

Economic Burden of Acute Stroke Care in Beneficiaries and Non-Beneficiaries under Social Security Schemes at Tertiary Care Hospitals of Western Rajasthan

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Abstract

Objective: A cost of illness study was conducted with aims to assess various cost of acute stroke care and its determinants among beneficiary (patients enrolled in any social security scheme) and non beneficiary (patients not enrolled in any social security scheme) of various social security schemes. **Method:** A cross-sectional study was conducted at government hospitals in western Rajasthan from March to May 2019. All consecutive stroke patients were enrolled during study period. Data related to socio-demographic, disease-related and cost-related data was collected by direct patient and main caregiver's interview. Primary study outcome was description of direct and indirect cost of acute stroke care among beneficiary and non beneficiary patients. Secondary outcome was description of determinants of cost or significant cost-driven variables. **Results:** Total of 126 stroke patients were enrolled in 3 months. Mean age was 57.67 ± 15.0 and male: female ratio was 82:44. Both beneficiary and non-beneficiary patients were similar in baseline characteristic except monthly income ($P < 0.01$). Mean hospital stay was 6.52 ± 2.23 . Total out of pocket direct cost among beneficiary was INR 12727.21 [95% C.I. 8658.50, 16795.92] and among non beneficiary was INR 23649.68 [95% C.I. 18591.37, 28707.99]. There was significant difference indirect cost of beneficiary and non-beneficiary patients ($P < 0.01$). Mean Indirect cost (wages loss) among beneficiary was INR 12414.75 [95% C.I. 9691.13, 15138.37] and among non-beneficiary patients was INR 16460 [95% C.I. 13044.81, 19875.19]. There was no significant difference in Indirect cost of beneficiary and non-beneficiary patients ($P = 0.06$). Monthly income, stroke severity (modified Rankin score) and hospital stay were significant direct cost determinants. **Conclusion:** Public health insurance scheme reduces direct cost of acute stroke care significantly. Severity of stroke and prolonged hospital stay were main cost-driven variables.

Keywords: Acute stroke care, cost of illness, direct cost, indirect cost, stroke

BACKGROUND

Understanding the costs of stroke in low- and middle-income countries is important.^[1] Acute stroke care and associated cost seems variable over various regions of large country like India.^[2] This study was planned to assess the cost of care for acute stroke and to know the determinants of cost including socio-demographic and disease-related variables.

In recent years in various states of India, many social security schemes like public health insurance schemes are implemented to achieve universal health coverage and reduce out of pocket (OOP).^[3-5] In Rajasthan state, such a scheme called Bhamashah social security scheme (BSSY) is implemented as a state government-financed insurance scheme with aim of universal health coverage. In this scheme beneficiary patients get cashless medical and surgical treatment at government and empanelled private hospitals for prespecified diseases. Even though it is cashless scheme but with limited resources at empanelled hospitals and fixed packages for diseases in this schemes beneficiary patients have to pay for diagnostics and drugs which are not available at treating hospitals.

This cost of illness study was done to assess the effect of this scheme on costs of acute stroke care. We did cost

comparison analysis among the two groups of beneficiary and non-beneficiary of these social security schemes.

METHOD

A cross-sectional cost of illness study was conducted at western Rajasthan from March 2019 to May 2019. Study subjects were recruited from neurology department of two tertiary care hospitals and academic institutes. Ethical clearance was taken from the institutional ethical committee. All consecutive stroke (both ischemic stroke and hemorrhagic stroke) patients of age 18 years or more, who has given written informed

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consent for study participation admit at study places during scheduled study time were enrolled.

Various social security schemes like Bhamashah social security scheme (BSBY), schemes for senior citizen and below poverty line (BPL) schemes are running in study hospitals. One of our study aims was to assess the effect of these schemes on direct as well as indirect cost of acute stroke care. Whereas government free medicine scheme is not considered as a beneficiary status as it is applicable to all indoor patients in both the hospital.

Data related to socio-demographic details including age, gender, level of education, socio-economic status, and disease-related baseline data including history of vascular risk factors including history of hypertension, high blood sugar level (diabetes mellitus), tobacco consumption (smoking, chewing), history of Obstructive sleep apnea, records of dyslipidemia (high cholesterol), history of previous of stroke/Transient ischemic attack, history of heart disease were recorded from medical records and confirmed by patients/caregivers.

Data of disease severity in form of Modified Rankin score were recorded at time of discharge. Cost-related data were collected from direct interview of patient and prime caregiver and cross-check was done with bills. We have provided a small diary in which we have asked caregiver to write down all the expenses they do on medicine, investigation, and for food and stay. All data were taken every day in evening and total expenditure was calculated at time of discharge. All data of the cost was presented in Indian Rupees. We collected direct cost including medical cost and non-medical cost as well as indirect cost (Wages loss).

Formulas of cost calculation:

Total cost = Direct cost + Indirect cost (wagesloss)

Direct cost = Medical cost + Non-medical cost

Medical cost = Cost of hospitalization + Investigations + Imaging + Drugs + Nursing charges

Non medical cost = Cost of food items + Cost of stay + Cost of travel

Indirect cost (wages loss) = Wages loss of patients + Wages loss of care givers

Direct cost

Direct cost was calculated as a sum of direct medical and non-medical cost.^[6]

Medical cost

The cost of hospitalization, blood investigations, imaging, drugs, nursing charges, consultant fees was obtained by the patient or main caregiver.

Non-medical cost

This cost includes cost of transportation, meals, and lodging. This study included the cost of transportation of the patient to the hospital and going back to home after discharge. Costs incurred by the caregivers during the period of patient's

hospitalization for meals, transportation, and on lodging. If the patient was brought to the hospital in an ambulance or hired vehicle, the actual charges were used. If the patient was transported using own or friends/relatives vehicle, then the cost was calculated using the approximate distance and average fuel cost.

Indirect cost (Wages Loss)

Indirect costs of disease are defined as the production value lost to society due to absence from work or disability. In this study, we have estimated the indirect cost or productivity losses for patients who had a paid job prior to the stroke and also for patients involved in unpaid domestic work. Loss of wages of caregiver was also included in indirect cost. Wages loss of caregiver is calculated by number of days he/she stayed at hospital with patient to take care of him/her. Total number of days are multiplied by average daily income to calculate total loss of wages. In case of sick leave, the number of sick leave days was multiplied by the average daily income. For the patients or caregivers who performed unpaid domestic activities, the loss of productivity was based on the average labor wages applicable in our country.

Statistical analysis

All data were collected in Epiinfo-7 based form. Continuous data are presented as mean \pm SD and/or Median (Interquartile range). Categorical data are presented as frequency (percentage). All data of expenditure/costs were presented as mean (95% confidence interval). For comparison of two group of beneficiary and non-beneficiary, student "t" test and Chi-square test were used as applicable. For study the predictors/determinants of OOP expenditure of all stroke patients' spearman correlation test was used. *P* value of less than 0.05 was considered as significant.

RESULTS

A cost of illness study with cross-sectional design was conducted to assess cost and associated factors of acute stroke care at the two major tertiary government hospitals in western Rajasthan. The study was done between March to May 2019.

Total 126 patients with acute stroke were enrolled in our study with 82 (65.08%) males and 44 (34.92%) females with mean age of 57.67 ± 15.04 years. Out of all patients, 61 (48%) were beneficiary of Public health insurance schemes while 65 (52%) were non-beneficiary. The socio-demographic and disease-related data are presented in Table 1.

There was no significant difference between age ($P = 0.24$), gender ($P = 0.85$), underline risk factors ($P = 0.85$), type of stroke ($P = 0.94$), severity of stroke (mRS) ($P = 0.95$), hospital stay ($P = 0.76$), type of stroke ($P = 0.94$) among beneficiary and non-beneficiary patients.

Mean of monthly income was 17593.44 ± 4054.95 for beneficiary with median of 18000.00 (IQR, 15000-21000) and in non-beneficiary mean monthly income was 36000 ± 11111 with median of 35000 (IQR, 25000-42000). Monthly income

Table 1: Socio-demographic and disease-related variables and comparison among two groups

Variables	Beneficiary (n=61)	Non-beneficiary (n=65)	P
Age	56.05±15.53	59.18±14.52	0.24
Gender			0.85
Male	39 (63.93)	43 (66.15)	
Female	22 (36.07)	22 (33.85)	
Monthly Income	17593.44 (4054.95)	36000 (11111.65)	<0.01
Risk Factors			
Diabetes	16 (26.23)	18 (27.69)	0.85
Hypertension	38 (62.30)	39 (60.00)	0.18
Smoking	40 (65.57)	36 (55.38)	0.15
Previous stroke	3 (4.92)	4 (6.15)	0.27
Other	16 (26.23)	21 (32.31)	0.54
Type of stroke			0.94
Ischemic	43 (70.49)	46 (70.77)	
Hemorrhagic	18 (29.51)	19 (29.23)	
Severity of stroke (mRS)			0.95
0-2	23 (37.71)	24 (36.92)	
3-5	38 (62.30)	41 (61.54)	

Bold values represent Significance level $P \leq 0.05$

of beneficiary and non-beneficiary was significantly different with P value of < 0.001 .

Mean direct cost of acute stroke care for total study subjects was INR 23649.68 [95% C.I 18591.37, 28707.99]. The mean wages loss (indirect cost) for total study subjects and caregivers was INR 14501.58 [95% C.I 12301.78, 16701.38] during the period of hospitalization for an episode of stroke.

Mean of total medical cost was 7170.66 ± 14626 in beneficiary with median of 1700.00 (IQR, 300-6000) and in non-beneficiary mean was 26330.77 ± 28619.46 with median of 13500 (IQR, 8690-30800). Mean total medical cost was significantly different in beneficiary and non-beneficiary.

Mean of total non-medical cost was 5335.26 ± 4671.77 in beneficiary with median of 4500 (IQR, 1300-8000) and in non-beneficiary mean was 7492.31 ± 9737.61 with median of 5000 (IQR, 3500-7500). Mean total non-medical cost was not significantly different in beneficiary and non-beneficiary.

Mean of total direct cost was 12505.92 ± 15886.46 in beneficiary with median of 8000 (IQR, 1300-8000) and in non-beneficiary mean was 33900 ± 33919.00 with median of 19200 (IQR, 13690-40000). Mean Total direct cost of beneficiary and non-beneficiary was significantly different with P value of < 0.01 .

Mean of Indirect cost (wages loss) was 12414.92 ± 10634.52 in beneficiary with median of 9000 (IQR, 6000-15000) and in non-beneficiary mean was 16460 ± 13782.71 with median of 12000 (IQR, 8000-21800). Total Wages loss (Indirect cost) of beneficiary and non-beneficiary was not significantly different.

DISCUSSION

A cost of illness study to assess cost and associated factors of acute stroke care were conducted at the two major tertiary

government hospitals of western Rajasthan. Various social security schemes like public health insurance schemes, schemes for senior citizen, and schemes for BPL families are working in government hospitals. In our study, we also assessed the effect of these schemes on direct as well as indirect cost of acute stroke care by comparison of beneficiary and non-beneficiary patients.

Total 126 patient of acute stroke were enrolled in this study. Out of which 61 were beneficiary and 65 were non beneficiary. In our study total, 48.41% of patients were secured under any of social security scheme whereas study conducted in Ludhiana where 186 study participants were enrolled, had only 10% insured patients.^[7] This high prevalence of beneficiary can be explained as we have taken patients only from government hospitals and we included all scheme except free medicine scheme of Rajasthan government. According to Heely *et al.*^[8] 62% of population were covered by insurance in China.

The beneficiary group of patients was not significantly different from non-beneficiary patients' group in socio-demographic and disease-related variable except monthly income [Table 1]. Monthly income was significantly different between these two groups of patients ($P < 0.01$).

Mean age of study participants in our study were $57.67 + 15.00$ which was similar to study conducted by Pandian *et al.*^[7] in 2013 where they found the mean age of patients was $58 + 13$ yrs. In another study on burden of stroke in India by Dalal *et al.*,^[9] age range was 41–60 years.

Out of 126 study participants, 82 (65.08) were male and 44 (34.92) were female in our study. In study by Gagandeep *et al.*^[7] from Ludhiana Punjab showed that out of total enrolled 67.67% were male patients. While in study of Mounica *et al.*^[10] 78% were male and 22% were female participants out of 100 participants in their study. Study from West Bengal^[11] also showed a greater preponderance of men (67%) with a male to female ratio of 2:1.

In this study we have come across that mean of monthly income was INR 27088.013 + 8765.76. Whereas an another study which was conducted in Ludhiana Punjab per capita income of Punjab State was INR 68,998 and Ludhiana city ranks first in the Punjab according to Human Development Index (2001).^[12] Only 5.2% population of Punjab lives below poverty line. This was not similar to our study because economic situation of both the state are different.

Mean hospital stay was 6.21 ± 1.92 in our study which was similar to the study by Mounica *et al.*^[10] where mean hospital stay was 5–10 days. Whereas study conducted by Gagandeep Kwatra *et al.*^[7] in Ludhiana Punjab, mean hospital stay was 13 ± 8 days. They have explained that mean days of hospital stay was high because there was rehabilitation center in their institute so hospital stay increased significantly in their study.

There was no significant difference ($P > 0.05$) seen in risk factor of stroke in beneficiary and non beneficiary [Table 1].

There was high prevalence of smoking and hypertension seen in stroke patients similar to study conducted by Dalal *et al.*^[13]

Mean direct cost of acute stroke care for total study subjects was INR 23649.68 [95% C.I. 18591.37, 28707.99] and the mean Indirect cost (wages loss) of patients and care givers was INR 14501.58 [95% C.I. 12301.78, 16701.38] during the period of hospitalization for an episode of stroke. Whereas study conducted in Ludhiana Punjab^[7] showed total cost of stroke was INR 86612. It could be because of we have calculated cost only till their discharge from the hospital whereas in that study they have taken cost till 6 months which also contributed by rehabilitation cost.

Beneficiary status, monthly income, stroke severity/outcome, and hospital stay were significantly correlated with Direct health care cost and total Direct cost (out of pocket). Non-health care cost was significantly correlated with mRS and age [Table 3].

Mean Direct cost was INR 12727.21 [95% C.I., 8658.50–16795.92] in beneficiary while it was INR 33900 [95% C.I., 25495.17–42304.83] in non-beneficiary patients. There was significant difference indirect cost of beneficiary and non-beneficiary patients ($P < 0.01$). Mean Indirect cost was INR 12414.75 [95% C.I., 9691.13–15138.37] in beneficiary and it was INR 16460 [95% C.I. 13044.81–19875.19] in non-beneficiary patients of stroke in western Rajasthan. There was no significant difference seen in indirect cost of beneficiary and non-beneficiary ($P = 0.06$) [Table 2 and Figure 1].

Study subjects with beneficiary status spent 40.75% on medical cost while 30.32% on non-medical cost of acute stroke care, which accounts total of 72.33% of their monthly income. This was showing that above described social security schemes were protecting beneficiary from spending on health care cost, but they need to spend a substantial share of their income on

non-health care which was mostly consist of travel cost. As stroke patients spent good amount on non-health-related items so this cost should also be covered in insurance schemes like schemes for maternal care.

Study subjects with non-beneficiary status spent 73.14% of their monthly income on medical cost whereas 20.81% of total monthly income on non-medical cost. Total cost was 94.16% of total monthly income. This was clear message for policy makers that beneficiary criteria were arbitrary and stringent, so these should be changed to enroll more and more people as beneficiary of these social security schemes.

Severe stroke/poor outcome and prolonged hospital stay were most cost driven factors irrespective of beneficiary status. Similar to our study these were also most cost driven factors in Kwatra *et al.*^[7] In our study non-medical cost was majorly decided by travel cost. Care givers have to spent more money when patient was severely disabled and older.

Our study has some limitations. It was a hospital-based study from two government hospital in western Rajasthan, India. Our data may represent the cost of stroke in a government sector hospital whereas there was a chance that cost of stroke could be higher in the private hospitals. There was no separate dedicated unit of rehabilitation in study setting. Whereas minimal rehabilitation was provided at hospital which was free of cost. So there is chance that direct cost may be underestimated. Study participants were taken only from tertiary government hospitals there is chance that the patients who did come to these hospitals were the more serious or vice versa. We missed the cost of untreated patients and patients treated at district hospitals. Despite these limitations, this study, for the first time, has explored comprehensively the cost of stroke care from western Rajasthan and studied the impact of public health insurance schemes on it.

Table 2: Description of various costs of acute stroke care

Cost Variable		Beneficiary $n=61$	Non-beneficiary $n=65$	P
Direct cost	Medical Cost	7170.66 [3424.66, 10916.65]	26330.76 [19239.21, 33422.32]	<0.01
	Non Medical Related	5335.25 [4138.75, 6531.74]	7492.31 [5079.45, 9905.17]	0.11
	Total	12727.21 [8658.50, 16795.92]	33900 [25495.17, 42304.83]	<0.01
Indirect cost (Wages loss)		12414.75 [9691.13, 15138.37]	16460 [13044.81, 19875.19]	0.06

Bold values represent Significance level $P < 0.05$. Mean [95% Confidence limits]

Table 3: Description of determinants of various cost and their spearman correlation coefficients

	Medical cost	Non-medical cost	Direct Cost	Indirect cost (wages Loss)
Age	-0.108 (0.30)	0.341** (<0.01)	0.017 (0.85)	0.135 (0.13)
Hospital stay	0.177* (0.05)	0.147 (0.10)	0.226* (0.01)	0.300** (<0.01)
Monthly income	0.468** (<0.01)	0.148 (0.10)	0.452** (<0.01)	0.137 (0.13)
Stroke severity (mRS)	0.191* (0.03)	0.274* (0.02)	0.273** (<0.01)	0.356** (<0.01)

Significance level * $P < 0.05$ and ** $P < 0.01$

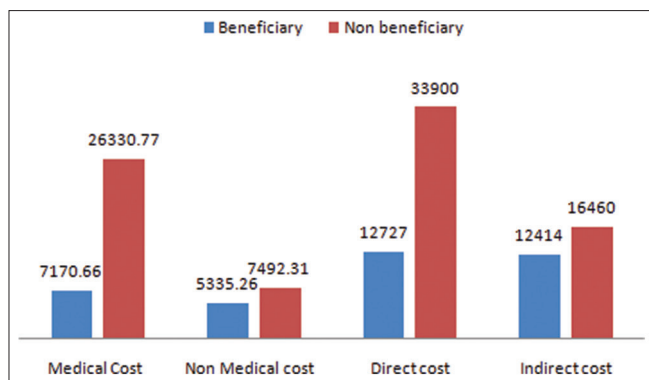


Figure 1: Distribution of various costs among beneficiary and non-beneficiary patient group

CONCLUSIONS

In our study, the Direct health care cost of acute stroke accounted for a major component of cost of stroke. Public health insurance scheme reduced OOP direct cost of acute stroke care statically significant. The cost-driving factors were higher income, poor outcome/severity of stroke and length of hospital stay. With the help of early supported discharge and home-based rehabilitation, we may be able to reduce the length of hospital stay and hence the acute stroke care cost. Multi-centered studies across the country are warranted to find out the cost of stroke in India and interventions to reduce the OOP. The result of this study can be used for further development of the methods for economic analyses as well as for analysis of improvements and investments in health care.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Kaur P, Kwatra G, Kaur R, Pandian JD. Cost of stroke in low and middle income countries: A systematic review. *Int J Stroke* 2014;9:678-82.
2. Pandian JD, Sudhan P. Stroke epidemiology and stroke care services in India. *J Stroke* 2013;15:128-34.
3. Prinja S, Chauhan AS, Karan A, Kaur G, Kumar R. Impact of publicly financed health insurance schemes on healthcare utilization and financial risk protection in India: A systematic review. *PLoS One* 2017;12:e0170996.
4. Yong M, Xianjun X, Jinghu L, Yunyun F. Effect of health insurance on direct hospitalisation costs for in-patients with ischaemic stroke in China. *Aust Health Rev* 2018;42:39-44.
5. Selvaraj S, Karan AK. Why publicly financed health insurance schemes are ineffective in providing financial risk protection. *Econ Polit Wkly* 2012;47:60-8.
6. Kastor A, Mohanty SK. Disease-specific out-of-pocket and catastrophic health expenditure on hospitalization in India: Do Indian households face distress health financing? *PLoS One* 2018;13:e0196106.
7. Kwatra G, Kaur P, Toor G, Badyal DK, Kaur R, Singh Y, *et al.* Cost of stroke from a tertiary centre in northwest India. *Neurol India* 2013;61:627-32.
8. Heeley E, Anderson CS, Huang Y, Jan S, Li Y, Liu M, *et al.* Role of health insurance in averting economic hardship in families after acute stroke in China. *Stroke* 2009;40:2149-56.
9. Dalal PM. Burden of stroke: Indian perspective. *Int J Stroke* 2006;1:164-6.
10. Mounica B. Estimating the economic burden of stroke in South India : A cost-of-illness study. *Value Health* 2015;18:A387.
11. 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.
12. Planning Panjab. Department of Planning Punjab [Internet]. [cited 2019 Jun 16]. Available from: <http://pbplanning.gov.in/reports.htm>.
13. Dalal PM, Malik S, Bhattacharjee M, Trivedi ND, Vairale J, Bhat P, *et al.* Population-based stroke survey in Mumbai, India: Incidence and 28-day case fatality. *Neuroepidemiology* 2008;31:254-61.