RESEARCH ARTICLE

Effectiveness of a Nurse-Led Structured Teaching Programme on Knowledge of Early Warning Signs and Prevention of Stroke among Hypertensive Patients: A Pre-Experimental Study from Cuttack, Odisha

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ABSTRACT

Background: Hypertension is the leading modifiable risk factor for stroke, and early recognition of warning signs determines whether patients reach treatment in time. Knowledge of stroke among hypertensive patients in eastern India has rarely been measured or targeted by structured education.

Objective: To assess the effectiveness of a nurse-led structured teaching programme (STP) on knowledge of the early warning signs and prevention of stroke among hypertensive patients, and to examine the association of knowledge with selected socio-demographic variables.

Methods: A quantitative, pre-experimental one-group pre-test–post-test study was carried out among 50 hypertensive patients aged 35–60 years, selected by purposive sampling at a multispecialty hospital in Tangi, Cuttack, Odisha. Knowledge was measured with a validated 30-item structured knowledge questionnaire (test–retest $r = 0.92$). The STP, a 45-minute lecture-cum-discussion supported by PowerPoint slides, was delivered in groups of five, and the post-test was administered seven days later. Data were analysed with descriptive statistics, the paired t-test and the chi-square test.

Results: At pre-test, 60% of participants had inadequate and 40% moderate knowledge, and none had adequate knowledge. After the STP, 82% had moderate, 16% adequate and 2% inadequate knowledge. The mean knowledge score rose from 10.02 ± 5.01 to 16.38 ± 4.61 (out of 30), a mean gain of 6.36 points (95% CI 4.46–8.26; paired $t = 6.725$, $df = 49$, $p < 0.001$; paired effect size $d_z = 0.95$). Knowledge was not significantly associated with age, gender, education, family type, occupation or type of community at either assessment ($p > 0.05$).

Conclusion: A single, brief nurse-led STP produced a large short-term improvement in hypertensive patients' knowledge of stroke warning signs and prevention, although few reached the adequate level. Structured stroke education should be built into routine hypertension care and reinforced over repeated contacts.

Keywords: Stroke, Hypertension, Warning signs, Stroke prevention, Structured teaching programme, Health education, Nursing.

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INTRODUCTION

Stroke remains the second leading cause of death and the third leading cause of combined death and disability worldwide, and the absolute number of people affected continues to rise, with the greatest share of the burden falling on low- and middle-income countries [1]. In India, the contribution of stroke to total disease burden has increased steadily over the last three decades, in parallel with the epidemiological transition towards non-communicable diseases [2]. Data from five population-based registries of the National Stroke Registry Programme recorded a crude incidence of 138.1 and an age-standardised incidence of 103.4 per 100,000 population, with ischaemic stroke as the dominant subtype and a substantial burden in rural areas [3]. A systematic review of Indian epidemiological studies reported crude incidence rates of 108–172 per 100,000 person-years and one-month case fatality of 18–42% [4].

Hypertension is the single most important modifiable risk factor for both ischaemic and haemorrhagic stroke. In the INTERSTROKE study, ten potentially modifiable risk factors accounted for about 90% of the population-attributable risk of stroke, and hypertension was the leading contributor in every region studied, including South Asia [5]. The relationship between blood pressure and stroke mortality is continuous across the usual range of blood pressure [6], and a 10 mmHg reduction in systolic blood pressure reduces the risk of stroke by about a quarter [7]. Yet, of the estimated 1.3 billion adults aged 30–79 years living with hypertension, only about one in five has the condition under control [8]. In India, the fifth National Family Health Survey found elevated blood pressure or use of antihypertensive medication in roughly one in four men and one in five women aged 15 years and above [9], which places a very large population at heightened stroke risk.

Prevention of stroke in hypertensive people depends not only on blood pressure control but also on patients' understanding of why control matters and on their ability to recognise warning signs early enough to seek emergency care. Community surveys in India have repeatedly documented poor recognition of stroke warning symptoms and risk factors [10,11]. Hospital-based studies among hypertensive patients elsewhere show similar gaps: only 18.3% had good knowledge of stroke in a study from north-west Ethiopia [12], 24.9% had good knowledge of stroke prevention at Debre Tabor [13], 40.7% had adequate stroke-related knowledge at Gondar [14], and only 15% had good knowledge of warning signs in South Gondar [15]; poor knowledge, attitudes and practices have also been reported among rural hypertensive patients in Saudi Arabia [16]. An integrative review concluded that knowledge of stroke risk factors and warning signs is generally poor and is not reliably improved by personal risk alone [17].

Educational interventions can improve stroke knowledge, although the effects of mass-media campaigns have been inconsistent [18]. Face-to-face teaching delivered by nurses during routine contacts offers a low-cost and targeted alternative for people already known to be at high risk, and current prevention guidelines emphasise patient education and self-management as part of hypertension care [19]. The present study was guided by King's theory of goal attainment, in which nurse–patient interaction and mutually agreed goals lead to the desired outcome—here, improved knowledge of stroke warning signs and prevention [20]. Evidence on the effect of such teaching among hypertensive patients in Odisha is scarce. This study therefore aimed to (i) assess the pre-test and post-

test knowledge of hypertensive patients regarding the early signs and prevention of stroke, (ii) evaluate the effectiveness of a structured teaching programme (STP) on this knowledge, and (iii) examine the association of knowledge with selected socio-demographic variables. It was hypothesised that post-test knowledge would be significantly higher than pre-test knowledge (H_1) and that knowledge would be significantly associated with selected socio-demographic variables (H_2).

MATERIALS AND METHODS

Study design and setting

A quantitative research approach with a pre-experimental one-group pre-test–post-test design (O_1 – X – O_2) was adopted [21]. The study was conducted in the outpatient and inpatient departments of Padmini Care Hospital, Tangi, Cuttack district, Odisha, a multispecialty hospital accredited by the National Accreditation Board for Hospitals and Healthcare Providers (NABH), which was selected for feasibility and the availability of hypertensive patients.

Participants and sampling

The target population comprised patients diagnosed with hypertension. Fifty hypertensive patients were recruited by non-probability purposive sampling. Patients of either sex aged 35–60 years who could read and write Odia and were willing to participate were included. Patients who were unwilling, absent at the time of data collection, or unconscious, semi-conscious or confused were excluded.

Data collection instrument

The instrument was developed after a review of the literature and consultation with subject experts. Section A recorded socio-demographic variables (age, gender, educational status, family type, occupation and type of community). Section B was a structured knowledge questionnaire of 30 multiple-choice items, each with four options, covering risk factors of stroke, early warning signs (including the FAST message—Face, Arm, Speech, Time [22]), the immediate response to suspected stroke, long-term effects, and preventive measures such as blood pressure control and monitoring, adherence to antihypertensive medication, salt restriction, physical activity and weight control. Each correct response scored 1 and each incorrect response 0 (range 0–30). Knowledge was graded as inadequate (0–10; <33.3%), moderate (11–20; 33.3–66.6%) or adequate (21–30; >66.6%).

Content validity was established by five experts in medical-surgical nursing, whose suggestions on clarity, adequacy and simplicity were incorporated. Reliability assessed by the test–retest method was r = 0.92. The questionnaire was translated into Odia and back-translated into English to ensure linguistic equivalence. A pilot study on five hypertensive patients (10% of the planned sample) at the same hospital showed that the study was feasible, practical and acceptable, and minor modifications were made thereafter.

Intervention

The STP was prepared as a lesson plan and delivered by the investigator as a 45-minute lecture-cum-discussion supported by a PowerPoint presentation. Its content covered: the meaning of hypertension and stroke; causes and risk factors; stages of hypertension; symptoms of raised blood pressure; signs and symptoms of stroke; early warning signs, including face drooping, arm weakness and speech difficulty with the need to seek help without delay; and measures for the prevention of stroke. Questions were invited and answered at the end of each session.

Data collection procedure

Formal permission was obtained from the hospital administration, and written informed consent was taken from each participant after the purpose of the study was explained and confidentiality was assured. Each day, five eligible patients completed the pre-test (self-report questionnaire), immediately followed by the STP; this was repeated over ten days until 50 participants had been enrolled. The post-test was administered to each group seven days after the teaching, using the same questionnaire.

Ethical considerations

The study was approved by the Institutional Ethics Committee of DRIEMS University, Cuttack [approval reference number and date to be inserted]. Participation was voluntary, written informed consent was obtained, and confidentiality of responses was maintained throughout.

Statistical analysis

Socio-demographic variables and knowledge levels were summarised as frequencies and percentages, and knowledge scores as mean ± standard deviation (SD). Pre-test and post-test scores were compared with the paired t-test. The 95% confidence interval (CI) of the mean difference and the paired effect size ($d_z = t/\sqrt{n}$) were derived from the paired t statistic [23].

Associations between knowledge level and socio-demographic variables were tested with Pearson's chi-square (χ^2) test, with degrees of freedom calculated as (rows − 1) × (columns − 1) after excluding knowledge categories with no observations. Statistical significance was set at $p < 0.05$.

RESULTS

Socio-demographic profile

The largest age group was 56–60 years (44%), and 58% of participants were men. More than half (58%) had completed 10th standard, 42% were unemployed, 66% lived in nuclear families, and 76% came from rural communities (Table 1).

Table 1: Socio-demographic characteristics of the participants (n = 50)

Variable	Category	n	%
Age (years)	35–45	13	26
	46–55	15	30
	56–60	22	44
Gender	Male	29	58
	Female	21	42
Educational status	Formal education†	10	20
	Completed 10th standard	29	58
	Higher education	11	22
Occupation	Unemployed	21	42
	Business	19	38
	Employed	10	20
Family type	Joint	17	34
	Nuclear	33	66
Type of community	Urban	12	24
	Rural	38	76

†Category label as used in the study questionnaire.

Level of knowledge before and after the STP

At pre-test, 30 participants (60%) had inadequate and 20 (40%) moderate knowledge; none had adequate knowledge. After the STP, 41 (82%) had moderate and 8 (16%) adequate knowledge, while only 1 (2%) remained in the inadequate category (Table 2; Figure 1).

Table 2: Distribution of participants by level of knowledge before and after the STP (n = 50)

Level of knowledge (score)	Pre-test n (%)	Post-test n (%)
Inadequate (0–10)	30 (60)	1 (2)
Moderate (11–20)	20 (40)	41 (82)
Adequate (21–30)	0 (0)	8 (16)

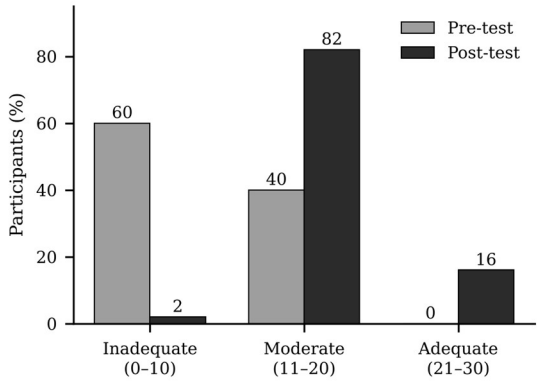


Figure 1: Percentage distribution of participants by level of knowledge at pre-test and post-test

Effectiveness of the STP

The mean knowledge score increased from 10.02 ± 5.01 (33.4% of the maximum) at pre-test to 16.38 ± 4.61 (54.6%) at post-test. The mean gain of 6.36 points (95% CI 4.46–8.26) was statistically significant (paired $t = 6.725$, $df = 49$, $p < 0.001$), and the paired effect size was large ($d_z = 0.95$) (Table 3). H_1 was therefore accepted.

Table 3: Comparison of pre-test and post-test knowledge scores (n = 50)

Measure	Pre-test	Post-test
Mean ± SD (maximum 30)	10.02 ± 5.01	16.38 ± 4.61
Mean score (% of maximum)	33.4	54.6
Mean difference (95% CI)	6.36 (4.46–8.26)	
Paired t (df)	6.725 (49)	
p value	< 0.001	
Effect size, d_z	0.95	

SD, standard deviation; CI, confidence interval; d_z, paired (within-subject) effect size.

Association of knowledge with socio-demographic variables

No socio-demographic variable showed a statistically significant association with the level of knowledge at either pre-test or post-test (all $p > 0.05$) (Table 4). H_2 was therefore not supported.

Table 4: Association between level of knowledge and socio-demographic variables (n = 50)

Variable	Pre-test χ^2 (df)	p	Post-test χ^2 (df)	p
Age	0.734 (2)	0.693	4.629 (4)	0.328
Gender	0.055 (1)	0.815	1.452 (2)	0.484
Education	0.084 (2)	0.959	6.635 (4)	0.156
Family type	1.797 (1)	0.180	1.524 (2)	0.467
Occupation	0.067 (2)	0.967	2.050 (4)	0.727
Community	0.018 (1)	0.892	1.209 (2)	0.546

Pre-test: inadequate vs. moderate (no participant had adequate knowledge). Post-test: inadequate, moderate and adequate; more than 20% of cells had expected counts below 5, so post-test results should be interpreted with caution. All associations non-significant at $p < 0.05$.

DISCUSSION

This study shows that hypertensive patients attending a hospital in Cuttack had limited knowledge of stroke warning signs and prevention before the intervention: 60% scored in the inadequate range and none reached the adequate level, with a mean score of only one-third of the maximum. This is consistent with the low levels of stroke knowledge reported among hypertensive patients in hospital-based studies from Ethiopia [12–15] and Saudi Arabia [16], and with the poor community awareness documented in India [10,11]. That a group under medical care for the principal risk factor of stroke should know so little about it indicates that routine hypertension consultations are not, by themselves, conveying this information.

A single 45-minute nurse-led session produced a mean gain of 6.36 points, equivalent to about 21 percentage points, with a large within-subject effect size and a 95% CI that excluded small effects. The proportion with inadequate knowledge fell from 60% to 2%. The direction and size of this change agree with earlier Indian pre-experimental studies of structured teaching among hypertensive patients: in Mehsana, mean scores rose from 10.80 ± 4.02 to 19.33 ± 3.69 among 60 patients ($t = 14.62$) [24], and in Bengaluru the proportion with inadequate knowledge fell from 68.3% to none, with 65.0% reaching adequate knowledge after teaching [25]. The finding is also in line with evidence that targeted education improves recognition of stroke symptoms more consistently than untargeted campaigns [18].

Notably, although knowledge improved, most participants moved only into the moderate category and just 16% achieved adequate knowledge, a smaller shift than in the Bengaluru study [25]. The low baseline, the limited formal education of many participants, and the brevity of a single session may explain this. Recognising the full range of warning signs and understanding blood pressure targets, home monitoring and medication adherence are complex messages; one session is unlikely to be sufficient. Repeated, reinforced teaching using simple tools such as the FAST message [22], printed material in Odia, and teach-back during follow-up visits may help more patients reach adequate knowledge.

No significant association was found between knowledge and age, gender, education, family type, occupation or community, either before or after the STP. Studies from Ethiopia have reported better knowledge among younger, urban and better-educated patients and those with longer follow-up [13–15]. The absence of such associations here probably reflects the small and fairly homogeneous sample (mostly rural, 35–60 years, literate in Odia), which limits statistical power; post-test analyses were further limited by small expected cell counts. The finding should therefore not be taken as evidence that demographic factors are unimportant. It does, however, suggest that the STP benefited participants across different backgrounds.

These findings have practical implications. Nurses in outpatient clinics, inpatient wards and community settings are well placed to deliver brief structured education on stroke warning signs and prevention during routine contacts with hypertensive patients. Integrating such teaching into hypertension care protocols, training nurses in patient education, and assessing knowledge during follow-up visits could support earlier recognition of stroke and better risk-factor control, in keeping with guideline recommendations [19].

Limitations

The study has several limitations. The one-group pre-test–post-test design without a control group cannot exclude testing effects (the same questionnaire was used twice), maturation or other external influences. The sample was small, purposively selected from a single private hospital and restricted to Odia-literate adults aged 35–60 years, which limits generalisability. Knowledge was assessed only seven days after teaching, so long-term retention is unknown, and the study measured knowledge rather than behaviour, blood pressure control or stroke outcomes. Finally, information on the duration of hypertension and treatment was not collected.

Recommendations

Future studies should use randomised or quasi-experimental designs with control groups and larger multicentre samples; assess retention of knowledge at three to six months; compare teaching approaches such as one-to-one counselling, group sessions, video and mobile-phone-based education; and examine whether improved knowledge translates into better medication

adherence, blood pressure control and timely presentation after stroke.

CONCLUSION

Hypertensive patients in this study had largely inadequate knowledge of stroke warning signs and prevention. A brief nurse-led structured teaching programme significantly improved their knowledge in the short term, with a large effect size, irrespective of socio-demographic characteristics. Because few participants reached adequate knowledge after a single session, structured stroke education should be incorporated into routine hypertension care and reinforced over repeated contacts.

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AUTHORS' CONTRIBUTIONS

SD: conceptualisation, tool development, intervention delivery, data collection, analysis and drafting. RS: supervision, methodology and critical revision. Both authors approved the final manuscript. [Authors to confirm.]

DECLARATION ON USE OF AI-ASSISTED TOOLS

[Authors to declare any use of AI-assisted writing or language tools in the preparation of this manuscript, as required by the journal's policy.]

REFERENCES

1. GBD 2021 Stroke Risk Factor Collaborators. Global, regional, and national burden of stroke and its risk factors, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021. Lancet Neurol. 2024;23(10):973–1003.
2. India State-Level Disease Burden Initiative CVD Collaborators. The changing patterns of cardiovascular diseases and their risk factors in the states of India: the Global Burden of Disease Study 1990–2016. Lancet Glob Health. 2018;6(12):e1339–e1351.
3. Rangamani S, Huliyappa D, Kulothungan V, Saravanan S, Murugan PK, Mahadevan R, et al. Stroke incidence, mortality, subtypes in rural and urban populations in five geographic areas of India (2018–2019): results from the National Stroke Registry Programme. Lancet Reg Health Southeast Asia. 2024;23:100308. doi:10.1016/j.lansea.2023.100308
4. Jones SP, Baqai K, Clegg A, Georgiou R, Harris C, Holland EJ, et al. Stroke in India: a systematic review of the incidence, prevalence, and case fatality. Int J Stroke. 2022;17(2):132–140. doi:10.1177/17474930211027834
5. O'Donnell MJ, Chin SL, Rangarajan S, Xavier D, Liu L, Zhang H, et al. Global and regional effects of potentially modifiable risk factors associated with acute stroke in 32 countries (INTERSTROKE): a case-control study. Lancet. 2016;388(10046):761–775.
6. Lewington S, Clarke R, Qizilbash N, Peto R, Collins R; Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. Lancet. 2002;360(9349):1903–1913.
7. Ettehad D, Emdin CA, Kiran A, Anderson SG, Callender T, Emberson J, et al. Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis. Lancet. 2016;387(10022):957–967.
8. World Health Organization. Global report on hypertension: the race against a silent killer. Geneva: WHO; 2023.
9. International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-5), 2019–21: India. Mumbai: IIPS; 2021.
10. Pandian JD, Jaison A, Deepak SS, Kalra G, Shamsher S, Lincoln DJ, et al. Public awareness of warning symptoms, risk factors, and treatment of stroke in northwest India. Stroke. 2005;36(3):644–648. doi:10.1161/01.STR.0000154876.08468.a0
11. Das K, Mondal GP, Dutta AK, et al. Awareness of warning symptoms and risk factors of stroke in the general population and in survivors stroke. J Clin Neurosci. 2007;14(1):12–16.
12. Abate AT, Bayu N, Mariam TG. Hypertensive patients' knowledge of risk factors and warning signs of stroke at Felege Hiwot Referral Hospital, Northwest Ethiopia: a cross-sectional study. Neurol Res Int. 2019;2019:8570428. doi:10.1155/2019/8570428
13. Tibebu NS, Emiru TD, Tiruneh CM, Nigat AB, Abate MW, Demelash AT. Knowledge on prevention of stroke and its associated factors among hypertensive patients at Debre Tabor General Hospital: an institution-based cross-sectional study. Risk Manag Healthc Policy. 2021;14:1681–1688. doi:10.2147/RMHP.S303876
14. Woldetsadik FK, Kassa T, Bilchut WH, Kibret AK, Guadie YG, Eriku GA. Stroke related knowledge, prevention practices and associated factors among hypertensive patients at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2021. Front Neurol. 2022;13:839879. doi:10.3389/fneur.2022.839879

15. Nigat AB, Abate MW, Demelash AT, et al. Knowledge on stroke warning signs and associated factors among hypertensive patients, Northwest Ethiopia: an institution-based cross-sectional study. Vasc Health Risk Manag. 2021;17:721–728. doi:10.2147/VHRM.S333394
16. Alhowaymel FM, Abdelmalik MA, Mohammed AM, Mohamaed MO, Alenezi A. Knowledge, attitudes, and practices of hypertensive patients towards stroke prevention among rural population in Saudi Arabia: a cross-sectional study. SAGE Open Nurs. 2023;9:23779608221150717. doi:10.1177/23779608221150717
17. Jones SP, Jenkinson AJ, Leathley MJ, Watkins CL. Stroke knowledge and awareness: an integrative review of the evidence. Age Ageing. 2010;39(1):11–22.
18. Lecouturier J, Rodgers H, Murtagh MJ, White M, Ford GA, Thomson RG. Systematic review of mass media interventions designed to improve public recognition of stroke symptoms, emergency response and early treatment. BMC Public Health. 2010;10:784. doi:10.1186/1471-2458-10-784
19. Bushnell C, Kernan WN, Sharrief AZ, et al. 2024 Guideline for the primary prevention of stroke: a guideline from the American Heart Association/American Stroke Association. Stroke. 2024;55(12):e344–e424. doi:10.1161/STR.0000000000000475
20. King IM. A theory for nursing: systems, concepts, process. New York: Wiley; 1981.
21. Polit DF, Beck CT. Nursing research: generating and assessing evidence for nursing practice. 11th ed. Philadelphia: Wolters Kluwer; 2021.
22. Kleindorfer D, Miller R, Moomaw CJ, et al. Designing a message for public education regarding stroke: does FAST capture enough stroke? Stroke. 2007;38(10):2864–2868.
23. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. Front Psychol. 2013;4:863. doi:10.3389/fpsyg.2013.00863
24. Patidar U, Patel H. Effectiveness of structured teaching programme on knowledge regarding prevention of stroke among hypertensive patients in a selected hospital, Mehsana district. 2020. [Journal, volume and pages to be supplied by authors.]
25. Swapna Mary A, Devi SS. Effectiveness of structured teaching programme on knowledge regarding warning signs and prevention of stroke among hypertensive patients in a selected hospital, Bangalore. 2022. [Journal, volume and pages to be supplied by authors.]