
ORIGINAL ARTICLE**Predictors of disability and quality of life in rural and urban stroke survivors***Saraswathi N^{1,2*}, Aralikatte Onkarappa Saroja², Karkala Ravishankar Naik²*

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Abstract

Background: Stroke is a common neurological disorder associated with long term morbidity and/or dependency of patient on family members leading to consequent disturbances in the life of caregivers. *Aim and Objectives:* A hospital based cross-sectional study was aimed to compare the disability and Quality of Life (QOL) between the rural and urban population at 3 months after stroke in North Karnataka. *Material and Methods:* Patients were assessed with National Institutes of Health Stroke scale (NIHSS), modified Rankin scale (mRS), modified Barthel index (MBI), World health organization quality of life-BREF (WHOQOL-BREF) questionnaire. Socio-demographic, vascular risk factors and stroke characteristics were compared in both the groups. *Results:* Ischaemic type was predominant with higher number of patients with moderate severity were observed in rural (52.4%) than urban (42.2%). Tobacco use (50.35%) was high in rural patients whereas past history of stroke (47.71%) was high in urban patients. QOL was poor (score <60) in both rural and urban patients at 3 months. Age, duration of stay, complications, stroke severity, and disability at the time of discharge had significant effect on QOL of both urban and rural patients. This is the first report from north Karnataka comparing the risk factors, severity, disability, QOL in rural and urban stroke patients. *Conclusion:* Interdisciplinary approach is required to improve the QOL and overcome any disabilities among rural and urban stroke patients.

Keywords: Functional Independence, Quality of life, Rankin Score, Stroke severity

Introduction

Stroke or cerebro-vascular accident has multitude of negative consequences on an individual life such as loss of independence, immobility, cognitive impairment, and communication difficulties. This requires a major adjustment in the social function and psychology of stroke survivors. Stroke is known for its distressing and disabling sequelae with associated poor Quality of Life (QOL) [1]. Prevalence rate of stroke as reported from an Indian study for urban population was 45 to 487/100000 and for rural population 55 to 388.4/100000 [2].

According to the World Health Organisation, QOL is defined as individual's perception of their life in

the context of their culture and value systems in which they live and in relation to their goals, expectations, standards and concerns [3]. 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 environment, physical and mental health, education, recreation and leisure time, and social belonging. Stroke has a detrimental effect, both on short term and long term QOL [4-6]. Compromised function demands adjustments, support and caregiving from the members of family [7].

Stroke leads to shorter- and longer-term decline in QOL in majority of survivors. India like other developing countries is in the midst of a stroke epidemic. There is a huge burden of stroke with significant regional variations. Stroke units, thrombolysis, and rehabilitation are predominantly available in urban areas, particularly in private sector hospitals. Rural population in India in comparison with its urban population has always thought to have lower level of health care accessibility and must travel to nearest bigger city for treatment [8]. Many Indian studies have reported poor QOL of stroke survivors [7-11].

Short term functional outcome, disability and the determinants of QOL in rural and urban stroke survivors are lesser-known fact. Normally, post-stroke physical, psychological, social and environmental expectations of patients who live in different areas, with different socio-economic status and different environments might have differences [12,13]. The assessment of QOL among these stroke survivors can be helpful in developing more comprehensive interventions for strategizing rehabilitative services in both rural and urban.

Hence, this study aimed to compare the outcome parameters particularly the disability and QOL between the rural and urban population at 3 months after stroke. Also, comparing the factors contributing to the disability and QOL in both rural and urban population. Based on previous studies, it is hypothesised that the outcome in rural would be poorer when compared to the urban.

Material and Methods

A hospital based cross-sectional study was undertaken in the Department of Neurology of a tertiary

care teaching hospital situated in North Karnataka, India, from July 2019 to June 2020. Study had the necessary approval from the Institutional Ethics Committee (KAHER/EC/19-20/290619001). Adult patients with acute stroke who attended the Neurology Department and willing to participate by giving written informed consent were enrolled.

A total of 250 participants were allocated into rural area (n=141) and urban area (n=109) depending on the place of residence. All the individuals of acute stroke (ischaemic and haemorrhagic strokes) patients who are admitted in the Department of Neurology were included in the study. The participants with recurrent strokes, cerebrovenous thromboses, vascular malformations, subarachnoid haemorrhages, serious medical condition, severe psychiatric disorder, and National Institutes of Health Stroke Scale (NIHSS) score more than 24 were excluded. Sample size was calculated based on the following equation and previous report on prevalence (46.3%) [14].

$$n = \frac{p(100 - p)Z^2}{E^2}$$

Minimum sample size was found to be 206, at 85 % confidence with the absolute precision of 5 %. Further to increase the accuracy of the test sample size was rounded off to 250. Detailed socio-demographic data and clinical history was collected from the participants. Information about the onset of symptoms, duration of stay at the hospital, lifestyle of the patients like alcohol and tobacco consumption, cardio vascular risk factors like hypertension, diabetes, past and family history of cardiovascular disorders were enquired. Validated instruments such as NIHSS, modified

Rankin Scale (mRS), Modified Barthel Index (MBI) of activities of daily living (ADLs) and World Health Organization Quality of Life-Biomedical Research and Education Facility (WHOQOL-BREF) questionnaire were used to evaluate the participants.

The severity of stroke was assessed using the NIHSS scale [15]. Severity score was obtained by the addition of each of the 12 elements comprising of level of consciousness to questions and commands, gaze, visual, facial palsy, motor arm, motor leg, limb ataxia, sensory, best language, dysarthria, and extinction/inattention). A score of 0 indicates no stroke symptoms, 1-4 as minor, 5-15 as moderate, 16-20 as moderate to severe and >20 as severe.

The clinical outcome that is disability after stroke was measured using the mRS at the time of discharge [16]. The mRS score of 0-1 was considered as favourable and 2-5 as unfavourable outcome. At 3 months post stroke, all the participants were further evaluated for functional status using MBI [17,18]. It is used as a measure of physical disability, used widely to assess behaviour relating to activities of daily living for stroke patient. The MBI score is obtained using 10 categories comprising of feeding, dressing, personal hygiene, bathing, toileting, bowel and bladder controls, mobility and stair climbing that are related to ADLs, the outcome is assessed by totaling the points bestowed to each category. High score indicated high functional independence.

WHOQOL-BREF, a 26-item questionnaire developed by WHO was utilized to assess QOL [3,19]. Two questions assess the domains on perception of QOL and perception of health of the patients; and the rest of the 24 questions were

categorized into another 4 domains: physical health with 7 items; psychological health with 6 items; social relationship with 3 items; and environmental health with 8 items. All questions were scored by Likert scale of 5-points. The total score of each domain was calculated according to the scores tables guidelines provided by WHO in the original WHOQOL-BREF. A higher score means a higher QOL.

Statistical analysis

Data were analyzed using SPSS, version 26.0 statistical software and Microsoft Excel. Categorical variables were given in the form of frequency tables. Continuous variables were given as Mean \pm SD / Median (Min, Max). Chi square test is used check the association between categorical variables. Continuous variables were analyzed using t test/ Mann Whitney u test. Correlational analysis was done depending on the data. Value of p less than or equal to 0.05 indicates statistical significance.

Results

Socio-demographic factors and stroke characteristics were compared between rural and urban participants using chi-square test (Table 1). A significant association was observed for education ($p=0.000$), employment ($p=0.01$) and socio-economic status ($p=0.000$). Infarction was the most common pathology in the stroke type, which was similar in both the groups. But the percentage of hemorrhagic type was more frequent in rural group (61.5%). Right side of the brain was affected more in both the groups. Moderate stroke severity was noted more among the rural group than urban group. However no significant association observed among stroke characteristics between rural and urban population.

Table 1: Comparison of socio-demographic factors and stroke characteristics among rural and urban population

Socio-demographic factors		Rural n=141 (56.4%)	Urban n=109 (43.6%)	<i>p</i>
Gender	Male	108 (57.8%)	79 (42.2%)	0.457
	Female	33 (52.4%)	30 (47.6%)	
Education	Illiterates	26 (81.3%)18	6 (18.8%)5	0.000*
	High school	56 (65.9%)39	29 (34.1%)26	
	Grade 10	18 (54.5%)12	15 (45.5%)13	
	Grade 12	16 (57.1%)11	12 (42.9%)11	
	Graduation	24 (36.9%)17	41 (63.1%)37	
	Post-graduation	1 (14.3%)0.7	6 (85.7%)5	
Employment	Unemployed	6 (42.9%)	8 (57.1%)	0.010*
	Housewife	29 (52.7%)	26 (47.3%)	
	Farmer	61 (93.8%)	4 (6.2%)	
	Retired	7 (25.0%)	21 (75.0%)	
	Private	20 (45.5%)	24 (54.5%)	
	Govt	7 (31.8%)	15 (68.2%)	
	Business	11 (50.0%)	11 (50.0%)	
Socio-economic status	Lower ses	13 (81.3)%	3 (18.8)%	0.000*
	Lower middle	49 (47.1)%	55 (52.9)%	
	Upper lower	77 (65.8)%	40 (34.2)%	
	Upper middle	2 (15.4)%	11 (84.6)%	
Stroke characteristics				
Subtype	Ischaemic type	109 (55.1%)	89 (44.9%)	0.248
	Haemorrhagic type	32 (61.5%)	20 (38.5%)	
Side of lesion in brain	Right	67 (54.0%)	57 (46.0%)	0.755
	Left	64 (58.7%)	45 (41.3%)	
	Bilateral	10 (58.8%)	7 (41.2%)	
Stroke severity (NIHSS)	Minor	34 (47.9%)	37 (52.1%)	0.178
	Moderate	74 (61.7%)	46 (38.3%)	
	Severe	33 (55.9%)	26 (44.1%)	

*Statistically significant with *p* value < 0.05

The common vascular risk factors were hypertension, diabetes mellitus, dyslipidemia and presence of ischaemic heart disease (Table 2). The tobacco and alcohol consumption were found to be higher in rural group (63.4%, 60.3%) than urban group (36.6%, 39.7%) respectively. There is

not much significant difference in vitamin B12 deficiency and hyper-homocystinemia. A significant association was observed for tobacco use ($p=0.03$) and past history of stroke ($p=0.008$) amongst rural and urban participants.

Table 2: Comparison of vascular risk factors between rural and urban participants

Variables		Rural n (%)	Urban n (%)	<i>p</i>
Hypertension	Present	42 (54.5%)	35 (45.5%)	0.693
	Absent	99 (57.2%)	74 (42.8%)	
Diabetes Mellitus	Present	41 (50.0%)	41(50.0%)	0.093
	Absent	100 (59.5%)	68 (40.5%)	
Dyslipidemia	Present	23 (46.9%)	26 (53.1%)	0.092
	Absent	118 (58.7%)	83 (41.3%)	
Ischemic Heart Disease	Present	17 (53.1%)	15 (46.9%)	0.415
	Absent	124 (56.9%)	94 (43.1%)	
Tobacco use	Present	71(63.4%)	41(36.6%)	0.030*
	Absent	70 (50.7%)	68 (49.3%)	
Alcohol use	Present	82 (60.3%)	54 (39.7%)	0.110
	Absent	59 (51.8%)	55 (48.2%)	
Past History of Stroke	Present	45(46.4%)	52 (53.6%)	0.008*
	Absent	96 (62.7%)	57 (37.3%)	
Family history of Stroke	Present	61(58.7%)	43(41.3%)	0.317
	Absent	80(54.8%)	66 (45.2%)	
Vitamin B₁₂ levels	Normal	112 (57.1%)	84 (42.9%)	0.382
	Deficiency	29 (53.7%)	25 (46.3%)	
Homocysteine levels	Normal	94(56.3%)	73 (43.7%)	0.916
	Increased	47(56.6%)	36 (43.3%)	

*Statistically significant with p value < 0.05

The mean duration of stay in the hospital is similar in both the groups. (rural= 7.13 ± 4.02 and urban = 7.6 ± 5.01 days) with no significance ($p = 0.750$). There was no statistically significant difference in

the blood pressure level ($p = 0.655$, $p = 0.842$), vitamin B12 ($p = 0.925$), homocysteine ($p = 0.202$) and cholesterol levels ($p = 0.972$) during admission (Table 3).

Table 3: Sociodemographic, clinical characteristics, disability score and WHOQOL-BREF score among the rural and urban group

Variables	Rural (n=141)	Urban (n=109)	<i>p</i>
Age (years)	57.82 ± 13.84 (57.82-55.57)	59.93 ± 13.57 (57.35-62.25)	0.17
Duration of stay (days)	7.13 ± 4.02 (6.46-7.8)	7.6 ± 5.011 (6.64-8.55)	0.750
Systolic blood pressure	147.51 ± 25.45 (143.24-151.78)	148.20 ± 26.56 (143.16-153.25)	0.655
Diastolic blood pressure	86.26 ± 11.43 (84.34-88.18)	86.55 ± 13.51 (83.99-89.12)	0.842
Random blood sugar	152.81 ± 75.52 (140.42-165.75)	153.17 ± 61.52 (141.48-164.85)	0.38
Cholesterol	121.68 ± 74.58 (109.17-134.19)	126.70 ± 73.37 (112.77-140.63)	0.972
Severity of stroke	10.01 ± 5.42 (9.10-10.92)	9.83 ± 5.96 (8.69-10.96)	0.754
Disability	73.56 ± 25.217 (69.32-77.8)	75.87 ± 25.08 (69.32-77.8)	0.405
Physical domain of QOL	13.52 ± 3.67 (12.9-14.13)	13.51 ± 3.66 (12.81-14.21)	0.702
Psychological domain of QOL	12.58 ± 3.29 (12.03-13.14)	12.66 ± 3.25 (12.04-13.27)	0.854
Social domain of QOL	14.07 ± 1.41 (13.83-14.3)	14.09 ± 1.35 (13.83-14.34)	0.793
Environmental domain of QOL	13.82 ± 1.52 (13.57-14.08)	13.84 ± 1.53 (13.54-14.13)	0.903
Total QOL	53.90 ± 9.25 (52.36- 55.44)	54.10 ± 9.19 (52.36-55.85)	0.943

Data represented as mean \pm standard deviation (95% Confidence interval), Mann whitney U test used for comparison

The comparison of disability with other variables showed that duration of stay ($p < 0.001$), complications ($p = 0.003, p = 0.001$), severity of stroke ($p < 0.001$) and mRS score ($p < 0.001$) are significantly correlated in both the groups (Table 4). However, age and tobacco consumption was significant only in urban group. A significant correlation was observed among age ($p = 0.002, p < 0.001$), duration of stay ($p < 0.001$), complications ($p = 0.013, p < 0.001$), and mRS score ($p < 0.001$) with QOL (Table 4). The Barthel index score measured at 3 months post discharge, for rural population was 73.56 ± 25.21 and 71.11 ± 25.08 for urban population. Frequency and mean value of disability in rural stroke survivors is higher compared to urban stroke survivors though statistically not significant between the two groups.

However, forced linear regression analysis between the dependent variable quality of life and the various factors were done separately for rural and urban population with some difference in the factors influencing quality of life. subtype of stroke and side of the brain involved in stroke and vitamin B₁₂ deficiency are found to be the factors responsible for poor quality of life in rural population whereas tobacco consumption in urban population. The common factors for both the groups include duration of stay in the hospital, presence of complications, stroke severity and MRs score at the time of discharge are contributing factors for poor quality of life in both the population.

Table 4: Correlation of disability and quality of life

Variables	Disability (p)		Quality of life (p)	
	Rural	Urban	Rural	Urban
Age	0.424	<0.001*	0.002*	<0.001*
Past History of stroke	0.019*	0.258	-	-
Education	-	-	0.013*	0.254
Dyslipidemia	0.405	0.054	-	-
Tobacco consumption	0.326	0.020*	0.427	0.010*
Duration of stay	<0.001*	<0.001*	0.001*	<0.001*
complications	0.003*	0.001*	0.013*	<0.001*
Severity of stroke	<0.001*	<0.001	<0.001	0.001*
Subtype	0.001*	0.449	0.080	0.413
Side involved	-	-	0.050	0.311
Vitamin B ₁₂ deficiency	0.057	0.209	0.014*	0.088
mRS score at the time of discharge	<0.001*	<0.001*	<0.001*	<0.001*

Discussion

India is a vast country with diverse socio-cultural practices across regions influencing the after care and rehabilitation services. Rural and urban differences have been noted in studies from India with respect to risk factors and type of stroke [7-9, 12, 20]. But the contributing factors for disability and quality of life with rural urban differentiation have not been studied earlier. This is the first study aimed to examine the differences in predictors of quality of life of stroke survivors at three months between rural and urban population from north Karnataka.

More than 70% of stroke patients were males, both in urban and rural population, no significant difference observed. Similar observation is reported by various studies from Mumbai, Bangalore, Trivandrum and rural areas of Karnataka [7, 10-11]. Education level may contribute to understanding of the disease and expectations. In this study, significant differences in the level of education were noted amongst rural and urban stroke patients. The ischaemic type of stroke was predominantly seen compared to hemorrhagic type in both rural and urban population. However, difference was insignificant, similar to other published literature [6-7, 9, 13, 20-21]. Severity of the stroke was observed to be similar among rural and urban patients. However, slightly a higher number of patients with moderate severity were observed in rural (52.4%) than urban (42.2%), comparable with Poland study [5].

Among the vascular risk factors, tobacco usage and history of stroke significantly affected the rural and urban patients. Tobacco use was high in rural patients whereas past history of stroke was high in urban patients. Among the other factors,

hypertension, diabetes mellitus, dyslipidemia, heart disease, vitamin B₁₂ deficiency were slightly increased in urban patients. Alcohol use, family history of stroke was observed in rural patients. This observation can be attributed to the lifestyle, eating habits, socio-demographic changes and physical activity of urban and rural patients. However, vascular risk factors were statistically insignificant. This comparison provides substantial reassurance that these risk factors are public health problem in both rural and urban population [5-9, 12-13, 20-22].

Overall QOL was poor (score <60) in both rural and urban patients at 3 months. Though there were differences in sociodemographic, clinical risk factors, stroke severity among rural and urban patients, none of these factors showed different effect on QOL of urban and rural patients at 3 months. However, individually age, duration of stay, complications, stroke severity, and disability at the time of discharge had effect on QOL of both urban and rural patients. In a study from rural areas of North Kerala, persistent disability is shown to have impact on QOL [9]. A study from Jaipur reported better QOL among rural compared to urban areas [8]. A 3 year study from Canadian hospital has reported that initial improvements in QOL followed by decline in QOL overtime [4].

The launch of National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS) program by Government of India has supported the screening of the vascular risk factors and providing treatment at primary health care level, yet acute management of stroke is opulence in rural areas [20]. Irrespective of urban and rural area Pucciarelli *et*

al. showed that 50 % survivors had no significant moderating effects of mutuality for QOL over time [23]. In another study from India which included both stroke survivors and their caregivers showed that stroke has a considerably negative impact on the QOL of patients and their caregivers. Authors also highlighted requirement of target based interventions at both stroke survivors and caregivers to improve their QOL [24].

The present study would have been more inferential if comparison could have been done before and after the interventions. Additional research is needed to understand and address factors like variations in care, rehabilitation services and socio-cultural determinants of stroke recovery which may contribute to disability and quality of life.

Conclusion

This is the first report from North Karnataka comparing the risk factors, severity, disability,

QOL in rural and urban stroke patients. Though the vascular risk factors were comparable in rural and urban patients, it is less likely to be controlled in rural than urban areas. This study suggests that interdisciplinary approach is required to improve the QOL and overcome any disabilities among rural and urban stroke patients. There is also a need to determine a basis for developing rural and urban care models for stroke survivors to improve their QOL. It is imperative to develop specific programs for recovery and develop policies aiming to control risk factors for stroke patients. Disability can be minimized and QOL can be improved by providing services at rehabilitation centres.

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