

Research Article

Prevalence, pattern, risk factors and outcome of stroke in women: a clinical study of 100 cases from a tertiary care center in South India

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ABSTRACT

Background: Stroke is the leading cause of acquired disability and the third leading cause of death in women worldwide. There had been relatively few studies of stroke in women. Objective of the study was to study the prevalence, patterns, risk factors and outcome of stroke in women. A cross sectional study with case control comparison and prospective follow up at one month at ESIC Super speciality hospital, Hyderabad in South India.

Methods: Total 100 stroke patients were identified over a period of 3 months and data collected on the basis of clinical proforma developed for the purpose.

Results: Of 100 stroke patients, 31 were females. Ischemic stroke was seen in 25 (80.64%) females. Age was an important non-modifiable risk factor for stroke. Stroke was predominant among older women 23 (74.19%). Mean age of stroke in females was 57 years. Menopause 27 (87.09%) was the predominant risk factor followed by hypertension in 25 (80.6%), dyslipidemia in 19 (70.3%) physical inactivity in 17 (54.8%) and diabetes in 12 (38.7%) females respectively. Majority of females 27 (87.09%) were uneducated as compared to males 27 (39.13%). The overall mortality in females was 3 (9.6%) as compared to males 3 (4.3%). 25 (89.2%) of females were ambulatory when compared to males 62 (93.9%).

Conclusion: Stroke was common in older women and ischemic stroke was the predominate type of stroke. Physical inactivity was the significant risk factor in women when compared to men. Women are more likely to be disabled after stroke than men.

Key words: Stroke, mRS score, Women

INTRODUCTION

Stroke is the third leading cause of death after heart disease and cancer, leading to acquired disability in women worldwide.¹ It is the fourth major cause of death in India, the death rate being 0.6/1000.² Studies performed in various parts of the world have found differences between sexes in stroke incidence, prevalence, mortality, and outcomes. Historically, male sex has been considered a risk factor for stroke; however, because of the longer life expectancy in female individuals, the majority of stroke deaths now occur in women.³ Women are more likely to have a past medical

history of hypertension and atrial fibrillation (AF), whereas men are more likely to present with heart disease, dyslipidemia, diabetes, myocardial infarction, peripheral artery disease, tobacco and alcohol use.³⁻⁵ Premenopausal women are less likely to suffer a stroke than men of similar ages or postmenopausal women. This difference in epidemiology has been ascribed to the protective effects of estrogen exposure.⁶

METHODS

This is a cross-sectional study with case control comparison to identify the prevalence, pattern, risk

factors of stroke in women conducted during November 2015 to January 2016 in the department of Neurology at the Employees State Insurance Corporations Super speciality Hospital, Hyderabad, a tertiary referral center in South India. Patients admitted with first-ever acute stroke confirmed by cranial CT or MRI within 14 days after onset was studied. The Institutional Ethics Committee approved the study protocol, and written informed consent was obtained from all participants. All patients admitted with definite diagnosis of stroke during the study period, were prospectively enrolled and followed for a period of 1 month.

The diagnosis of stroke was established clinically and confirmed by neuroimaging (non-contrast CT head and MRI Brain DW sequence). The study subjects were grouped into cases (females) and controls (males) as per the gender.

Information regarding the relevant variables in the study was collected with the help of structured proforma comprising age, sex, risk factors, clinical features, pattern and outcome of stroke. Non-modifiable risk factors like age, gender, and genetic predisposition and the common modifiable risk factors like hypertension, diabetes mellitus, smoking, dyslipidemia, alcohol, coronary artery disease (CAD), transient ischemic attack (TIA), premenopausal and menopausal and lack of exercise were inquired into. Outcome was measured using modified Rankin Scale (mRS).⁷ The mRS is a 6-point, ordinal hierarchical scale that describes global disability with a focus on mobility (Table 1).

Data obtained in the study were subjected to statistical analysis with Statistical Package for Social Sciences (SPSS) version 11. Categorical variables were summarized as counts (percentage) and continuous variables as means or medians (interquartile ranges (IQR)). Bivariate analysis was done to find the risk factors of stroke among women using chi-square test. A two-tailed probability value < 0.05 was considered significant. Multivariate analysis was done using logistic regression.

Definition of important study variables

Stroke

Stroke is defined according to WHO criteria as rapidly developing clinical symptoms and/or signs of focal, and at times global, loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin.⁸

Young onset stroke

Patients having acquired stroke at less than or equal to 50 years of age.^{8,9}

Old onset stroke

Patients having acquired stroke above 50 years of age.^{9,10}

Hypertension

Patient taking either antihypertensive drugs or if the blood pressure is >140 mm of Hg systolic and >90 mmHg diastolic in two measurements.⁸

Diabetes mellitus

Patient is already diagnosed as diabetic or has fasting plasma glucose ≥ 126 mg/dl (7.0 mmol/l) or 2-h plasma glucose ≥ 140 mg/dl (7.8 mmol/l) or glycosylated hemoglobin of $\geq 6.5\%$.¹²

Dyslipidemia

Dyslipidemia is defined according to the National Cholesterol Education Program-Adult Treatment Panel III criteria as total cholesterol ≥ 240 mg/dL, or low density lipoprotein cholesterol (LDL-C) ≥ 160 mg/dL, or High density lipoprotein cholesterol (HDL-C) <40 mg/dL, and Triglyceride ≥ 200 mg/dL.¹³

Menopause

Absence of menstrual periods for 12 consecutive months.¹⁴

Obesity

Obesity is defined as abnormal or extensive fat accumulation that negatively affects health. According to the World Health Organization, obesity is defined as Body Mass Index (BMI) ≥ 30 kg/m² and central obesity as a waist circumference greater than 102 cm in men and 88 cm in women.¹⁵

Physical inactivity

Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure. Physical inactivity is the lack of physical activity.¹⁶

RESULTS

Socio demographic characteristics

During the study period, 100 stroke patients were identified. The age of incidence ranged from 18-79 years having a mean and median age of 54 years. 31 were females and 69 were males. Mean age was 57 years for females and 52 years in males. Median age of stroke in women was 58 years (interquartile range was 18). Among females 23 (74.19%) were aged >50 years and 8

(25.80%) were aged <50 years. Stroke was common in age range of 50-60 years in both genders (Figure 1).

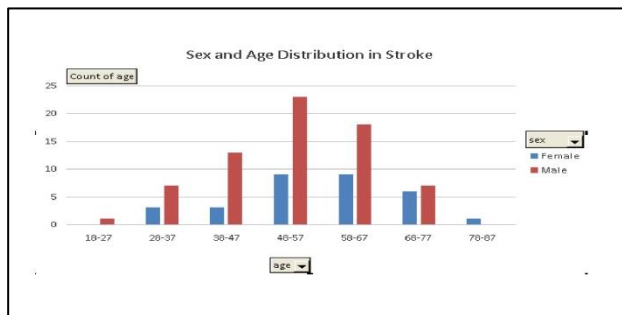


Figure 1: Sex and age distribution in stroke.

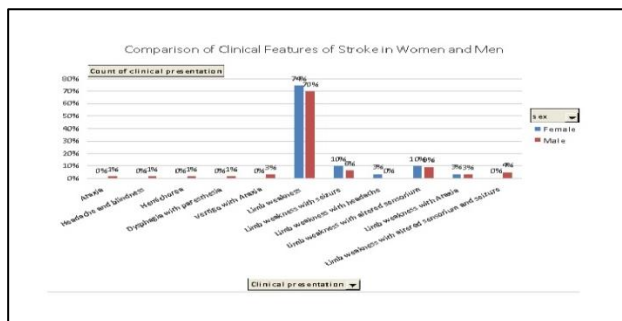


Figure 2: Comparison of clinical features of stroke in woman and men.

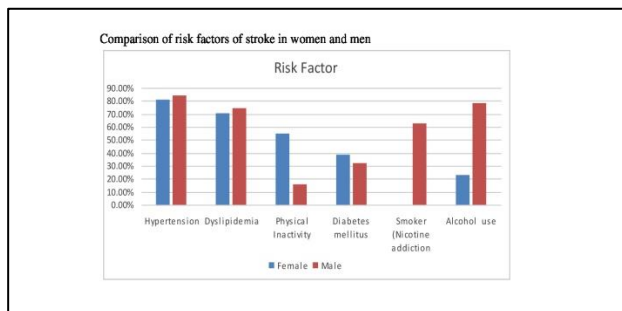


Figure 3: Comparison of risk factors of stroke in woman and men.

Overall females 27 (87.9%) were more uneducated than males 27 (39.1%). Among females 27 (87.09%) were uneducated and 4 (12.9%) were educated that too only primary education. 42 (60.86%) of males were educated, 32 (31.8%) having primary and 20 (28.9%) having secondary education. Table 2 shows the comparison of socio-demographic characteristics of stroke in women and men.

Clinical characteristics

Out of 31 females, 19 (61.2%) arrived within 24 hours of stroke, 8 (25.80%) in 48 hours to 72 hours and 4 (12.9%) beyond 72 hours. None of the cases arrived with in window period of 4.5 hours. On comparison 36 (52.17%)

men arrived within 24 hours, 13 (18.8%) in 48 hours to 72 hours and 20 (28.98%) beyond 72 hours. Limb weakness (focal deficit) was the most common clinical presentation in both genders (80.64% women and 88.4% men) followed by altered sensorium, seizures and ataxia. Clinical features were similar in women (cases) when compared to men (Figure 2).

Table 1: The modified Rankin scale (mRS).

| Grade | Description |
|---------|---|
| Grade 0 | No symptoms at all |
| Grade 1 | No significant disability despite symptoms; able to carry out all usual duties and activities |
| Grade 2 | Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance |
| Grade 3 | Moderate disability; requiring some help, but able to walk without assistance |
| Grade 4 | Moderately severe disability; unable to walk without assistance, unable to attend to needs without assistance |
| Grade 5 | Severe disability; bedridden, incontinent, and requiring constant nursing care and attention |
| Grade 6 | Dead |

Risk factors

Menopause was the most common risk factor in 27 (87.09%) women followed by hypertension in 25 (80.6%), dyslipidemia in 19 (70.3%), physical inactivity in 17 (54.8%), diabetes mellitus in 12 (38.7%), alcohol use in 7 (22.5%) and obesity in 6 (19.35%) cases respectively. Habituation of alcohol and smoking was less in women than men (smoker 62.3%, alcohol use 78.26%). Majority of women 24 (77.4%) were non-drinkers. 7(22.58%) were drinkers, either former drinker, active or occasional drinker. None of the women (cases) smoked. Alcohol was the major risk factor in men 54(78.2%). (Figure 3)

Physical inactivity was the significant risk factor in women (case) when compared with men. While in men alcohol use and smoking was a significant risk factor. Women had less dyslipidemia than men (Table 3).

Cardiac diseases were found to be more in cases when compared with controls (27.58% versus 8.69%). The common heart diseases seen in the study group were coronary heart diseases, chronic rheumatic heart disease and dilated cardiomyopathy. Prior stroke was seen in 12.9% of cases when compared with controls (11.59%). Co morbid illness such as hypothyroidism, chronic obstructive pulmonary disease, osteoarthritis knee, osteoporosis, and chronic kidney disease were more in women 8 (25.80%) when compared with men 12 (17.39%) (Table 4).

Multivariable analysis was done using logistic regression. All those variables with significance level (p value <0.05) namely physical inactivity, alcohol use and smoking were included in the analysis. After this low physical activity emerged as the independent risk factor in women.

Pattern of stroke

On analyzing the pattern of stroke 80.64% of women had ischemic type of stroke compared to men (73.9%), while hemorrhagic stroke was seen in 6 (19.35%) cases.²⁵

Outcome of stroke

Outcome of stroke was assessed at one-month using mRS score. A significant residual deficit was considered with mRS score of greater than 3. Ambulatory group were those who had mRS score of either 1, 2 or 3 and non-ambulatory group had mRS score of 4 or 5. The overall mortality (mRS score 6) in women was 3 (9.6%) when compared to men 3 (4.3%) during hospital stay. Follow up at one month showed that out of the survival group, only 89.2% of women were ambulatory when compared to men (93.9%).

Table 2: Comparison of socio-demographic characteristics of stroke in women and men.

| Variable | Category | Females n=31(%) | Males n=69(%) | P value | Odds Ratio(95%CI) |
|--------------|---------------------|--------------------|------------------|---------|-----------------------------|
| Age | <50 Years | 8 (25.8%) | 25 (36.23%) | 0.3074 | 0.6122 (0.2385 to 1.5710) |
| | >50 Years | 23 (74.19%) | 44 (63.76%) | | |
| Education | Uneducated | 27 (87.09%) | 27 (39.13%) | 0.0001 | 10.5000 (3.3047 to 33.3619) |
| | Primary education | 4 (12.9%) | 22 (31.88%) | | |
| | Secondary education | | 20 (28.98%) | | |
| Distribution | Rural | 21 (67.7%) | 59 (85.5%) | 0.0446 | 0.3559 (0.1299 to 0.9754) |
| | Urban | 10 (32.2%) | 10 (14.4%) | | |
| Income | BPL | 29 (93.54%) | 62 (89.85%) | 0.6892 | 1.4032 (0.2668 to 7.3798) |
| | APL | 2 (6.45%) | 6 (8.6%) | | |

Table 3: Comparison of frequencies of stroke risk factors in women and men.

| Risk factors | Frequency in women n=31(%) | Frequency in men n=69 (%) | P value | Odds ratio (95%CI) |
|---------------------|--------------------------------|------------------------------|---------|----------------------|
| Smoking | 0 | 43(62.31) | 0.0013 | 0.0097(0.0006-0.164) |
| Alcohol | 7(22.5) | 54(78.26) | <0.0001 | 0.081(0.0293 -0.22) |
| Hypertension | 25(80.6) | 58(84%) | 0.67 | 0.7902(0.2631- 2.37) |
| Diabetic mellites | 12(38.7) | 22(31.88%) | 0.50 | 1.3493(0.55 -3.2609) |
| Physical inactivity | 17(54.8) | 11(15.9) | 0.0001 | 6.40 (2.45-16.67) |
| Dyslipidemia | 19 (70.3%)(n=27) | 40 (70.17%)(n=54) | 0.7241 | 0.8313(0.2979 -2.31) |

Table 4: Comparison of other risk factors of stroke in women and men.

| Risk factors | Frequency in women n=31(%) | Frequency in men n=69 (%) | P value | Odds ratio (95%CI) |
|-------------------|-------------------------------|------------------------------|---------|---------------------------|
| Cardiac disease | 7 (22.5%) | 6 (8.6%) | 0.06 | 3.062 (0.93-10.04) |
| Prior stroke | 4 (12.9%) | 8 (11.59%) | 0.853 | 1.129 (0.313-4.07) |
| obesity | 6 (19.35%) | 15 (21.71%) | 0.786 | 0.864 (0.299-2.491) |
| Co-morbid illness | 8 (25.80%) | 12 (17.39%) | 0.5189 | 0.7040 (0.2423 to 2.0452) |

DISCUSSION

In the present study 31% were women and 69% were men. This implies that women have lesser chances of stroke than men. The available literature states that male sex has been considered as a risk factor for stroke, however because of the longer life expectancy in female individuals, the majority of stroke deaths now occur in women.¹⁷

Women under age 50 years are generally considered to have a lower incidence and prevalence of stroke than men.^{17,18} In the present study also this trend was observed with young women constituting only 25.8% of stroke and older women 74.19% of stroke.

In our study we found that majority 87.09% of women were uneducated than men (39.13%) and those educated had only primary education. This may be because of the

obvious reason that women are discriminated based on their gender. Certain social evil practices still prevail in our country that women are not supposed to leave their home, need to look after children and older people, education may prevent them from doing their domestic duties.

Women have significantly higher percentage of physical inactivity compared to men in our study. This may be attributed to the reason that men's tend to involve in more physical activity at their work place, and they are the sole breadwinners of the family. Our findings were in concordance with that of studies done by Mario et al.¹⁹

Ischemic stroke was more prevalent in women (80.64%) when compared to men (73.9%). This may be due to fact women consume alcohol lesser than men, hence men have higher chances of hemorrhagic strokes. Similar findings have been reported by Thabele et al.²⁰

Recent studies worldwide have reported that women are more likely to have hypertension, diabetes mellitus, obesity as risk factors where men are more likely to have smoking and alcohol consumption.²¹⁻²³ In the present study among the risk factors of stroke in women, menopause was the major risk factor followed by hypertension, dyslipidemia, low physical activity, diabetes mellitus, and alcohol use. In men hypertension was the major risk factor followed by alcohol use, dyslipidemia, smoking, diabetes mellitus and low physical activity. Low physical activity was found to be statistically significant risk factor in women when compared to men.

Menopause is associated with an increase in multiple stroke risk factors. Cohort studies of healthy women moving through the menopausal transition have shown an increase in abdominal obesity, an increase in triglycerides, total cholesterol and LDL cholesterol, a decrease in HDL cholesterol, increased fasting glucose and other measures of insulin resistance, increased BMI, and increased blood pressure.²⁴ Endogenous estrogen levels decline by 60% during the menopausal transition, leading to relative androgen excess, which could contribute to the increased cardiovascular risk factors in women.¹⁴ Early decline in estradiol levels from early age at menopause could be detrimental to bone and blood vessel health. In our study majority of women were in menopause (87.9%). This may be attributed to the age of onset of stroke and earlier menopause due to malnutrition, and lower socioeconomic status.

In our study we found that cardiac risk factors were of higher frequency in women (27.58%) than men (8.69%). This may be attributed to higher prevalence of menopause and rheumatic heart disease in the study group.

Various studies also have looked at case fatality rates by sex and found no significant difference between men and

women or that women had slightly higher rates.³ Similar findings were found in our study. Baseline differences between men and women (eg; age, co morbidities, severity, and pre-stroke disability) cause much of the excess of mortality in women. However, even when controlling for these factors, women continue to have poorer functional outcomes after stroke.^{17,25} This could be because women have lower quality of care than men, less social support, and have underlying co morbid illness.

CONCLUSION

Stroke in women occurred commonly at older age. Ischemic type was the major pattern of stroke. Menopause, hypertension and dyslipidemia were the major risk factors of stroke among women. Women are less habituated to alcohol use and smoking in India. Low physical activity is identified as significant risk factor when compared to men. Women are more likely to be disabled after stroke than men. It is important for women to maximize a healthy lifestyle throughout midlife to reduce the overall risk for stroke and cardiovascular disease.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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