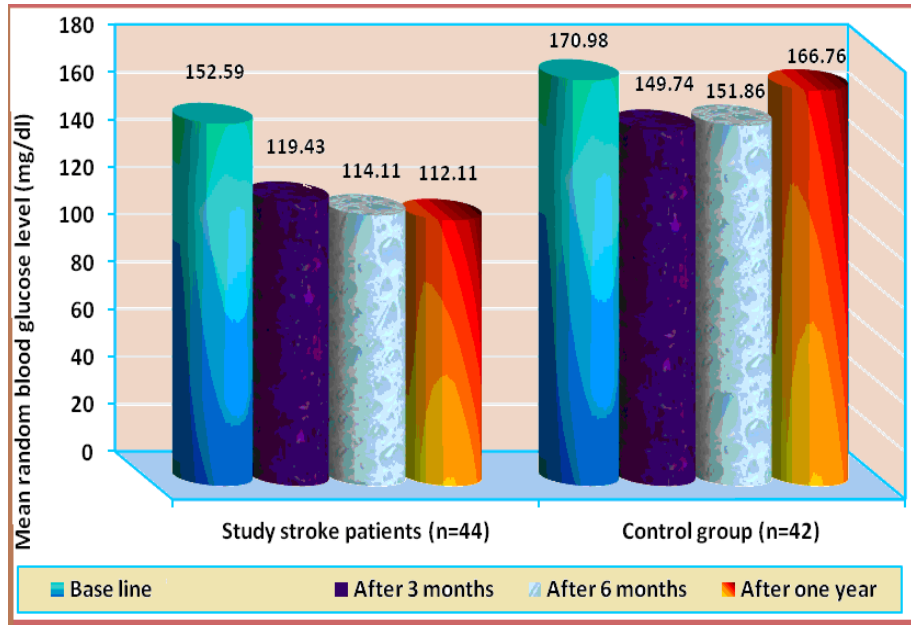


Figure (3): Mean random blood glucose levels during one year follow-up of studied stroke patients (study and control groups) (n=86).

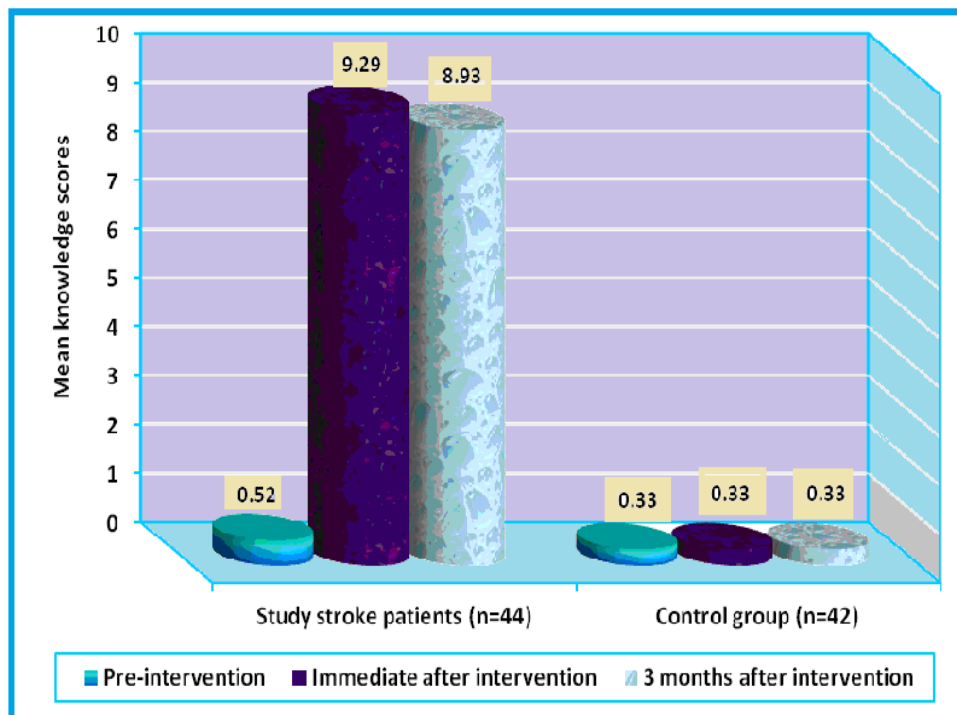


Figure (4): Mean scores of knowledge about stroke during one year follow-up of studied stroke patients (study and the control groups) (n=86)

Table (4): Barthel index during one year follow-up of studied stroke patients (study and control groups) (n=86).

Barthel Index	Stroke group (n=44)		Control group (n=42)		X ²	P
	n	%	n	%		
Barthel index:						
Pre-intervention:						
▪ Totally dependent	3	6.8	3	7.1	1.169	0.560
▪ Sever dependence	32	72.7	34	80.9		
▪ Moderate dependence	9	20.5	5	11.9		
3 months after intervention:						
▪ Sever dependence	0	0	34	81.0	68.213	0.0001*
▪ Moderate dependence	10	22.7	8	19.0		
▪ Mild dependence	34	77.3	0	0		
6 months after intervention:						
▪ Sever dependence	1	2.3	26	61.9	78.379	0.0001*
▪ Moderate dependence	1	2.3	16	38.1		
▪ Mild dependence	39	88.6	0	0		
▪ Minimal dependence	3	6.8	0	0		
After one year:						
▪ Sever dependence	0	0	34	81.0	75.328	0.0001*
▪ Moderate dependence	4	9.1	8	19.0		
▪ Mild dependence	12	27.3	0	0		
▪ Minimal dependence	28	63.6	0	0		

*Significant (P<0.05)

Table (5): Occurrence of stroke episodes during one year follow-up among studied stroke patients (study and control groups) (n=86)

Occurrence of stroke episodes	Stroke group (n=44)		Control group (n=42)		X ²	P
	n	%	n	%		
3 months after intervention:						
▪ Occurred	1	2.3	2	4.8	0.395	0.529
▪ Not occurred	43	97.7	40	95.2		
6 months after intervention:						
▪ Occurred	1	2.3	4	9.5	2.063	0.151
▪ Not occurred	43	97.7	38	90.5		
12 months after intervention:						
▪ Occurred	4	9.1	11	26.2	4.363	0.037*
▪ Not occurred	40	90.9	31	73.8		

*Significant (P<0.05)

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