# Demographics and Clinical Characteristics of Stroke Patients: A Single Centre Retrospective, Observational Study from Surendranagar, Gujarat, India

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#### ABSTRACT

**Background:** Stroke is the second leading cause of death and the third leading cause of disability globally, with varying demographics and clinical characteristics influencing outcomes. The aim of this retrospective, observational study was to evaluate the Incidence and Prevalence rates of stroke patients, who underwent Physiotherapy from a single centre. **Methods**: This retrospective, observational study analyzed the incidence and prevalence rates of stroke patients undergoing Physiotherapy at the Neuro Physiotherapy Department of a Single centre in the Saurashtra Region of Gujarat, from June 2020 to February 2025. Data on demographic variables (age, sex) and clinical characteristics (stroke type, side, phases, comorbidities) were collected and statistically examined. Incidence and Prevalence rates were analysed statistically. The incidence per 100,000 patients and the concomitant 95% CI (Confidence Intervals) were computed.

**Results**: The present study included 524 stroke patients in the time period of 4 years and 9 months. The mean age was 51.18 years (Males) and 53 years (Females).

Among them, 40.84% sought physiotherapy during the Subacute Phase, 34.16% during the Acute Phase, and 25.00% during the Chronic Phase. Ischemic strokes accounted for 84.9% of cases, while haemorrhagic strokes accounted for 15.1%. Incidence proportion and annual incidence rates were 0.0256% and 5.4 per 100,000 population per year, respectively. Prevalence rates included point prevalence (0.00098%), period prevalence (0.0256%), and lifetime prevalence (0.0367%).

**Conclusion**: This study offers valuable insights into the demographics and clinical characteristics of stroke patients undergoing physiotherapy in a single centre, laying the groundwork for broader, multi-centre studies to validate the findings.

*Keywords:* Stroke, Physiotherapy, Demographics, Incidence, Prevalence, Saurashtra, Retrospective Study

#### **INTRODUCTION**

#### Background

Stroke is a leading cause of death and longterm disability worldwide, with an increasing burden in low- and middleincome countries like India.<sup>1</sup> According to the Global Burden of Disease (GBD) 2019 report, stroke accounts for approximately

6.2 million deaths annually, making it the second leading cause of death globally.<sup>2</sup>

The National Stroke Registry Programme has been established to monitor stroke patterns and provide reliable data on its magnitude and incidence. Population-based stroke registries have been initiated in regions like Varanasi, Kota, Tirunelveli, Cuttack, and Cachar. Hypertension, diabetes, and tobacco use are major Risk factors. Stroke mortality at 28 days postonset varies significantly, with crude case fatality rates ranging from 15.3 to 46.6 per 100,000 population.<sup>3</sup>

With increasing life expectancy, urbanization, and lifestyle changes, the prevalence of major stroke risk factors including hypertension, diabetes. dyslipidemia, smoking, alcohol consumption, and sedentary behavior-has risen significantly in India.<sup>1</sup> However, early detection management and remain challenging due to delayed physiotherapy commencement, lack of awareness, and inadequate healthcare infrastructure in rural and semi-urban regions.

There is limited region-specific data on stroke patients, particularly regarding their demographic profiles, risk factors, clinical presentations, and outcomes. A retrospective observational study can provide valuable insights into the patterns of stroke cases in this region, aiding healthcare providers and policymakers in developing targeted interventions.<sup>4</sup>

India faces an alarming rise in stroke cases, primarily due to aging populations, urbanization, and increasing prevalence of lifestyle-related risk factors such as hypertension, diabetes, hyperlipidemia, smoking, and obesity. Hypertension is the leading modifiable risk factor, present in 60-80% of stroke patients. Diabetes affects nearly 30-40% of Indian stroke patients, significantly increasing their risk. Tobacco use (both smoking and smokeless forms) contributes significantly, with a 35-45% prevalence among male stroke patients. Sedentary lifestyles and poor dietary habits are emerging risk factors, particularly in semi-urban and rural populations.<sup>5</sup>

Gujarat reflects evolving trends in stroke epidemiology, with ischemic strokes accounting for a higher proportion (75-80%) compared to hemorrhagic strokes (20-The estimated prevalence 25%). is approximately 350-400 cases per 100,000 population in urban areas, with slightly lower rates in rural regions. The estimated annual incidence ranges from 145 to 160 cases per 100,000 people. The 30-day mortality rate can reach up to 20-30% in some regions. There is a notable male predominance (60–65%), although the incidence among women is rising, largely due to increasing rates of hypertension and diabetes. Unlike Western populations where stroke typically affects individuals over 65. Gujarat is witnessing a growing number of cases among a younger demographic aged 40-55 years. Delayed hospital admissions averaging 4 to 6 hours after stroke onset are common, primarily due to limited public and inadequate emergency awareness response infrastructure.<sup>6-10</sup>

Regions like Surendranagar face considerable challenges in early detection, risk factor management, and post-stroke rehabilitation, contributing to higher rates of mortality and disability compared to urban centers. Surendranagar, a district with a unique blend of urban and rural populations, shows significant variation in access to physiotherapy services. While tertiary care centers offer specialized neurophysiotherapy, region-specific epidemiological data on stroke remains limited.

Retrospective observational studies are essential for:

- Identifying the prevalence of modifiable risk factors contributing to stroke.
- Evaluating clinical presentations, stroke subtypes, and treatment approaches.
- Providing evidence-based recommendations for stroke prevention and physiotherapy strategies tailored to the region.<sup>11</sup>

This study highlights the importance of single-centre studies, as they offer a controlled environment to analyze stroke characteristics and evaluate the influence of local healthcare factors—such as access to physiotherapy services and public health initiatives—on stroke care and recovery. By focusing on a single centre, researchers can trends, identify local optimize care protocols, and assess the effectiveness of interventions at a detailed level (Ng et al., 2018). A coordinated effort from both government and private sectors is essential to address the growing stroke epidemic in India.<sup>12</sup>

The study overview and objectives centered around analyzing the demographic and clinical characteristics of stroke patients received physiotherapy who at the Outpatient Neuro Physiotherapy Department of C.U. Shah Physiotherapy College, a single tertiary care centre. The importance of single-centre studies lies in their ability to generate focused, regionspecific data that can improve clinical practices and healthcare planning. The study aimed to determine the overall incidence rate of stroke to provide baseline data for comparison with national and regional statistics, analyze demographic distribution (age and gender) to identify high-risk groups, and evaluate stroke types (ischemic or hemorrhagic) and affected sides to guide treatment protocols. It also sought to explore the relationship between incidence and risk factors such as hypertension, diabetes, and obesity to support preventive strategies. Furthermore, the study examined distribution of patients seeking the physiotherapy during various recovery stages (acute, subacute, chronic), and compared the mean age of male and female patients while analyzing the association between age and blood pressure. These objectives collectively emphasize the importance of personalized physiotherapy interventions, early management, patient education, and long-term care, while contributing essential epidemiological data to inform future research and policy development in stroke rehabilitation.

## **MATERIALS & METHODS**

This retrospective study utilized data collected from 1st June 2020 to 28th February 2025. Limiting the study to this specific time period ensured consistency and allowed for the assessment of trends in stroke incidence and patient characteristics over a defined timeframe.

**Study Setting:** The study was conducted at the Physiotherapy Outpatient Department (OPD) of C.U. Shah Physiotherapy College, a centre that provides comprehensive physiotherapy care. The database included detailed information on both subjective and objective medical evaluations, as well as the physiotherapy interventions administered. The study was approved by the Institutional Ethics and Research Committee.

**Inclusion Criteria:** The study included:

- 1. All patients diagnosed with stroke (ischemic or hemorrhagic) during the study period, based on clinical presentation and radiological imaging (e.g., CT, MRI).
- 2. Patients aged 18 years or older.
- 3. Stroke patients who underwent physiotherapy at the centre between June 2020 and February 2025.
- 4. Patients with complete and accessible medical records, including demographic details, clinical history, comorbidities, stroke type, stroke severity, rehabilitation data, and follow-up information.
- 5. Both first-time stroke patients and those with recurrent strokes.
- 6. Patients at any stage of stroke recovery (acute, subacute, or chronic) who received physiotherapy services.
- 7. Patients capable of understanding and communicating in the language used at the centre.

**Exclusion Criteria:** The study excluded:

- 1. Patients with incomplete or missing medical records.
- 2. Patients diagnosed with transient ischemic attacks (TIAs).
- 3. Patients with co-existing neurological conditions other than stroke.

**Data Collection Tools:** Data were collected using the following tools:

- Electronic Health Records: Patient demographics, medical history, imaging, treatment details, and outcomes were extracted.
- **Institutional Information System:** Daily physiotherapy entry details, lab results, and intervention records were retrieved.
- Manual Data Extraction: Standardized forms were used to manually extract information from case assessment sheets.

**Outcome Measures:** The following outcome measures were assessed:

- 1. **Demographics:** Age and sex.
- 2. Clinical Characteristics:
- Stroke type (ischemic or hemorrhagic).
- Stroke stage (acute, subacute, or chronic).
- Side of stroke (right or left).
- Co morbidities such as hypertension, diabetes, ischemic heart disease, dyslipidemia, atrial fibrillation, smoking, and obesity.

**Data Validation Process:** A standardized data collection form (digital spreadsheet) was developed. Data were manually cross-

checked for completeness and accuracy. Missing or inconsistent data were identified and resolved as part of the data validation process.

#### STATISTICAL ANALYSIS

All variables were categorized and coded for analysis using JASP software. Both descriptive statistics and inferential tests were performed. The dataset was validated to check for missing values and outliers.

- **Incidence and Prevalence:** These were computed using standard epidemiological formulas.
- **Continuous Variables:** Age was expressed as mean ± standard deviation.
- **Categorical Variables:** Gender, co morbidities, stroke type, stroke side, and stroke stage were represented as frequency (n) and percentage (%).
- Normality Testing: Skewness and kurtosis tests were performed to assess the normality of continuous variables.
- **Significance Level:** A p-value < 0.05 was considered statistically significant for all comparisons.

#### **RESULT**

#### Table 1: Year-wise Distribution of Stroke Patients

Year	<b>Stroke Patients</b>
June 2020 – Dec 2020	37
Jan 2021 – Dec 2021	93
Jan 2022 – Dec 2022	117
Jan 2023 – Dec 2023	131
Jan 2024 – Dec 2024	134
Jan 2025 – Feb 2025	12
Total	524

Table2:	Gender	and	Mean	Age	of Stroke	Patients

Group	Mean Age (Years) + Standard Deviation (SD)	Percentage (%)	Sample Size (n)
Males	51.18 <u>+</u> 14.87	69.5%	364
Females	53+15.46	30.5%	160
Total	51.74+15.05	100%	524

#### Table 3: Age Distribution of Stroke Patients

Age Group	Males	Females	Total
18-30	38	13	51
31-40	45	14	59
41-50	76	36	112
51-60	87	33	120

61-70         96         40         136           71-80         28         18         46           81-90         4         6         10	Total	374	160	524
61-70         96         40         136           71-80         28         18         46	81-90	4	6	10
61-70 96 40 136	71-80	28	18	46
	61-70	96	40	136

#### Table 4: Stroke Patients Seeking Physiotherapy Services and Stage

Stage	Duration	Frequency	Percentage
Acute	<3 months	179	34.16%
Subacute	3-12 months	214	40.84%
Chronic	>1 year	131	25.00%
Total		524	100%

#### Table 5: Stroke Side

Year	Frequency (Right Side Stroke)	Frequency (Left Side Stroke)
2020	27	10
2021	66	27
2022	77	40
2023	86	45
2024	85	49
2025	8	4
Total	349	175

#### **Table 6: Type of Stroke**

Stroke Type	Frequency	Percentage (%)
Ischemic Stroke	445	84.9%
Hemorrhagic Stroke	79	15.1%
Total	524	100%

#### Table 7-Comorbid Conditions in Stroke Patients

<b>Co-Morbid Conditions</b>	Frequency	Percentage
Hypertension	113	21.6%
Diabetes	96	18.3%
Ischemic Heart Disease	81	15.5%
Dyslipidemia	73	13.9%
Atrial Fibrillation	59	11.3%
Smoking	57	10.9%
Obesity	45	8.6%

#### Table 8-Normality Test Results Using Skewness and Kurtosis

	Age Distribution	Males	Females
Mean	50.250	53.429	22.857
Std. Error of Mean	7.804	12.769	5.007
95% CI Mean Upper	70.310	84.673	35.108
95% CI Mean Lower	30.190	22.185	10.606
Std. Deviation	19.115	33.783	13.247
95% CI Std. Dev. Upper	46.881	74.392	29.170
95% CI Std. Dev. Lower	11.932	21.769	8.536
Skewness	-0.069	-0.091	0.180
Std. Error of Skewness	0.845	0.794	0.794
Kurtosis	-1.091	-1.365	-2.010
Std. Error of Kurtosis	1.741	1.587	1.587
Minimum	24.000	4.000	6.000
Maximum	75.500	96.000	40.000

All skewness and kurtosis Z-scores fall within the acceptable range (-1.96 to

+1.96), indicating no significant deviation from normality.

The age distribution is approximately normal for both males and females, with no significant skewness or kurtosis observed.

**Parametric Tests**: Since the data is approximately normal, parametric tests were performed as they are more powerful and appropriate for normally distributed data.

#### **Pearson Correlation Analysis:**

Pearson correlation tests were used to examine the relationship between Age and Systolic Blood Pressure. The results are presented in Table 9:

]	fable	9:	Pearson	correlation	coefficient
		_			

	Age	Systolic BP
Age	1.000000	0.727391
Systolic BP	0.727391	1.000000

**Interpretation:** The Pearson correlation coefficient (r) of 0.727 indicates a strong positive correlation between age and systolic blood pressure. This means that as age increases, systolic blood pressure tends to rise significantly.

The scatter plot illustrates the positive trend between age and systolic blood pressure, with the red regression line indicating that systolic blood pressure increases as age rises.



Figure 1: Scatter Plot with Regression Line

The box plot highlights the distribution of systolic blood pressure values within different age groups: The boxes represent the interquartile range (IQR), showing the middle 50% of values. The horizontal line inside each box represents the median systolic blood pressure. Whiskers and dots indicate the spread of data and potential outliers.



Figure 2: Box Plot of Systolic Blood Pressure across Age Groups

#### Interpretation Incidence

Based on the data obtained, the total stroke cases from June 2020 to February 2025

were 524. The study period was 4 years and 9 months (approximately 4.75 years), and the estimated population of Surendranagar in 2025 was 2,045,701 (Males: 1,059,871

and Females: 985,830) (Source: Indiacensus.net).

- The incidence proportion of stroke during the study period was 0.0256%, meaning approximately 0.0256% of the total population experienced a stroke over 4.75 years.
- The annual incidence rate of stroke was calculated as 5.4 per 100,000 population per year.

## Prevalence

- Point Prevalence: 0.00098% (approximately 0.001%) Active stroke cases at a single time point.
- Period Prevalence: 0.0256% Stroke cases over the 4.75-year study period.
- Lifetime Prevalence: 0.0367% The proportion of individuals who ever had a stroke as of February 2025.

# **Demographic Distribution**

- Gender: Of the 524 cases, 69.5% were male (364 patients), and 30.5% were female (160 patients).
- Age: The mean age of male stroke patients was 51.18 years, and for females, it was 53 years. The largest age group affected was 61–70 years, with 136 total cases.

## **Clinical Characteristics**

- Stroke Type: 84.9% of cases were ischemic strokes (445 patients), and 15.1% were hemorrhagic strokes (79 patients).
- Stroke Side: Of the total, 349 patients had right-side strokes, while 175 experienced left-side strokes.

## **Recovery Stage at Physiotherapy Entry:**

- Acute Phase (<3 months): 34.16% (179 patients)
- Subacute Phase (3–12 months): 40.84% (214 patients)
- Chronic Phase (>1 year): 25.00% (131 patients)

# Co morbidities

The most common comorbid conditions among stroke patients were:

- Hypertension: 21.6% (113 patients)
- Diabetes: 18.3% (96 patients)
- Ischemic Heart Disease: 15.5% (81 patients)
- Dyslipidemia: 13.9% (73 patients)
- Atrial Fibrillation: 11.3% (59 patients)
- Smoking: 10.9% (57 patients)
- Obesity: 8.6% (45 patients)

## **Trends Over Time**

The year-wise distribution of stroke cases indicated a progressive increase in the number of cases, peaking in 2024 with 134 cases. The highest annual increase in cases occurred between 2020 and 2021, highlighting potential factors such as increased awareness or reporting.

#### DISCUSSION

This study provides an in-depth analysis of stroke incidence, prevalence, demographics, clinical characteristics, and physiotherapy utilization at a tertiary care centre in the Saurashtra region of Gujarat. The findings contribute to the growing body of knowledge on stroke in India, offering several new and significant observations. These results warrant careful interpretation and discussion, especially in comparison to existing literature on stroke epidemiology and rehabilitation practices.

## Stroke Incidence, Subtypes, and Demographic Characteristics

The annual stroke incidence rate of 5.4 per 100,000 population observed in this study aligns with the lower range reported in prior studies conducted in India, which estimate stroke incidence between 145 and 152 per 100,000 population.<sup>1</sup> The relatively low rates in this study may reflect differences in population demographics, regional access to healthcare services, or underreporting in rural areas. Global data highlights ischemic stroke as the dominant subtype, a trend mirrored in this study, where ischemic strokes accounted for 84.9% of cases.<sup>13</sup> This

further emphasizes the critical role of modifiable risk factors—hypertension, diabetes, and dyslipidemia—which were prevalent among the patient population and consistent with prior findings.

The demographic insights from this study revealed a male predominance (69.5%) and a mean age of stroke onset in the early 50s, which is notably younger than the average age reported in Western populations.<sup>13</sup> Studies in urban centres of India similarly indicate younger age groups being at risk, attributed to lifestyle-related factors such as smoking, sedentary behavior, and poor dietary habits.<sup>13</sup> Interestingly, the highest age group affected in this study was 61–70 years, suggesting that targeted interventions focusing on middle-aged and older adults could have the greatest impact on stroke prevention.<sup>14</sup>

# Physiotherapy Utilization and Implications

This study observed that most patients sought physiotherapy during the subacute phase (40.84%), followed by the acute (34.16%) and chronic (25.00%) phases. Previous researches highlight the benefits of early physiotherapy intervention in reducing improving disability and functional outcomes post-stroke. The lower proportion of patients seeking physiotherapy during the acute phase underscores potential delays in healthcare access and awareness in the region. Strategies to improve early intervention, such as community education and enhanced emergency response systems, could mitigate these delays and improve outcomes.15

# **Strengths and Limitations**

One of the strengths of this study is its detailed analysis of stroke patients over a defined period, providing valuable insights into incidence, prevalence, and clinical characteristics. The use of standardized data collection tools and validation methods ensures data reliability. However, several limitations must be acknowledged. First, the study is based on data from a single centre, which may restrict the generalizability of findings to larger populations. Second, rural populations may be underrepresented, potentially leading to an underestimation of true incidence and prevalence rates. Third, the retrospective nature of the study relies on existing records, which could introduce biases due to incomplete or inconsistent data.

# **Recommendations and Future Directions**

To address the weaknesses observed, future studies should incorporate multi-centre designs and larger sample sizes to validate these findings. Prospective studies could explore additional factors influencing stroke incidence and recovery, such as socioeconomic status, healthcare access, and exposures.<sup>16</sup> environmental Moreover, interventions targeting modifiable risk factors-hypertension, diabetes, smoking, and obesity-could be prioritized to reduce stroke burden. Community-based awareness programs emphasizing early detection and physiotherapy initiation may improve stroke outcomes in rural and semi-urban regions.<sup>1</sup> Finally, establishing region-specific stroke registries could enhance data accuracy and provide robust foundation a for policymaking and resource allocation.<sup>15,17</sup> Thus this study contributes valuable data to stroke research in India, emphasizing the need for region-specific strategies to address the growing stroke burden. By prioritizing intervention, early personalized physiotherapy plans, and comprehensive risk factor management, healthcare systems can improve outcomes and reduce strokerelated disability and mortality.

## CONCLUSION

This study sheds light on the demographic patterns, clinical characteristics, and physiotherapy utilization of stroke patients in the Saurashtra region, providing valuable data on stroke incidence and prevalence. The findings emphasize the substantial burden of ischemic stroke and the prevalence of modifiable risk factors such as hypertension and diabetes, reinforcing the

need for targeted preventive strategies and lifestyle interventions.

Despite the strengths of standardized data collection and detailed analysis, limitations such as the single-centre study design and potential underrepresentation of rural populations must be acknowledged. These factors may affect the generalizability of the results.

Clinically, the study highlights the significance of early physiotherapy intervention, particularly in the acute and subacute phases, to optimize functional outcomes and reduce disability. Moreover, the demographic insights from this study can inform tailored stroke prevention programs and resource allocation.

Overall. this research contributes to understanding regional stroke trends. offering a foundation for further multistudies and improved centre stroke management protocols that align with the unique challenges of rural and semi-urban populations.

# **Declaration by Authors**

# Ethical Approval: Approved

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