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Original Research Article

Clinical and Radiological Profile of Stroke in Young Adults Aged 15–45 Years

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Abstract

Background: Stroke in young adults is increasingly recognized as a significant cause of morbidity and disability. The clinical presentation and radiological characteristics of stroke in individuals aged 15–45 years differ from those observed in older populations.

Aim: This study aimed to identify the clinical presentation and radiological profile of patients presenting with stroke between the ages of 15 and 45 years.

Methods: A prospective observational study was conducted on 120 patients diagnosed with stroke in the age group of 15–45 years. Detailed clinical evaluation and neurological examination were performed, and radiological assessment using CT scan of the brain was carried out to determine the type and location of stroke.

Results: Seizures were observed in 23.3% of patients, while decreased level of consciousness was present in 38.3%. Dysphasia was noted in 30% of patients, and cranial nerve deficits were seen in 61.7% of cases. Motor deficits were the most common neurological manifestation, with hemiparesis occurring in 58.3% of patients. Radiological findings showed that infarction was the most common CT finding (70%), followed by hemorrhage (20%) and venous thrombosis (10%). Overall, ischemic stroke accounted for 80% of cases, whereas hemorrhagic stroke accounted for 20%.

Conclusion: Stroke in young adults commonly presents with motor weakness, speech disturbances, and cranial nerve deficits. Ischemic stroke is the predominant subtype observed in this age group. Early recognition of clinical features combined with prompt radiological evaluation is essential for effective diagnosis and management.

Keywords: Young stroke, Clinical presentation, Radiological profile, Ischemic stroke.

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Introduction

Stroke is one of the leading causes of mortality and long-term disability worldwide and represents a major public health concern. It is defined as a sudden onset of neurological deficit caused by a disturbance in cerebral blood circulation, which may result from either ischemia or hemorrhage. Although stroke has traditionally been considered a disease affecting older adults, increasing evidence indicates that a considerable proportion of strokes occur in younger individuals.

Recent epidemiological studies have shown that approximately 10–15% of all strokes occur in people younger than 50 years of age, highlighting the growing burden of stroke among the young population [1]. Stroke occurring in individuals between 15 and 45 years of age is particularly important because it affects people during their most productive years, leading to significant socioeconomic consequences and long-term disability. The rising incidence of stroke in young adults has been attributed to an increase in traditional vascular risk factors such as hypertension, diabetes mellitus, dyslipidemia, smoking, and obesity.

In addition to these conventional factors, several non-traditional risk factors such as migraine, pregnancy, oral contraceptive use, illicit drug use, and hypercoagulable states have also been implicated in the pathogenesis of stroke in this age group [2]. The etiology of stroke in young adults

differs significantly from that in older individuals. While atherosclerosis remains an important cause, other mechanisms such as arterial dissection, cardioembolism, vasculitis, thrombophilia, congenital heart disease, and cerebral venous thrombosis are relatively more common in young patients. Because of these diverse etiological mechanisms, the clinical presentation and diagnostic evaluation of stroke in young individuals may vary widely. This diversity often makes the diagnosis challenging and requires a comprehensive clinical assessment combined with appropriate radiological investigations [3].

The clinical presentation of stroke in young adults is often similar to that seen in older patients but may also include atypical manifestations depending on the underlying etiology. Common presenting symptoms include hemiparesis, speech disturbances, facial weakness, sensory deficits, and altered level of consciousness. In some cases, patients may present with headache, seizures, or visual disturbances, particularly in cases such as intracerebral hemorrhage or cerebral venous thrombosis. Early recognition of these symptoms is essential because timely diagnosis and management significantly improve clinical outcomes [4].

Radiological imaging plays a pivotal role in the diagnosis and evaluation of stroke. Neuroimaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) are essential for differentiating between ischemic and hemorrhagic stroke, identifying the location of the lesion, and determining the extent of brain injury. CT scan is often the first imaging modality used in the emergency setting because of its rapid availability and ability to detect intracranial hemorrhage, whereas MRI provides greater sensitivity in detecting early ischemic changes and small infarcts [5].

Advancements in neuroimaging techniques have significantly improved the evaluation of stroke. Modern imaging modalities such as CT angiography, MR angiography, and perfusion imaging allow detailed visualization of intracranial and extracranial vessels. These techniques assist clinicians in identifying vascular abnormalities, assessing cerebral perfusion, and guiding therapeutic decisions in patients presenting with acute stroke [6].

Understanding the clinical presentation and radiological characteristics of stroke in young adults is crucial for early diagnosis and effective management. Since stroke in young individuals often has different etiological factors compared to older patients, identifying the clinical patterns and imaging findings may help clinicians recognize potential risk factors and improve patient outcomes. Comprehensive evaluation also contributes to improved diagnostic accuracy and appropriate treatment planning [7].

Despite increasing awareness, there remains limited data regarding the clinical and radiological profile of stroke in young adults in many regions, particularly in developing countries. Hospital-based studies play an important role in understanding the patterns of stroke, associated clinical features, and radiological findings in this population. Such studies can provide valuable insights into disease characteristics and help develop strategies for early detection and management [8].

Furthermore, evaluating stroke in younger patients is important because early diagnosis and targeted treatment can significantly reduce long-term disability. Identifying common clinical presentations and imaging findings may help clinicians recognize stroke promptly and initiate timely interventions, ultimately improving prognosis and reducing disease burden [9].

Therefore, the present study was undertaken to evaluate the clinical presentation and radiological profile of patients presenting with stroke between the ages of 15 and 45 years. By analyzing both clinical manifestations and radiological findings, the study aims to contribute to a better understanding of stroke characteristics in young adults and assist clinicians in early diagnosis and management [10].

Material and Methods

The present study was conducted as a prospective observational study in the Department of Medicine of a tertiary care hospital. The study aimed to evaluate the clinical presentation and radiological profile of patients presenting with stroke between the ages of 15 and 45 years. The study was carried out over a defined study period during which all eligible patients presenting with clinical features suggestive of stroke were evaluated and included after obtaining informed consent.

A total of 120 patients aged between 15 and 45 years presenting with symptoms suggestive of stroke were included in the study. Patients were enrolled consecutively after confirmation of stroke based on clinical examination and radiological imaging. Both male and female patients who were diagnosed with either ischemic or hemorrhagic stroke and fulfilled the inclusion criteria were included in the study. Patients with traumatic intracranial hemorrhage, brain tumors, infections of the central nervous system, or other neurological conditions mimicking stroke were excluded from the study.

All patients underwent a detailed clinical evaluation at the time of admission. A comprehensive history was obtained including

demographic details, presenting complaints, duration of symptoms, and associated risk factors such as hypertension, diabetes mellitus, smoking, alcohol consumption, cardiac disease, and family history of stroke. A thorough general physical examination and neurological examination were performed in all patients. Clinical presentation including symptoms such as hemiparesis, facial weakness, speech disturbances, headache, seizures, altered sensorium, and visual disturbances were recorded.

Radiological evaluation was performed in all patients to confirm the diagnosis of stroke and determine the type and location of the lesion. Computed tomography (CT) scan of the brain was performed in all cases as the initial imaging modality because of its rapid availability and ability to detect intracranial hemorrhage in the emergency setting.

However, since early CT imaging may not detect all ischemic strokes, magnetic resonance imaging (MRI) of the brain was performed in approximately 40–50% of patients after 24 hours when ischemic stroke was clinically suspected but CT findings were inconclusive. MRI provided improved sensitivity for detecting early ischemic changes and helped confirm the diagnosis of ischemic stroke in patients being evaluated for advanced interventions such as thrombolysis or thrombectomy. The radiological findings including type of stroke, anatomical location of the lesion, and associated intracranial abnormalities were documented and analyzed.

All relevant laboratory investigations including complete blood count, blood glucose levels, lipid profile, renal function tests, and coagulation profile were performed as part of the diagnostic evaluation. Additional investigations such as electrocardiography and echocardiography were carried out when clinically indicated to identify potential cardiac sources of embolism.

The collected data were systematically recorded in a structured proforma and analyzed using appropriate statistical software. Continuous variables such as age were expressed as mean ± standard deviation, while categorical variables such as clinical symptoms, type of stroke, and radiological findings were expressed as frequency and percentage. Associations between clinical features and radiological findings were evaluated using the Chi-square test for categorical variables and Student's t-test for continuous variables. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Ethics Committee prior to the commencement of the study. Written informed consent was obtained from all patients or their legally authorized representatives before inclusion in the study. Patient confidentiality was maintained throughout the study, and all procedures were conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Results

The clinical presentation of stroke among the study participants is summarized in Table 1. A total of 120 patients aged between 15–45 years were evaluated. Seizures were absent in 92 patients (76.7%), while 28 patients (23.3%) presented with seizures. Regarding the level of consciousness, 74 patients (61.7%) had normal consciousness at presentation, whereas 46 patients (38.3%) showed decreased consciousness. Assessment of speech revealed that 54 patients (45.0%) had normal speech, 36 patients (30.0%) had dysphasia, and speech status could not be determined in 30 patients (25.0%). Cranial nerve examination demonstrated that 46 patients (38.3%) had no cranial nerve deficit, while facial nerve involvement was the most common abnormality seen in 60 patients (50.0%). Oculomotor nerve involvement was noted in 8 patients (6.7%), and multiple cranial nerve involvement was present in 6 patients (5.0%). Motor deficit was a common clinical feature, with hemiparesis observed in 70 patients (58.3%), hemiplegia in 36 patients (30.0%), and monoplegia in 14 patients (11.7%). Sensory examination showed that hemisensory loss was present in 12 patients (10.0%), while the remaining 108 patients (90.0%) had no sensory deficit. Cerebellar signs were uncommon and were present in only 5 patients (4.2%), while 115 patients (95.8%) did not demonstrate cerebellar deficits.

Radiological evaluation using CT scan of the brain revealed different patterns of stroke as shown in Table 2. Infarction was the most common radiological finding and was identified in 84 patients (70.0%). Intracerebral hemorrhage was detected in 24 patients (20.0%), while venous thrombosis was observed in 12 patients (10.0%). These findings indicate that ischemic pathology constituted the majority of stroke cases in the young population evaluated in the present study.

The distribution of stroke type based on radiological findings is presented in Table 3. Ischemic stroke was the predominant type and was observed in 96 patients (80.0%). Hemorrhagic stroke was present in 24 patients (20.0%). These findings demonstrate that ischemic stroke is significantly more common than hemorrhagic stroke among young adults presenting with stroke.

The comparison of clinical features observed in the present study with previous literature is presented

in Table 4. Seizures were noted in 23.3% of patients in the present study compared to 28.6% reported by Bansal et al. altered level of consciousness was observed in 38.3% of patients compared with 57.2% reported by Bansal et al. Dysphasia was present in 30.0% of cases in the present study compared with 30.4% reported previously.

Cranial nerve deficits were observed in 61.7% of patients in the present study. Motor deficit in the form of hemiparesis was the most common neurological deficit and was seen in 58.3% of patients compared to 79.2% reported by Bansal et al. Sensory deficits were relatively less common and were observed in 10.0% of patients, while cerebellar signs were noted in 4.2% of cases. The comparison of CT scan findings with previous studies is shown in Table 5.

In the present study, ischemic stroke accounted for 70.0% of cases, which is slightly lower than the 76.2% reported by Rajeh SA et al. intracerebral hemorrhage was observed in 20.0% of patients in the present study compared to 23.8% reported previously. Cortical venous thrombosis accounted for 10.0% of cases in the present study, highlighting its contribution to stroke in the young population.

Table 1: Clinical features of stroke (N = 120)

Clinical Feature	Number	%	Confidence Interval (90%)
Seizures – Absent	92	76.7	70.40 – 83.00
Seizures – Present	28	23.3	17.00 – 29.60
Consciousness – Normal	74	61.7	54.10 – 69.30
Consciousness – Decreased	46	38.3	30.70 – 45.90
Speech – Normal	54	45.0	37.30 – 52.70
Speech – Dysphasia	36	30.0	23.10 – 36.90
Speech – Not determined	30	25.0	18.90 – 31.10
Cranial nerve deficit – Normal	46	38.3	30.70 – 45.90
Cranial nerve deficit – Oculomotor	8	6.7	2.20 – 11.20
Cranial nerve deficit – Facial	60	50.0	42.20 – 57.80
Cranial nerve deficit – Multiple	6	5.0	1.10 – 8.90
Motor deficit – Hemiplegia	36	30.0	23.10 – 36.90
Motor deficit – Hemiparesis	70	58.3	50.70 – 65.90
Motor deficit – Monoplegia	14	11.7	6.60 – 16.80
Sensory deficit – Normal	108	90.0	85.20 – 94.80
Sensory deficit – Hemisensory loss	12	10.0	5.20 – 14.80
Cerebellar deficit – Absent	115	95.8	92.30 – 99.30
Cerebellar deficit – Present	5	4.2	0.70 – 7.70

Table 2: CT scan findings (N = 120)

CT Scan Findings	Number	%	Confidence Interval (90%)
Infarct	84	70.0	63.20 – 76.80
Venous thrombosis	12	10.0	5.20 – 14.80
Hemorrhage	24	20.0	13.70 – 26.30

Table 3: Type of stroke (N = 120)

Type of Stroke	Number	%	Confidence Interval (90%)
Ischemic	96	80.0	73.70 – 86.30
Hemorrhagic	24	20.0	13.70 – 26.30

Table 4: Comparison of clinical features

Sr. No.	Clinical Feature	Present Study	Bansal et al. [7]
1	Seizure	23.3%	28.6%
2	Consciousness level	38.3%	57.2%
3	Speech (Dysphasia)	30.0%	30.4%
4	Cranial nerve deficit	61.7%	—
5	Motor deficit (Hemiparesis)	58.3%	79.2%
6	Sensory deficit	10.0%	—
7	Cerebellar deficit	4.2%	—

Table 5: Comparison of CT findings

CT Findings	Present Study	Rajeh SA et al. [8]
Ischemic stroke	70.0%	76.2%
Intracerebral hemorrhage	20.0%	23.8%
Cortical venous thrombosis	10.0%	—

Discussion

The present study evaluated the clinical presentation and radiological profile of stroke in patients aged between 15 and 45 years. Stroke in young adults has gained increasing attention in recent years because of its growing incidence and its impact on the economically productive age group. In the current study, various neurological manifestations and radiological patterns were analyzed in 120 patients to better understand the characteristics of stroke in this population. The findings demonstrated that neurological deficits such as motor weakness, speech disturbances, and cranial nerve involvement were the most common presenting symptoms, while ischemic stroke constituted the predominant radiological subtype.

In the present study, seizures were observed in 23.3% of patients, while the majority of patients (76.7%) did not present with seizures. Seizures are known to occur more frequently in younger stroke patients compared to older individuals due to cortical involvement and underlying etiological factors such as venous thrombosis or hemorrhage. Previous studies have also reported seizure incidence ranging between 15% and 30% in young stroke patients, which is consistent with the findings of the present study [11]. The occurrence of seizures at presentation may sometimes delay diagnosis, particularly in cases where stroke is not initially suspected in younger individuals.

Altered level of consciousness was observed in 38.3% of patients in the present study, while 61.7% of patients were fully conscious at presentation. Decreased consciousness in stroke patients may indicate more extensive brain involvement or the presence of hemorrhagic stroke. Earlier studies have also reported that reduced level of consciousness is associated with larger infarcts, intracerebral hemorrhage, or increased intracranial pressure, and therefore represents an important clinical indicator of stroke severity [12].

Speech abnormalities were another common clinical feature observed in the present study. Dysphasia was noted in 30% of patients, while 45% had normal speech and in 25% the speech status could not be determined. Speech disturbances often occur when the dominant cerebral hemisphere is involved, particularly in cases of middle cerebral artery territory infarction. Similar findings have been reported in earlier studies where dysphasia was one of the common presenting symptoms in young stroke patients due to cortical involvement [13]. Cranial nerve deficits were present in a considerable proportion of patients in the present study. Facial nerve involvement was the most common deficit and was seen in 50% of patients, while oculomotor nerve involvement and multiple cranial nerve involvement were less frequent. Cranial nerve deficits usually occur due to involvement of brainstem structures or cortical areas responsible for facial motor control. These findings highlight the importance of detailed neurological examination in patients presenting with suspected stroke.

Motor deficit was the most prominent neurological manifestation in the present study. Hemiparesis was observed in 58.3% of patients and hemiplegia in 30%, indicating that motor weakness remains the most common presenting symptom of stroke in young adults. These findings are consistent with previous reports where hemiparesis was the most frequent clinical feature among young stroke patients due to involvement of corticospinal pathways [14]. Sensory deficits were relatively less common and were present in only 10% of patients, while cerebellar signs were observed in 4.2% of patients. This suggests that most strokes in the present study involved the cerebral hemispheres rather than posterior circulation structures.

Radiological evaluation using CT scan demonstrated that infarction was the most common finding and was present in 70% of patients, followed by intracerebral hemorrhage in 20% and venous thrombosis in 10% of cases. These findings indicate that ischemic stroke remains the predominant type of stroke in young adults. The distribution of stroke types in the present study was further confirmed when strokes were categorized as ischemic and hemorrhagic, where ischemic stroke accounted for 80% of cases compared with 20% of hemorrhagic stroke. Previous studies have also reported similar trends, with ischemic stroke representing the majority of cases in young stroke patients due to factors such as cardioembolism, arterial dissection, and thrombophilia [15].

Although CT scan was used as the initial imaging modality in all patients because of its rapid availability and ability to detect hemorrhage, it is well recognized that early CT imaging may fail to detect acute ischemic changes. Therefore, MRI of the brain was performed in approximately 40–50% of patients after 24 hours when ischemic stroke was

suspected clinically but CT findings were normal or inconclusive.

MRI is more sensitive in detecting early infarction and small ischemic lesions and is particularly useful when patients are being evaluated for therapeutic interventions such as thrombolysis or thrombectomy. Incorporating MRI imaging in selected patients improves diagnostic accuracy and helps guide appropriate management in young stroke patients [11,12].

Overall, the findings of the present study highlight that stroke in young adults commonly presents with neurological deficits such as hemiparesis, speech disturbances, and cranial nerve involvement, while ischemic stroke remains the predominant radiological subtype. Early recognition of these clinical features and prompt radiological evaluation are essential for accurate diagnosis and effective management of stroke in young individuals.

Conclusion

The present study demonstrates that stroke among individuals aged 15–45 years presents with a variety of neurological manifestations, with motor deficits and speech disturbances being the most common clinical features.

Radiological evaluation revealed that ischemic stroke was the predominant subtype, followed by intracerebral hemorrhage and venous thrombosis.

Early identification of clinical symptoms combined with prompt radiological imaging plays a crucial role in the diagnosis and management of stroke in young adults. Improved awareness and early detection may help reduce morbidity and long-term disability associated with stroke in this age group.

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