

# A Study on the Quality of Life among Stroke Survivors: A Cross-sectional Study

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## Abstract

**Background:** The World Health Organization defines – Health as a “state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.” **Materials and Methods:** A cross-sectional study on 96 patients with stroke aged more than 30 years was carried out NIMS Hospital, Jaipur for a period of 4 months from January 1, 2018, to April 30, 2018. **Results:** Out of 96 patients, mean quality of score of patients with stroke was  $65.04 \pm 9.982$  there was significant difference seen in quality of life (QOL) score according to sex, side of lesion, duration of stroke, socio-economic status, occupation, and hypertension. **Conclusion:** It can be said that QOL is a multidimensional concept. As stroke cases is among the most devastating of health aspect, having multiple and profound effects on all aspects of life; hence, evaluation of QOL is very important. Each and every effort should be made to improve these aspects and, in turn, to activity daily living and to improve the overall quality of stroke patients.

**Keywords:** Activity daily living, Quality of life, Strokes, WHOQOL-brief

## Introduction

Stroke is defined according to the World Health Organization (WHO) as Rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 h or longer or leading to death, with no apparent cause other than of vascular origin. Global burden of disease reported 9.4 million deaths in India of which 619000 Stroke and DALY 28.5 million. The prevalence of stroke in India, rural area is around 84–262/1,000,000 and urban 334–424/100,000.<sup>[1]</sup> Even though there is rise in death many surviving stroke patients are disabled and need help in activities of daily living which must be provided by family members, the health system, or other social institutions. Stroke has multitude of negative consequences on an individual’s life ranging from death, loss of independence, etc.<sup>[2]</sup> Quality of life (QOL) defined as (WHO) “Individual’s perceptions of their position in life in context of the culture and value systems in which they live and in relation to their goals, standards, expectations, and concerns.”<sup>[3]</sup> QOL should not be confused with the concept of standard of living, which is based primarily on income. Instead, standard indicators of the QOL include not only wealth and employment but also the built environment, physical and mental health,

education, recreation and leisure time, and social belonging.<sup>[4]</sup> Studies have shown that QOL among stroke patients has a detrimental effect on both short- and long-term health related QOL and that disability is a strong determinant of health-related QOL.<sup>[5]</sup> The assessment of QOL among these patients can be helpful in developing more comprehensive interventions for improvement and provide be rehabilitative services. Stroke symptoms such as headaches and dizziness may indicate a number of conditions other than stroke. It is often the speed of symptom development that indicates stroke. People experiencing strokes may not notice symptoms themselves: The stroke may make them appear dazed, “spaced-out,” or confused. Common stroke symptoms include sudden are difficulty speaking, dizziness, headache, hearing difficulty, paralysis, vision problems, and weakness. Stroke survivors often describe sudden dizziness, and, in some cases, the most painful headaches of their lives. The sudden appearance of debilitating headaches should always be checked, especially if the person has no history of migraine headache.<sup>[6]</sup> A multidimensional approach is necessary to measure QOL. QOL assessment includes at least four dimensions:- Physical, psychological, social health, and environment.



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**Aims and objectives**

The aim and objectives are as follows:

1. To assess the QOL among stroke patients.
2. To assess the functional and social activities among stroke patients.

**Materials and Methods**

Material and methods will be discussed under following headings.

**Study area**

This study was conducted at the NIMS Hospital, Jaipur, Rajasthan.

**Type of study**

This was hospital-based cross-sectional study.

**Study period**

The study was from January 1, 2018, to April 30, 2018.

**Study population**

All stroke patients who were registered at the NIMS Hospital, Jaipur, during the above-mentioned study period.

**Inclusion criteria**

The following criteria were included in the study:

- 1) Stroke patients aged 40 years and above.
- 2) Duration of stroke more than 1 year (Time since diagnosis and initiation of treatment).

**Exclusion criteria**

The following criteria were excluded from the study:

- 1) Patients with severely ill and not able to communicate.
- 2) Patients who did not give consent for participation in the study.

**Sampling**

**Estimation of sample size**

For estimation of sample size, the mean and standard deviation of QOL score. Formula for estimating a proportion with absolute precision will be used to calculate sample size.

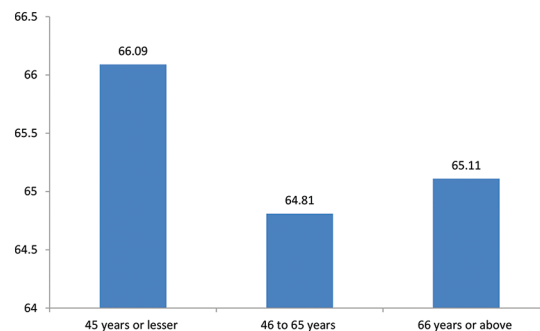
$$n = \frac{Z_a^2 P(1 - P)}{d^2}$$

Where,  
*n* = Sample size.  
*Z* = Level of significance.

**Table 1.1: Quality of life of stroke patients according to age**

Age groups	Number (%)	Mean±SD
45 years or lesser	11 (11.5)	66.09±7.726
46 to 65 years	58 (60.4)	64.81±10.711
66 years or above	27 (28.1)	65.11±9.308
Total	96 (100)	65.04±9.982

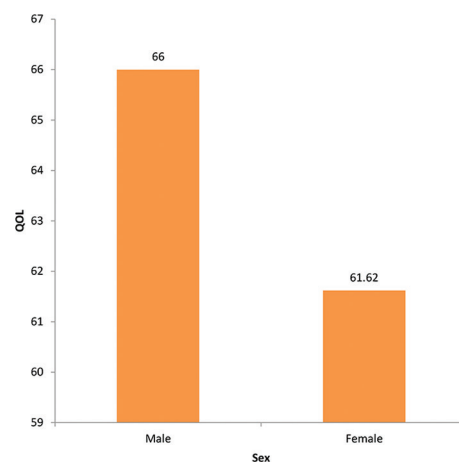
#ANOVA test; *P*=0.927



**Table 1.2: Quality of life of stroke patients according to sex**

Sex	Number (%)	Mean±SD
Male	75 (78.1)	66.00±10.351
Female	21 (21.9)	61.62±7.820
Total	96 (100)	65.04±9.982

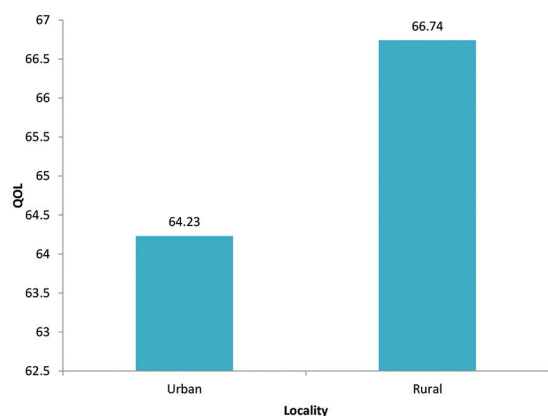
#t-test; *P* = 0.042



**Table 1.3: Quality of life of stroke patients according to locality**

Locality	Number (%)	Mean±SD
Urban	65 (67.7)	64.23±10.587
Rural	31 (32.3)	66.74±8.485
Total	96 (100)	65.04±9.982

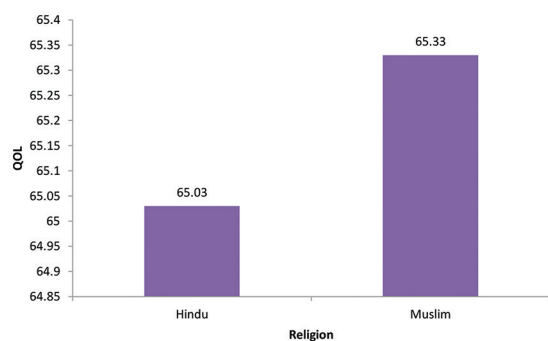
#t-test ; P = 0.216



**Table 1.4: Quality of life of stroke patients according to religion**

Religion	Number (%)	Mean±SD
Hindu	93 (96.9)	65.03±10.126
Muslim	3 (3.1)	65.33±4.041
Total	96 (100)	65.04±9.982

#t-test; P = 0.914



d = Absolute precision required on either side of the proportion (In % points).

P = Anticipated population proportion, 100(1-α)% = 95% Confidence level.

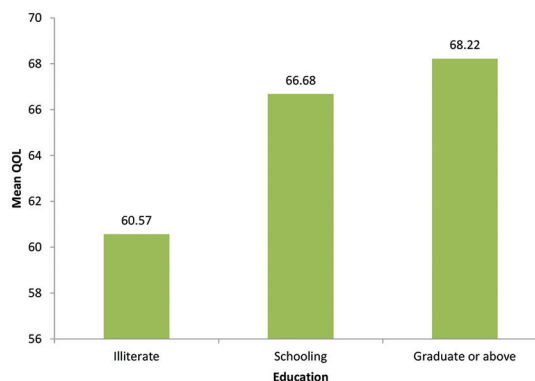
**Sampling method**

A sample of 96 patients was done using WHOQOL-BREF Questionnaire. This number was expected to

**Table 1.5: Quality of life of stroke patients according to educational status**

Educational status	Number (%)	Mean±SD
No education	28 (29.2)	60.57±7.249
schooling	59 (61.5)	66.68±10.265
Graduation and postgraduate	9 (9.4)	68.22±11.872
Total	96 (100)	65.04±9.982

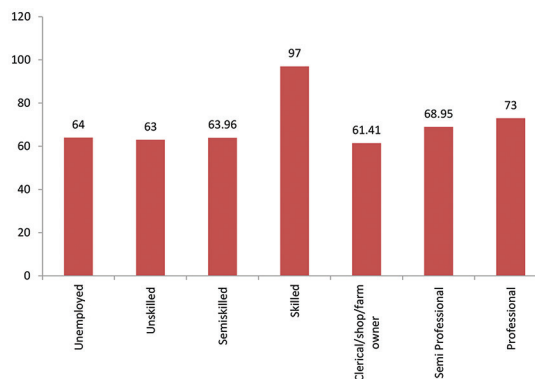
#ANOVA test; P = 0.16



**Table 1.6: Quality of life of stroke patients according to occupation**

Occupation	Number (%)	Mean±SD
Unemployed	23 (23.0)	64.0±9.94
Unskilled worker	5 (5.0)	63.0±4.64
Semi-skilled	28 (28.0)	63.96±8.19
Skilled worker	1 (1.0)	97
Clerical/shop/farm owner	17 (17.0)	61.41±8.25
Semi professional	20 (20.0)	68.95±11.21
Professional	2 (2.0)	73.00±12.73
Total	96 (100)	65.04±9.982

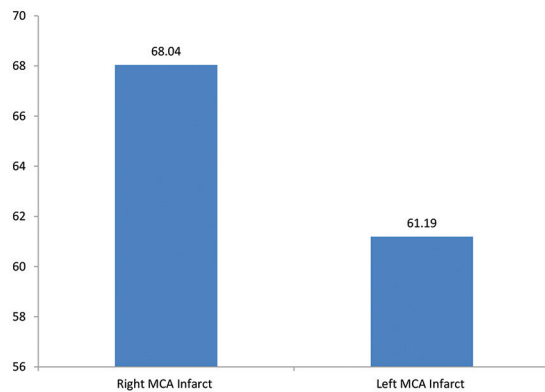
#ANOVA test; P = 0.01



**Table 1.7: Quality of life of stroke patients according to side of lesion**

Side of lesion	Number (%)	Mean±SD
Right MCA infarct	54 (56.3)	68.04±10.064
Left MCA infarct	42 (43.8)	61.19±8.540
Total	96 (100)	65.04±9.982

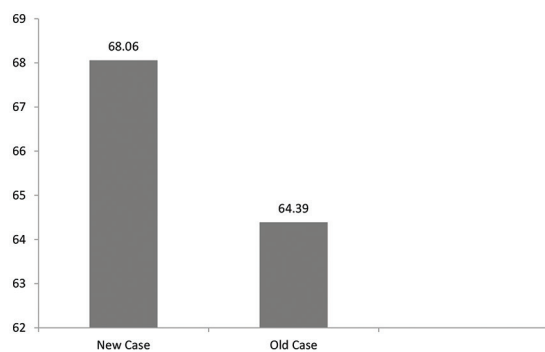
#t-test; P = 0.001



**Table 1.8: Quality of life of stroke patients according to duration of stroke**

Case	Number (%)	Mean±SD
New case (1 to 2 year)	17 (17.7)	68.06±6.427
Old case (>2 year)	79 (82.3)	64.39±10.511
Total	96 (100)	65.04±9.982

#t-test; P = 0.069



result in a sample of required sample size 96 will be covered.

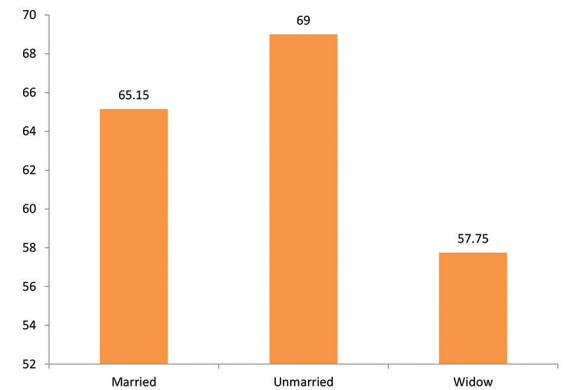
**Method of collection of data**

Prior informed written consent in the local language was taken from all the patients included in the study. For those who were illiterates, the consent was read out and explained to them in their language

**Table 1.9: Quality of life of stroke patients according to marital status**

Marital status	Number (%)	Mean±SD
Married	87 (90.6)	65.15±10.107
Unmarried	5 (5.2)	69.00±6.442
Widow	4 (4.2)	57.75±8.617
Total	96 (100)	65.04±9.982

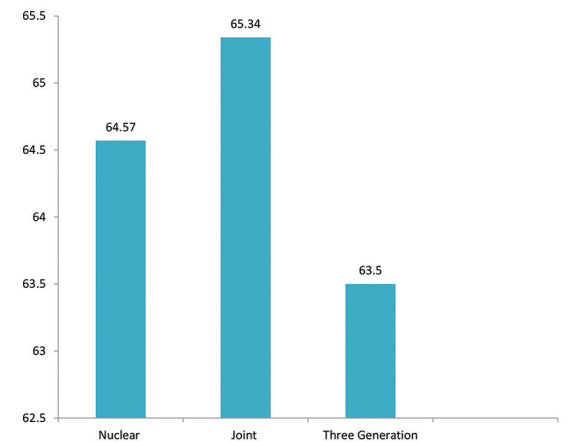
#ANOVA test; P = 0.233



**Table 1.10: Quality of life of stroke patients according to type of family**

Types of family	Number (%)	Mean±SD
Nuclear	28 (29.2)	64.57±9.485
Joint	64 (66.7)	65.34±10.467
Three generation	4 (4.2)	63.50±6.137
Total	96 (100)	65.04±9.982

#ANOVA test; P = 0.899



and consent was obtained by taking their signature in the consent form.

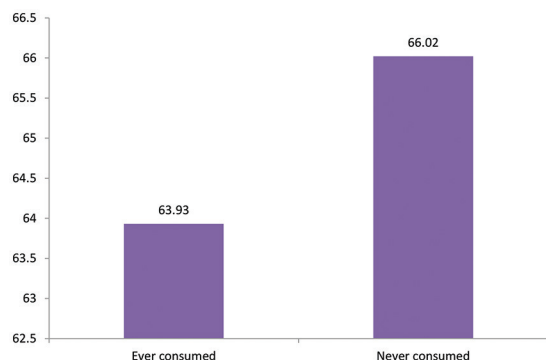
All patients under the study were personally interviewed and administered the questionnaire.



**Table 1.11: Quality of life of stroke patients according to alcoholism**

Alcoholism	Number (%)	Mean±SD
Ever consumed	45 (46.9)	63.93±9.488
Never consumed	51 (53.1)	66.02±10.393
Total	96 (100)	65.04±9.982

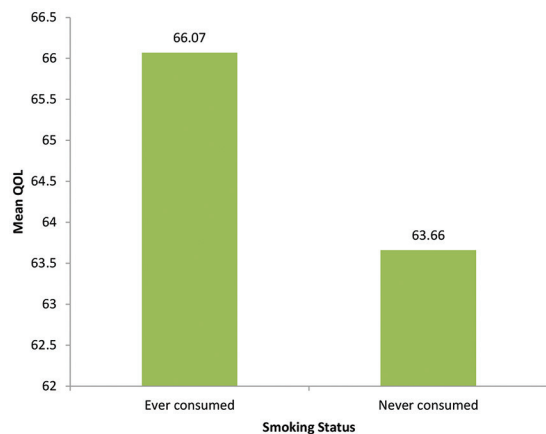
#t-test; P = 0.307



**Table 1.12: Quality of life of stroke patients according to smoking**

Smoking	Number (%)	Mean±SD
Ever smoked	55 (57.3)	66.072±10.713
Never smoked	41 (42.7)	63.66±8.848
Total	96 (100)	65.04±9.982

#t-test; P = 0.230



Approval of NIMS Hospital, Jaipur Ethical committee was obtained.

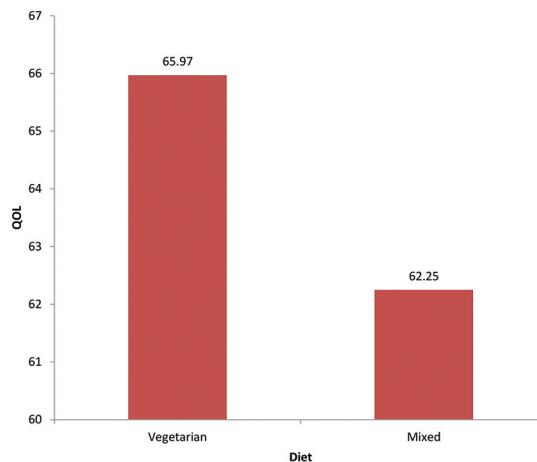
**Statistical analysis**

WHO QOL-BREF produces a QOL profile. We have derived from domain score. In WHO QOL-BREF

**Table 1.13: Quality of life of stroke patients according to diet**

Diet	Number (%)	Mean±SD
Vegetarian	72 (75)	65.97±10.403
Mixed	24 (25)	62.25±8.163
Total	96 (100)	65.04±9.982

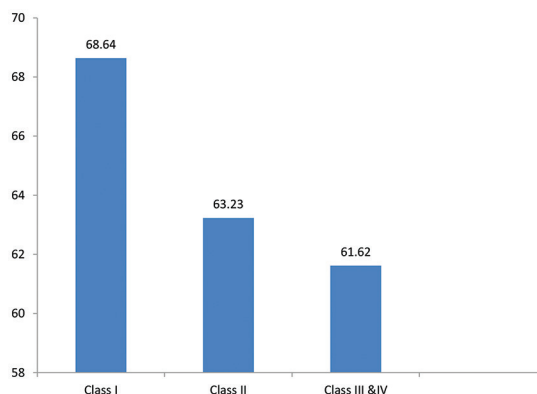
#t-test; P = 0.078



**Table 1.14: Quality of life of stroke patients according to socioeconomic status**

Socioeconomic status	Number (%)	Mean±SD
Class I	36 (37.5)	68.64±10.524
Class II	47 (49)	63.23±9.279
Classes III and IV	13 (13.5)	61.62±8.451
Total	96 (100)	65.04±9.982

#ANOVA test; P = 0.019



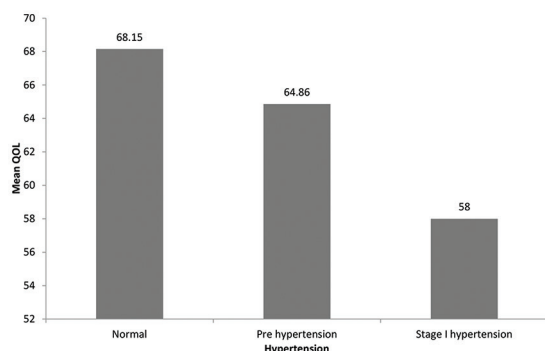
questionnaire Question 1 – describes an individual’s overall perception of QOL and Question 2 – describes an individual’s overall perception of their



**Table 1.15: Quality of life of stroke patients according to hypertension**

Hypertension	Number (%)	Mean±SD
Normal	20 (20.8)	68.15±11.132
Pre hypertension	69 (71.9)	64.86±9.679
Stage I hypertension	7 (7.3)	58.00±5.745
Total	96 (100)	65.04±9.982

#ANOVA test; P = 0.064



health. The responses given by the participants for each question (item) in the questionnaire were coded in a positive direction (higher score denotes higher QOL). These score were considered as the raw score. The frequency and percentages are described for each of the score and for each item/questionnaire and are presented in Table 2.1.

**Study variables**

**Age**

We have arbitrarily classified age into <45 years, 46–65 years and more than 66 years.

**Sex**

We have classified into male and female.

**Educational status**

**No Education**

The person who cannot read and write with understanding in any language.

**Schooling**

The person who can read in any school level, that is

**Primary school**

A person who has studied in any class between 1<sup>st</sup> and 5<sup>th</sup> standard.

**Middle school**

A person who has studied anywhere between 6<sup>th</sup> and 8<sup>th</sup> standard.

**High school**

The person who has studied 9<sup>th</sup> and 10<sup>th</sup> passed.

**Intermediate**

The person who has studied 11<sup>th</sup> and 12<sup>th</sup> passed.

**Graduate**

The person who has done a degree or diploma course.

**Postgraduate**

The person who has done a postgraduate degree course.

**Type of family**

**Nuclear family**

Married couple and their children, while they are still regarded as dependents.

**Joint family**

It consists of a number of married couples and their children who live together in the same household. All the men are related by blood and the women of the household are their wives, unmarried girls and widows of the family kinsmen.

**Three generation family**

It is a household where there are representatives of three generations, related to each other by direct descent. It occurs usually when young couples are unable to find separate housing accommodation and continue to live with their parents and have their own children.

**Occupation**

**Unemployed**

(a) Unemployed, (b) retired, (c) students, and (d) housewives.

**Unskilled worker**

(a) Laborers, (b) peon, (c) vegetable vendor, (d) domestic servants, and (e) sweeper.



**Table 2.1: Frequency responses (%) for the predominant domains of QOL**

Domains and scale points	QOL scores (%)				
	1	2	3	4	5
General quality of life	0	58 (60.4)	34 (35.4)	4 (4.2)	0
General health	1 (1.0)	57 (59.4)	31 (32.3)	6 (6.3)	1 (1.0)
Physical domain					
Pain and discomfort	0	2 (2.1)	37 (38.5)	48 (50.0)	9 (9.4)
Energy and fatigue	15 (15.6)	58 (60.4)	19 (19.8)	3 (3.1)	1 (1.0)
Sleep and rest	0	34 (35.4)	17 (17.7)	42 (42.8)	3 (3.1)
Dependence on medication	1 (1.0)	18 (18.85)	73 (76)	3 (3.1)	1 (1.0)
Mobility	1 (1.0)	55 (57.3)	31 (32.3)	9 (9.4)	0
Activities of daily living	1 (1.0)	52 (54.2)	31 (32.3)	11 (11.5)	1 (1.0)
Work capacity	2 (2.1)	58 (60.4)	23 (24)	13 (13.5)	0
Psychological domain					
Enjoy life	15 (15.6)	28 (29.2)	45 (46.9)	7 (7.3)	1 (1.0)
Meaningful life	12 (12.5)	28 (29.2)	44 (45.8)	7 (7.3)	5 (5.2)
Self esteem	0	55 (57.3)	28 (29.2)	11 (11.5)	2 (2.1)
Concentration	10 (10.4)	32 (33.3)	50 (52.1)	3 (3.1)	1 (1.0)
Body image	11 (11.5)	55 (57.3)	26 (27.1)	2 (2.1)	2 (2.1)
Negative feeling	1 (1.0)	7 (7.3)	47 (49)	12 (12.5)	29 (30.2)
Social relationships					
Personal relationships	0	44 (45.8)	40 (41.7)	11 (11.5)	1 (1.0)
Sex	1 (1.0)	38 (39.6)	54 (56.3)	2 (2.1)	1 (1.0)
Social support	2 (2.1)	21 (21.9)	24 (25.0)	46 (47.9)	3 (3.1)
Environment					
Financial resources	9 (9.4)	43 (44.8)	38 (39.6)	5 (5.2)	1 (1.0)
Information and skills	3 (3.1)	40 (41.7)	48 (50.0)	5 (5.2)	0
Recreation and leisure	4 (4.2)	40 (41.7)	47 (49.0)	5 (5.2)	0
Home environment	0	13 (13.5)	31 (32.3)	50 (52.1)	2 (2.1)
Access to health and social care	0	5 (5.2)	18 (18.8)	71 (74.0)	2 (2.1)
Physical safety and security	10 (10.4)	30 (31.3)	53 (55.2)	0	3 (3.1)
Physical environment	2 (2.1)	31 (32.3)	55 (57.3)	6 (6.3)	2 (2.1)
Transport	0	8 (8.3)	28 (29.2)	57 (59.4)	3 (3.1)

QOL: Quality of life

**Table 2.2: Mean scores for four domains of quality of life**

	Physical	Psychological	Social relationship	Environmental
Mean	39.698	36.760	46.698	50.427
Std. Deviation	11.47	14.74	14.23	10.43
Minimum	19.0	6.0	19.0	25.0
Maximum	81.0	81.0	94.0	94.0



**Semi-skilled worker**

(a) Agricultural laborers, (b) factory workers, (c) potters, and (d) security guard.

**Skilled worker**

(a) Tailor, (b) carpenter, (c) artisan, (d) electrician, (e) painter, (f) barber, (g) supervisor, (h) driver, (i) plumber, (j) postman, (k) gardener, (l) cook, (m) mason, (n) soldier, (o) constable, and (p) mechanic.

**Semi professional**

(a) Teacher, (b) pharmacist, (c) social worker, (d) computer programmer, (e) nurse, (f) constructor, (g) government employee, and (h) owner of small business and manager.

**Professional**

(a) Doctor, (b) physiotherapist, (c) principal, (d) director, (e) lawyer, (f) military officer, (g) senior executive, (h) writer, (i) scientist, (j) police officer, (k) university professor, and (l) engineer.

**Socio-economic status**

Socio-economic status of the urban family was assessed using Modified Kuppuswamy's method of socio-economic scale, which is based on the following three characteristics of the family.

1. Educational status of the head of the household
2. Type of occupation of the head of the household
3. Monthly income of the family.

**Marital status**

We have classified marital status into married, unmarried, divorced, and widowed.

**Place of residence (locality)**

We have classified patients into urban and rural according to their permanent residence.

**Religion**

We have classified religion into Hindu, Muslim, Christian, and Others.

**Side of lesion**

We have classified into right MCA infarct and left MCA infarct.

**Diet**

We have classified into vegetarian and mixed type of diet.

**Alcoholism**

We have classified into ever consumed and never consumed.

**Smoking**

We have classified into ever smoked and never smoker.

**Hypertension**

We have classified into normal (systolic blood pressure [SBP] <120 mm of Hg, diastolic blood pressure [DBP] <80 mm of Hg), pre hypertension (SBP 120–139 mm of Hg, DBP 80–89 mm of Hg).

**Observation and Results**

Results of the study have been presented under the following headings:

1. Representation of QOL in various demographic factors.
2. Descriptive summary for the various items according to four domains of QOL.

**Association of QOL with respect to various factors**

In the present study, the mean QOL of study subjects was  $65.04 \pm 9.982$ . We observed that QOL of study subjects were high in the age group of 45 years or lesser group ( $66.09 \pm 7.726$ ) and less in the age group of 46 to 65 years ( $64.81 \pm 10.711$ ) Table 1.1.

The mean QOL score was  $66 \pm 10.3$  in males and  $61.62 \pm 7.8$  in females Table 1.2.

In the present study, we found that patients from urban area (67.7) had better mean QOL score  $64.2 \pm 10.5$  than patients from rural areas Table 1.3.

In the present study, it is observed that the mean QOL score was almost same in both religions Table 1.4.

We have seen that patients with higher education had better QOL as compared to patients with lesser education. The mean QOL score was  $65.04 \pm 9.982$  among patients who had graduate and postgraduate education than patients with no education who had QOL of  $60.57 \pm 7.249$  Table 1.5.

Patients who were higher up in the hierarchy of





occupation had better QOL score than the other patients Table 1.6.

Patients had better QOL in right MCA Infarct ( $68.04 \pm 10.064$ ) rather than in left MCA Infarct Table 1.7.

New cases of stroke had better QOL ( $68.06 \pm 6.427$ ) than old cases ( $64.39 \pm 10.511$ ) Table 1.8.

In the present study, unmarried having better mean QOL ( $69.00 \pm 6.442$ ) and poor mean QOL in widow patients ( $57.75 \pm 8.617$ ) Table 1.9.

The study subjects who belonged to joint family had better mean QOL ( $65.34 \pm 10.467$ ) than patients belonging to nuclear family and three generation Table 1.10.

We found that patients who were never consumed alcohol had better mean QOL than former and ever consumed individuals Table 1.11.

Almost similar mean QOL score in ever smoked and never smoked consumed individuals Table 1.12.

In the present study, vegetarian was better mean QOL ( $65.97 \pm 10.403$ ) than patients who are having mixed diet, we observed Table 1.13.

Stroke patients from socioeconomic status Class I had better QOL ( $68.64 \pm 10.524$ ) than in Class II and poor QOL in Classes III and IV Table 1.14.

Individuals with normal blood pressure were having better QOL ( $68.15 \pm 11.132$ ) than pre-hypertensions and hypertensives Table 1.15.

### **Descriptive summary for the various items according to four domains of QOL**

#### **1. Physical Domain**

Majority (60.4%) of the stroke patients described their general quality of life to be poor. Majority (59.4%) of the stroke patients described their general health as dissatisfied. Nearly 50% of patients were having very much pain & discomfort and 39% were having moderate pain & discomfort. In energy and fatigue, 15.6% of patients were having no energy and 60.4% were having little energy of work and activities of daily living. Around 35.4% were dissatisfied, 17.7% were neither satisfied nor dissatisfied and 42.8% were satisfied with sleep and rest. About, 76% were moderately and 18.85% were a little dependence on medication. For mobility, 57.3% of the stroke patients described as poor, 32.3% as neither poor nor good and only 9.4% as good mobility. When activities of daily living (ADL) were assessed, 54.2% were dissatisfied, 32.3% were neither satisfied nor dissatisfied 11.5% were satisfied and only 1%

were very satisfied. With work capacity, 60.4% were dissatisfied, 24% were neither satisfied nor dissatisfied and 13.5% were satisfied.

#### **2. Psychological Domain**

About, 16% did not enjoy life and only 46.5% moderately enjoyed their life. Around, 45.8% of stroke patients felt that they had a moderate meaningful life. Only, 11.5% of the stroke patients had a satisfied self-esteem. Hardly 5% of the stroke patients had satisfied concentration ability. Around 84.4% of stroke patients had little to moderate acceptance of their bodily appearance. Around 93% of stroke patients had negative feelings.

#### **3. Social Relationship**

Only 11.5% of the stroke patients had a satisfied personal relationship and 4% had a satisfied sexual life. Around 48% of the stroke patients described to have a satisfied social support.

#### **4. Environment Domain**

Around 84.4% of stroke patients had either little to moderate financial support. Almost 91.7% of the stroke patients received either little or moderate information and skills for day-to-day life. Only 46.9% of the stroke patients had little opportunity for leisure activities. Only 52.1% half of the stroke patients were satisfied with their home environment. Majority i.e. 74% described their access to health and social care to be satisfied. Majority, i.e. 55.2% described that they had a moderate amount of feeling of safe place in their daily life. Only 57.3% of stroke patients describe to have a architectural barrier (physical environment) for healthy living. Only 59.9% of stroke patients describe to have satisfied with transports service.

### **Conclusion**

It can be said that quality of life is a multidimensional concept. As stroke cases is among the most devastating of health aspect, having multiple and profound effects on all aspects of life; hence, evaluation of QOL is very important. QOL depends on patients with physical, social, psychological, and environmental aspects. Each and every effort should be made to improve these aspects and, in turn, to activity daily living and to improve the overall quality of stroke patients.



**Recommendations**

It is important to establish the reasons behind the inability of rehabilitation to reach those people who cannot afford to go to the local health centers. The required patient to staff levels for effective rehabilitation during in-patient physiotherapy needs to be investigated to improve health delivery to patients post-stroke.

**References**

1. Bhattacharjee M, Vairale J, Gawali K, Dalal PM. Factors affecting burden on caregivers of stroke survivors, Population based study in Mumbai (India). *Ann Indian Acad of Neurol* 2012;15:113-9.
2. Paul SL, Sturm JW, Dewey HM, Donnan GA, Macdonell RA, Thrift AG. Long-term outcome in the North East Melbourne stroke incidence study: Predictors of quality of life at 5 years after stroke. *Stroke* 2005;36:2082-6.
3. Nichols-Larsen DS, Clark PC, Zeringue A, Greenspan A, Blanton S. Factors influencing stroke survivors' quality of life during sub-acute recovery. *Stroke* 2005;36:1480-4.
4. Sims NR, Muyderman H. Mitochondria, oxidative metabolism and cell death in stroke. *Biochim Biophys Acta* 2010;1802:80-91.
5. Xie J, Wu QE, Zheng JZ. Impact stroke on health related quality of life in the non-institutionalized population in the United States. *Stroke* 2006;37:2567-72.
6. Das SK, Banerjee TK, Biswas A, Roy T, Raut DK, Mukherjee CS, et al. A prospective community-based study of stroke in Kolkata, India. *Stroke* 2007;38:906-10.

