The Prevalence Of Stroke In Acute Vertigo Presentations In Erbil East Emergency Hospital

Sarmand Abdulrahman Rashid[1] , Dr. Abdullah Faqiyazdin Ahmed[2] , Samir Qader Ahmed[3]

[1] Principle Investigator Kurdistan Board Of Medical Specialties email. Mbchb
[2]Supervisor M.B.Ch.B.,Fibms, Frcp (Edinb), Professor Of Neurology At Khcms Pedroy2017@Gmail.Com
[3]Co- Supervisor Emergency Medicine Specialist Fkhcms.

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Abstract

Background: Vertigo is a common symptom in emergency departments (EDs), with both peripheral and central causes. Central vertigo, particularly ischemic strokes, can initially present with isolated vertigo symptoms, posing a diagnostic challenge. Timely identification of stroke-related vertigo is crucial to initiate appropriate treatment and improve patient outcomes. This study aims to determine the prevalence of acute ischemic brain injury among patients with acute vertigo, using advanced neuroimaging techniques, including diffusion-weighted imaging (DWI) and fluid-attenuated inversion recovery (FLAIR) MRI.

Objective: The aim of this study is to determine how frequently ischemic brain injury occurs among acute vertigo patients visiting Erbil East Emergency Hospital.

Methods: A cross-sectional study was conducted at Erbil East Emergency Hospital from May 2, 2024, to April 1, 2025. A total of 144 patients presenting with acute vertigo were screened for ischemic brain injury using DWI-MRI within 5 hours of symptom onset. Positive cases were followed up with FLAIR-MRI after 24 hours to differentiate between ischemic stroke and transient ischemic attack (TIA). A total of 23 patients were diagnosed with ischemic brain injury and formed the acute ischemic brain injury sub-cohort.

Results: Among the 23 patients in the sub-cohort, 14 (61%) were diagnosed with ischemic stroke and 9 (39%) with TIA. Of the ischemic stroke cases, 93% were associated with posterior circulation lesions, while 7% involved anterior circulation lesions. Of the TIA cases, 77.7% had posterior circulation involvement, and 22.2% had anterior circulation lesions. MRI findings revealed persistent lesions on FLAIR imaging in ischemic stroke cases, while TIA lesions resolved, confirming the transient nature of the event.

Conclusion: This study highlights the significant prevalence of ischemic brain injury, particularly posterior circulation strokes, among patients presenting with acute vertigo. The use of DWI and FLAIR MRI offers critical diagnostic accuracy in distinguishing ischemic stroke from TIA and peripheral causes of vertigo. Early and accurate identification of ischemic brain injury is crucial for appropriate management and timely interventions.

1. Introduction

Emergency medicine professionals frequently encounter vertigo symptoms as this condition causes patients to experience sensations of spinning, imbalance, and dizziness. The medical condition affects both patients' quality of life and their capacity to function properly. Additional factors that lead to vertigo range from non-harmful vestibular conditions to serious neurological manifestations. The assessment process must reveal the root cause because urgent medical treatment must be provided in certain conditions.[1] Vertigo is categorized into peripheral and central causes, which identify the origin. Vertigo develops in the peripheral region when problems affect the vestibular apparatus or vestibular nerve function which is a common condition, being presented as benign paroxysmal positional vertigo (BPPV), vestibular neuritis, or Ménière's disease. This kind of vertigo exists only briefly and may be accompanied by nystagmus without affecting other neurological functions.[2] People with central vertigo develop their symptoms either due to brainstem or cerebellar lesions which could be underlined by stroke, multiple sclerosis, tumors, or hemorrhage. Persistent vertigo from central origin remains active without positional resolution and usually is presented alongside neurological symptoms including speech impairments, diplopia, limb ataxia, and body weakness.[3] Medical practitioners in the emergency department face the clinical difficulty of differentiating peripheral from central causes of vertigo and must be careful regarding their diagnosis since depending on clinical symptoms alone could result in misdiagnosis. The diagnosis of stroke-related vertigo holds medical urgency because posterior circulation strokes affecting the brainstem and cerebellum initially present with isolated vertigo symptoms like those of benign disorders. The failure to identify stroke symptoms early prevents patients from receiving crucial medical interventions promptly.[4] Stroke is a major global health burden functioning as one of the world's leading health threats that leads to considerable morbidity alongside mortality worldwide. Recent epidemiological studies suggest that there are 12.2 million new strokes annually while stroke causes more than 6.5 million deaths in one year.[5, 6] Stroke incidence in the Middle East and North Africa (MENA) region keeps increasing as the intensifying risk factors including hypertension, diabetes, smoking, and sedentary lifestyles are increasing.[5, 12] Data specific to Iraq and the broader Middle East regarding the rate of stroke among vertigo patients are limited however, the number of strokes in Iraq has shown a rising prevalence, while ischemic stroke appears more commonly than hemorrhagic stroke.[7] Research provided only limited data about posterior circulation strokes that present with vertigo symptoms in Iraq.[7, 8] As for Western society vertigo appears regularly in emergency departments (EDs) as a complaint type with 3-5% of the vertigo population being later diagnosed as ischemic stroke.[9, 10] Vertigo is primarily caused by benign factors among affected patients although posterior circulation stroke can account for up to 25% of stroke presentations as isolated vertigo or dizziness symptoms.[11] The rising stroke patient numbers, along with the potential for misdiagnosis in stroke patients initially presenting with vertigo, pose an important challenge to be addressed in the emergency medicine department. The main obstacle in differentiating peripheral from central vertigo depends on posterior circulation strokes showing only vertigo symptoms at the beginning,[4] The FAST (Face, Arm, Speech, Time) criteria along with other traditional assessment methods fails to detect posterior circulation strokes since these conditions typically do not display the typical motor defects associated with anterior circulation strokes.[9, 13] Stroke cases that exhibit symptoms of vertigo may exhibit poor prognosis due to the late diagnosis, subjecting the patient to higher risks of adverse health outcomes.[4] The determination of stroke in acute vertigo patients depends heavily on neuroimaging techniques. CT scan availability is common, yet these methods offer reduced sensitivity for detecting initial signs of ischemic changes, especially when assessing posterior circulatory lesions.[14] MRI with diffusion-weighted imaging stands as the best method for detecting acute ischemic strokes in medical diagnostic procedures.[15] Research indicates that non-contrast CT misses approximately 20% of strokes in the posterior circulation, highlighting MRI as essential for high-risk vertigo diagnosis.[16] The availability of MRI imaging is restricted in various emergency departments, making diagnosis difficult. Delayed treatment and improper diagnosis emerge from the absence of established stroke

screening procedures for individuals who experience vertigo symptoms.[17] The absence of standardized vestibular evaluation and vertigo stroke screening practices in emergency departments leads to increased possibilities of missed central causes in patients.[4, 17] Emergency health practitioners can use the HINTS (Head-Impulse, Nystagmus, Test of Skew) assessment to identify vertigo origin as peripheral or central, as HINTS exhibits a sensitivity superior to early MRI in detecting stroke yet, special training is needed to perform this test, which remains non-standardized across all emergency departments.[18] Several obstacles require better diagnostic procedures to diagnose stroke-related vertigo rapidly and precisely, along with early detection methods and standard assessment techniques to initiate treatment approaches for optimal patient results.[8]

Aim of The Study

The goal of this research is to determine how frequently ischemic brain injury occurs among acute vertigo patients visiting Erbil East Emergency Hospital. This research establishes stroke-related vertigo proportions to improve diagnosis precision, speed up identification, and enhance emergency care practices for patients. The results serve to advance better screening protocols with time-sensitive interventions, which help decrease diagnostic errors while enhancing patient response.

2. Materials and Methods

A cross-sectional analysis was conducted at Erbil East Emergency Hospital to determine the prevalence of acute ischemic brain injury among patients presenting to the emergency department with acute vertigo. The study was conducted over a period of 11 months, from May 2, 2024, to April 1, 2025, and a total of 144 patients who presented with acute vertigo were screened for acute ischemic brain injury in the study employing diffusion weighted imaging magnetic resonance (DWI-MRI) within the first 5 hours from the symptoms onset,[19] and upon a positive finding the patient was followed by fluid attenuated inversion recovery magnetic resonance imaging (FLAIR-MRI) after 24 hours from symptoms onset to further categorize the ischemic lesion as Ischemic Stroke or Transient Ischemic Attack (TIA),[20] throughout which a cohort of 23 patients were identified as having ischemic related vertigo, forming the Acute Ischemic Brain Injury sub cohort. As for the inclusion and exclusion criteria, all adult patients (≥18 years) presenting to the emergency department with acute vertigo were eligible, while children (<18 years) were excluded from the study.

3. Results

3.1 Acute Vertigo Cohort:

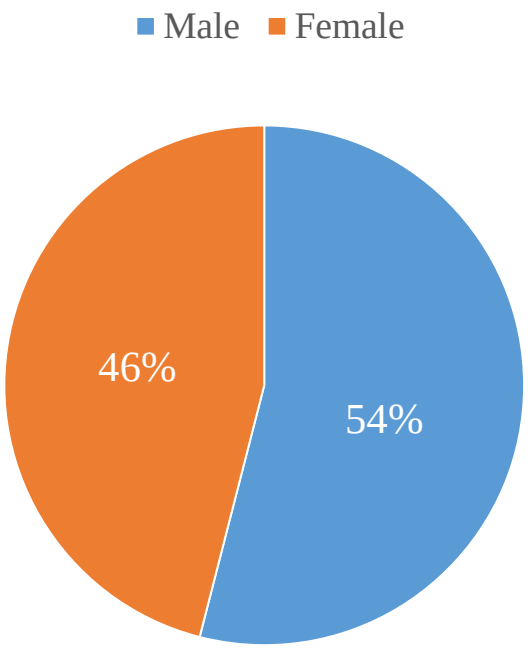
The study cohort of acute vertigo consisted of 144 patients presenting to the Erbil East Emergency Hospital. The cohort included 78 male patients (54%) and 66 female patients (46%). Participants ranged from 29 to 71 years, with a mean age of 41 ± 9.5 years. The patients' body mass index (BMI) ranged from 22.4 to 54.9 kg/m², with a mean BMI of 32.6 ± 3.7 kg/m². Regarding comorbidities, 69 patients (48%) had hypertension, 56 patients (39%) had Type II diabetes mellitus, and 43 patients (30%) had ischemic heart disease. Additionally, 23 patients (16%) were diagnosed with an acute ischemic brain injury, which included both ischemic strokes and transient ischemic attacks (TIAs). These demographic parameters highlight the diverse characteristics of the patient population, with particular emphasis on prevalent comorbid conditions that may influence the clinical presentation of acute vertigo. further classifications are shown in Table 1 and Figure 1.

Table 1: Demographic Parameters of the Studied Group

Demographic Parameters	**Acute Vertigo Cohort (n=144)**

Sex (Male/Female)	78/66
Age (Range)	29 - 71
Age (Mean ±SE)	41 ±9.5
BMI (Kg/m^2) (Range)	22.4 - 54.9
BMI (Kg/m^2) (Mean ±SE)	32.6 ±3.7
Hypertension (%)	69 (48%)
Diabetes Mellitus Type II (%)	56 (39%)
Ischemic Heart Disease (%)	43 (30%)
Dx Acute Ischemic Brain Injury (%)	23 (16%)

Figure 1: Gender Dispersion Among The Studied Group

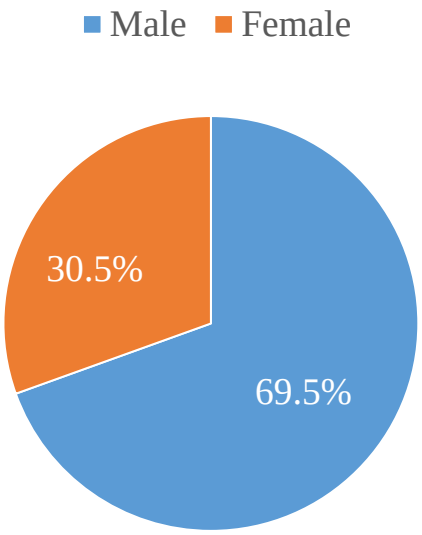


3.2 Acute Ischemic Brain Injury Sub-Cohort:
The acute ischemic brain injury sub-cohort consisted of 23 patients, with 16 male patients (69%) and 7 female patients (31%). The age range of the patients was between 44 and 71 years, with a mean age of 56 ± 7 years. The patients' body mass index (BMI) ranged from 26.7 to 52.3 kg/m², with a mean BMI of 34.3 ± 2.1 kg/m². Regarding comorbidities, 17 patients (74%) had hypertension, and 8 patients (35%) had Type II diabetes mellitus. These demographic parameters highlight a predominantly middle-aged to elderly population with a high prevalence of hypertension, reflecting the significant risk factors associated with acute ischemic brain events in the study group. further classifications are shown in Table 2 and Figure 2.

Table 2: Demographic Parameters of the Acute Ischemic Brain Injury Sub-Cohort

Demographic Parameters	**Acute Ischemic Brain Injury Sub-Cohort (n=23)**
Sex (Male/Female (%)	16/7
Age (Range)	44-71
Age (Mean ±SE)	56 ±7
BMI (Kg/m^2) (Range)	26.7-52.3
BMI (Kg/m^2) (Mean ±SE)	34.3 ±2.1
Hypertension (%)	17 (74%)
Diabetes Mellitus Type II (%)	8 (35%)

Figure 2: Gender Dispersion Among AIBI Sub-Cohort



3.3 DWI and FLAIR MRI Findings of the Acute Ischemic Brain Injury Sub-Cohort:
The DWI and FLAIR MRI findings of the acute ischemic brain injury sub-cohort (n=23) revealed significant information regarding the distribution of ischemic stroke and transient ischemic attack (TIA) cases, with particular focus on the vascular territories involved. Out of the total 23 patients, 14 (61%) were diagnosed with ischemic stroke, most of which were due to posterior circulation lesions (93%) and only 1 case (7%) being due to anterior circulation lesion. In contrast, 9 (39%) patients were diagnosed with TIA, with 7 (77.7%) having posterior circulation lesions and 2 (22.2) having anterior circulation lesions. A further breakdown of the posterior circulation cases revealed that out of the 20 patients with lesions in the posterior circulation, 14 (70%) had ischemic stroke, and 6 (30%) had TIA. This highlights the strong association between posterior circulation involvement and both ischemic stroke and TIA in the studied cohort. In terms of diagnostic imaging, DWI was initially performed to detect acute

ischemia, and FLAIR imaging was used to differentiate between ischemic stroke and TIA by assessing lesion persistence. In the case of ischemic stroke, the lesions were persistent on FLAIR imaging, confirming the infarction, while in TIA cases, the lesions resolved, indicating the transient nature of the event. These findings underscore the prevalence of posterior circulation ischemia in both ischemic strokes and TIAs, highlighting the critical role of DWI and FLAIR imaging in accurately categorizing ischemic brain events in acute vertigo presentations. Further classifications are mentioned in Table 3.

Condition	Acute Ischemic Brain Injury (n=23) (%)	Posterior Circulation (%)	Anterior Circulation (%)
Ischemic Stroke (n=14)	14 (61%)	13 (93%)	1 (7%)
Treansient Ischemic Attack (n=9)	9 (39%)	7 (77.7%)	2 (22.2%)

4. Discussion

This study aimed to evaluate the prevalence and characteristics of acute ischemic brain injury among patients presenting with acute vertigo to Erbil East Emergency Hospital. The results underscore the critical importance of timely and accurate diagnosis, especially given the potential for misdiagnosis of central causes of vertigo, particularly ischemic strokes, which can present initially with isolated vertigo symptoms. This study highlights the significant role of advanced imaging techniques, particularly DWI and FLAIR MRI, in distinguishing between ischemic stroke and transient ischemic attack (TIA), both of which are common causes of acute vertigo. The demographic characteristics of the acute vertigo cohort in this study (n=144) revealed that vertigo is a condition affecting a broad age range, with a mean age of 41 years. The predominance of comorbidities, such as hypertension (48%), diabetes mellitus (39%), and ischemic heart disease (30%), aligns with previous studies in acute vertigo conducted by (Mahmud et al., 2022).[10] The increased prevalence of these comorbidities in the studied cohort supports the notion that acute vertigo can often be an early warning sign of underlying ischemic brain events, particularly among individuals with established vascular risk factors. In the acute ischemic brain injury sub-cohort (n=23), the findings further reinforce the association between vascular risk factors, particularly hypertension, and the occurrence of ischemic brain injury. This sub-cohort had a higher mean age of 56 years and a high prevalence of hypertension (74%), and diabetes mellitus (35%) which is consistent with known risk factors for ischemic strokes, further emphasizing these conditions as common risk factors for ischemic events, including ischemic strokes and TIAs, as mentioned also by (Boehme et al., 2017).[21] The fact that 39% of the acute ischemic brain injury sub-cohort was diagnosed with TIA further emphasizes the importance of neuroimaging in distinguishing between ischemic stroke and TIA, as these conditions require profound management strategies. Given the transient nature of TIAs, their differentiation from ischemic strokes, which result in permanent brain injury, is crucial for appropriate treatment planning. The MRI findings from the DWI and FLAIR scans provided valuable insights into the location and nature of ischemic lesions in the acute ischemic brain injury sub-cohort. The majority of ischemic stroke cases (93%) were found to involve the posterior circulation, consistent with previous studies like (Schneider and Olshaker, 2012) that suggest posterior circulation strokes are often underdiagnosed due to the initial presentation of isolated vertigo symptoms.[22] In contrast, anterior circulation strokes in this cohort were low, accounting for only 7% of ischemic stroke cases. This is in line with literatures like (Kim and Lee, 2013) that suggests posterior circulation strokes, though less common overall, can present

with vertigo as a predominant symptom and may be easily missed if proper diagnostic imaging is not employed.[23] Regarding TIAs, 77.7% of the cases were attributed to posterior circulation lesions, with the remaining 22.2% involving anterior circulation lesions. The relatively high frequency of posterior circulation TIAs further emphasizes the critical role of MRI in diagnosing these cases, as TIA lesions are transient and may not be detected on initial imaging if only non-contrast CT scans are used. The use of DWI for initial detection, followed by FLAIR imaging to confirm the lesion's resolution, is essential for accurately distinguishing between ischemic strokes and TIAs. These findings highlight the importance of employing both DWI and FLAIR in the diagnostic workup of acute vertigo patients to ensure accurate diagnosis and timely treatment. The study also reinforces the potential limitations of CT scans in detecting posterior circulation strokes, which are less sensitive than MRI, particularly in the acute phase of ischemic events. Non-contrast CT scans, commonly available in emergency departments, missed approximately 20% of posterior circulation strokes, which makes MRI, especially with DWI, a gold standard for detecting ischemic brain injury, which is also illustrated by the findings of (Kumar et al., 2023), emphasizes the importance of having access to MRI imaging in emergency settings to improve diagnostic accuracy and patient outcomes.[17]

Conclusion

this study highlights the prevalence of ischemic brain injury, particularly posterior circulation lesions, in patients presenting with acute vertigo. The combination of DWI and FLAIR MRI offers superior diagnostic capabilities in distinguishing ischemic strokes from TIAs and peripheral causes of vertigo. Given the serious consequences of delayed diagnosis and treatment in stroke patients, emergency departments must adopt standardized screening procedures and make use of advanced neuroimaging techniques to ensure the timely identification and management of ischemic brain injuries. Future research should focus on improving the accessibility and standardization of these diagnostic techniques in emergency settings to reduce the risk of misdiagnosis and enhance patient care.

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