Journal of Population Therapeutics & Clinical Pharmacology

**RESEARCH ARTICLE**
**DOI: 10.53555/ngbjyc33**

# ACUTE SYMPTOMATIC SEIZURES IN ADULT INDIAN RURAL WOMEN: AN OBSERVATIONAL STUDY AND COMPARISON OF SEIZURE PROFILE WITH URBAN POPULATION

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## ABSTRACT

Adult women presenting with acute symptomatic seizures for the first time compromise a significant component of seizure patients. Compared with men, they have a different hierarchy of etiologies and therefore different requirements in terms of evaluation and further treatment. These etiologies not only differ according to the geographical location (between North and South India), but also between urban and rural population. A study to elucidate the different etiologies in women will help the primary care physician to understand the various etiologies and provide appropriate treatment. This data would be useful to health organizations to take appropriate preventive measures to control and eradicate infective etiologies in rural population and educate the urban population about the life style diseases that predispose to seizures.

**Material and Methods**- A prospective observational cross- sectional study conducted at Rohilkhand Medical College and Hospital. The first 100 adult women, presenting with new onset symptomatic seizures were recruited.

**Results-** Infective etiology (67%), were most common cause, neurocysticercosis was commonest, followed by tuberculoma, viral meningoencephalitis and bacterial meningoencephalitis. Metabolic causes (15%) were second most common, with hyponatremia as commonest cause, followed by uremic encephalopathy, hypocalcemia and hypoglycemia. Cerebrovascular disease (9%) was the third most common, with arterial infarcts, followed by Intracerebral hemorrhage and cerebral venous sinus thrombosis. Miscellaneous causes (9%) were 3 tumors and 6 cases of Organophosphorus poisoning.

**Conclusion**- Infective causes are the leading cause of acute symptomatic seizures in adult rural women. Organophosphorus poisoning also is an important cause, which needs to be addressed by the primary health care provider. The etiology was different on comparison with studies in urban population, where cerebrovascular disease were the most common, due to increase prevalence of lifestyle diseases in urban population, compared to the poor sanitation in rural population contributing to infections and thereby acute symptomatic seizures in adult women.

**KEY Words** : women, rural, India, acute symptomatic seizure, AWAOSS (Adult Women with Acute Onset Symptomatic Seizures )

## Background

As per definition, an epileptic seizure is a transient occurrence of signs and/or symptoms due to an abnormal excessive or synchronous activity in the brain (1). Epilepsy, on the other hand, as per International League against Epilepsy (ILAE), is a disease of the brain which includes a single unprovoked seizure with a high recurrence risk over the next 10 years (at least 60%), therefore epileptic seizures occur in every person with epilepsy, but not everyone who experiences an epileptic seizure suffers from epilepsy (2). This demarcation is very significant as in several societies, epilepsy is associated with a social stigma, more so, when the person suffering is an unmarried woman.

At this stage, it is also important to understand the concept of an acute symptomatic seizure, which is described as a seizure that occurs in a close temporal relationship with an acute CNS insult, which may be metabolic, toxic, structural, infectious, or due to inflammation [3,4]. It is essential therefore to comprehend that they are different from unprovoked seizures in many ways. Firstly, unlike in unprovoked seizures, there should always be a clearly identifiable, concomitant acute, causal condition that has occurred close to the time of the seizure. The cause may be an acute disturbance of structural brain such as a brain hemorrhage, or a disturbance of brain function, for example due to alcohol withdrawal, present at the time of the seizure. Secondly, acute symptomatic seizures usually do not recur once the precipitating factor or condition has been removed or reversed and the functional integrity of the CNS has been restored. This is in contrast to epilepsy where seizures are expected to recur. The absence of a precipitating predisposition, after an acute symptomatic seizure, means epilepsy does not exist. For example, if a patient has two epileptic seizures due to severe hyponatremia, there is no precipitating predisposition once the hyponatremia has resolved. However, the distinction between acute symptomatic seizures and epilepsy is more complicated in persons with acute symptomatic seizures due to destructive brain pathologies, such as stroke or head trauma, because they have an increased risk of developing epilepsy. Thus, close temporal relationship between a CNS insult and a seizure varies according to the underlying pathology (5). For example, a seizure is considered acute symptomatic if it occurs within the first seven days of a stroke or a traumatic brain injury (2). In other conditions, an acute symptomatic seizure may occur longer than a week after the onset of the brain insult provided that there is evidence of a continued active brain disease (6). An example is acute inflammatory CNS disease (such as infectious or autoimmune encephalitis). For other conditions, a closer temporal relationship is required to prove an association for example disorders such as hyponatremia, where there must be evidence of low serum sodium level within 24 hours of the seizure.

Seizures that are the manifestation of a neurodegenerative disease, for example Alzheimer's are considered progressive symptomatic seizures. They do not qualify as acute symptomatic seizures as the cause of the seizure is neither transient nor reversible. In such cases, a diagnosis of epilepsy can definitively be made after a second seizure but might be made even after the first seizure, if there is evidence of a recurrence risk greater than 60% and similarly, seizures that arise from most brain tumors are progressive symptomatic seizures. In multiple sclerosis, a seizure should be considered acute symptomatic if it occurs on presentation or within seven days of a relapse (2,5,6).

As far as India is concerned, as per one of the older studies, it was estimated that there are more than 10 million people with epilepsy, with a higher prevalence in rural India (1.9%) compared to urban population (0.6%) and an overall prevalence of about 1% (3,4), these figures would have defiantly changed over the period of time. It is important to understand that there is a significant difference in the etiology and prevalence of seizures between rural and urban population and between males and females. A large number of studies have been conducted in India and the majority of them are in tertiary care centers in metropolitan cities and not in the semi urban areas and majority have not elaborated the difference in the etiological profile between men and women (7,8,9,10). In view of

this lacunae in the available data base, concerning this important aspect, and also, as it has lot of clinical and social implications, we conducted this study with the aim to elucidate the etiology of adult-onset acute symptomatic seizures, that is seizure for the first time, in women more than 18 years of age, in the semi- urban population of India. Understanding the various etiological factors will defiantly assist in taking adequate measures to prevent and thereby decrease the incidence and prevalence of adult-onset acute symptomatic seizures in the women population of our country and be a guiding source for the health authorities and organisations.

Study Design This was a prospective observational cross- sectional study conducted in the Medical Emergency department and Medical Intensive Care Unit of Rohilkhand Medical College and Hospital, Bareilly, Utter Pradesh.

Study Population Women, more than 18 years of age, presenting with acute onset symptomatic seizures for the first time (with no past history of seizures) to the medical emergency department and MICU of RMCH were recruited for the study.

Sample size

100 women presenting with AWAOSS (Adult with acute onset symptomatic seizure)

**Sampling Method**

The first 100 women presenting with AWAOS were included in the study

**Inclusion Criteria**

All women more than 18 years of age with no past history of seizures presenting to the medical emergency or in MICU were enrolled in the study

**Exclusion Criteria** -

All the patients who had a history of previous seizure, age less than 18 years, insufficient history for diagnosis of seizures, pseudo- seizures, eclampsia, were excluded from the study.

**Period of Study** -August 2022 to February 2024

Methodology After obtaining approval from the Hospital Ethics Committee and informed consent from all the patients, the first 100 women presenting with AWAOS, as per the inclusion and exclusion criteria, were enrolled in the study. A detailed history was taken and clinical examination was performed for all the patients. All the patients underwent a routine bio- chemical and hematological profile evaluation, which included complete blood count, liver and renal function tests, blood sugar, electrolytes and EEG. Brain imaging in the form of CT scan was done for all the patients. CSF analysis, X- ray chest PA view, serum anti- cysticercal antibodies, serum anti-tubercular antibodies, CSF and blood culture were done where clinically indicated.

**Statistical analysis**

Data was analyzed using SPSS version 20 (SPSS Inc., Chicago, IL).

Result

**Table 1: Demographic data of patients with Acute symptomatic seizures**

| Age in years | Number of cases | Percentage |
|---|---|---|
| >18 <20 | 4 | 4 |
| 21-30 | 15 | 15 |
| 31-40 | 32 | 32 |
| 41-50 | 19 | 19 |
| 51-60 | 13 | 13 |
| 61-70 | 14 | 14 |
| >71 | 3 | 3 |
| Total | 100 | 100 |

**Seizures occurred most commonly in the age group of 31 to 40 years (32%), followed by 41 to 50 years (19%).**

**Table 2: Type of Seizure**

| Type of Seizure | Number of Patients | Percentage |
|---|---|---|
| Primary Generalized | 67 | 67 |
| Simple Partial | 22 | 22 |
| Complex Partial | 4 | 4 |
| Simple Partial with secondary generalization | 7 | 7 |

**The most common type of seizure observed was primary generalized seizure (67%) followed by simple partial seizures (22%)**

**Table 3: Etiology of Seizure**

| Etiology | Number of Patients | Percentage |
|---|---|---|
| INFECTIVE CAUSES | 67 | 67 |
| CEREBROVASCULAR DISEASE | 9 | 9 |
| METABOLIC DISORDERS | 15 | 15 |
| MISCELLANEOUS CAUSES | 9 | 9 |
| Total | 100 | 100 |

**Table 4: Infective etiologies**

| Etiology | Number of Patients | Percentage (n= 62) |
|---|---|---|
| INFECTIVE CAUSES | 67 | |
| Neurocysticercosis | 29 | 43.28 |
| Tuberculoma | 18 | 26.87 |
| Viral Meningoencephalitis | 13 | 19.40 |
| Bacterial Meningoencephalitis | 5 | 7.46 |
| Cerebral Malaria | 2 | 2.99 |

**Amongst the infective causes, Neurocysticercosis was the most common cause (43.28%).**

**Table 5: Cerebrovascular Diseases**

| Etiology | Number of Patients | Percentage (n= 9) |
|---|---|---|
| CEREBROVASCULAR DISEASE | 9 | |
| Arterial Infarct | 6 | 66.67 |
| Intracerebral Hemorrhage | 2 | 22.22 |
| Cerebral Venous Sinus Thrombosis | 1 | 11.11 |

**Arterial infarcts were the most common cerebrovascular causes of acute symptomatic seizures (66.67%).**

**Table 6: Metabolic Disorders**

| Etiology | Number of Patients | Percentage (n= 11) |
|---|---|---|
| METABOLIC DISORDERS | 15 | |
| Uremic encephalitis | 2 | 13.33 |

| | | |
|---|---|---|
| Hyponatraemia | 7 | 46.67 |
| Hypocalcaemia | 1 | 6.67 |
| Hypoglycemia | 5 | 33.33 |

**Hyponatraemia was the most common metabolic cause of acute symptomatic seizures (46.67%)**

**Table 7: Miscellaneous Causes**

| Etiology | Number of Patients | Percentage (n= 18) |
|---|---|---|
| MISCELLANEOUS CAUSES | 9 | |
| Tumor | 3 | 33.33 |
| Alcohol withdrawal | 0 | 0 |
| Poisoning (Organophosphorus poisoning) | 6 | 66.67 |

**Amongst the miscellaneous causes Poisoning was the most common cause (66.67%)**

**Table 8 : Etiology of seizures in relation to Age of the patients**

| Etiology | Age < 40 years | > 40 to 60 years | > 61 years | Total |
|---|---|---|---|---|
| | N= 51 | N= 32 | N=17 | 100 |
| INFECTIVE CAUSES | 44 | 20 | 3 | 67 |
| Neurocysticercosis | 21 | 8 | 0 | 29 |
| Tuberculoma | 16 | 2 | 0 | 18 |
| Viral Meningoencephalitis | 5 | 6 | 2 | 13 |
| Bacterial Meningoencephalitis | 1 | 3 | 1 | 5 |
| Cerebral Malaria | 1 | 1 | 0 | 2 |
| CEREBROVASCULAR DISEASE | 0 | 3 | 6 | 9 |
| Arterial Infarct | 0 | 2 | 4 | 6 |
| Intracerebral Hemorrhage | 0 | 1 | 1 | 2 |
| Cerebral Venous Sinus Thrombosis | 0 | 0 | 1 | 1 |
| METABOLIC DISORDERS | 2 | 6 | 7 | 15 |
| Uremic encephalitis | 0 | 2 | 0 | 2 |
| Hyponatraemia | 0 | 1 | 6 | 7 |
| hypocalcaemia | 1 | 0 | 0 | 1 |
| Hypoglycemia | 1 | 3 | 1 | 5 |
| MISCELLANEOUS CAUSES | 5 | 3 | 1 | 9 |
| Tumor | 0 | 2 | 1 | 3 |
| Alcohol withdrawal | 0 | 0 | 0 | 0 |
| Poisoning (Organophosphorus poisoning) | 5 | 1 | 0 | 6 |

**In the age group of less than 40 years, infective causes were the most common, followed by Organophosphorus poisoning (miscellaneous causes). In the age group of 41 to 60 years, infective causes were the most common, followed by metabolic disorders. In the age group of more than 60 years metabolic disorders were the most common, followed by cerebrovascular causes.**

**Table 9: Type of Seizure and its relation to etiology**

| Type of Seizure | INFECTIVE CAUSES (N=67) | CEREBROVASCULAR DISEASE (N=9) | METABOLIC DISORDERS (N=15) | MISCELLANEOUS CAUSES (N=9) |
|---|---|---|---|---|
| Primary Generalized (N=67) | 41 | 5 | 14 | 7 |
| Simple Partial (n=22) | 19 | 2 | 0 | 1 |
| Complex Partial (N=4) | 2 | 1 | 1 | 0 |
| Simple Partial with secondary generalization (N=7) | 5 | 1 | 0 | 1 |

**Amongst all the causes, primary generalized seizure was the most common type of acute symptomatic seizure.**

**Discussion**

Acute onset seizures in adults, especially women in rural India have a very significant clinical and social importance as they are usually linked to an underlying medical condition which could be treatable. Elucidating the etiology, treating the underlying medical condition and then taking preventive measures to control the factors responsible for propagating the causative factor are very important for the primary care physician. Understanding the etiology will assist in making evidence-based decisions and treating the patients in a better manner and assist in guiding the community to take adequate measures to prevent these seizures.

In our study the most common etiology was neuroinfections (67%) and amongst it was neurocysticercosis (n=29, 43.28% of all causes), followed by metabolic causes (15%) and then by cerebrovascular disease (9%)and miscellaneous causes (9%).

**Table Number 10: Comparison of etiologies of acute symptomatic seizures**

| Etiology | Our Study Rural | | Vemulapalli *et al* (Bangalore) Urban | | Bhatia *et al* (Chandigarh) Urban | | Ashwin *et al* (Pondicherry) Urban | |
|---|---|---|---|---|---|---|---|---|
| | N=100 | % | N=138 | % | N=90 | % | N=100 | % |
| Infections | 67 | 67 | 37 | 26.8% | 36 | 40 | 17 | 17 |
| CVA | 9 | 9 | 45 | 32.6% | 40 | 43.4 | 21 | 21 |
| Metabolic | 15 | 15 | 18 | 13% | 11 | 13.3 | 15 | 15 |
| Alcohol Withdrawal | 0 | 0 | 15 | 10.9% | 0 | 0 | 5 | 5 |
| Tumors | 3 | 3 | 6 | 4.3% | 3 | 3.3 | 6 | 6 |
| Poisoning | 6 | 6 | 0 | 0 | 0 | 0 | 1 | 1 |

A similar pattern was seen by Vemulapalli (7), from Bangalore (South India), in their study the most common cause of AWAOS was also neuroinfections (32.6%), followed by CVA (28.2%). Among the neuroinfections, neurocysticercosis was the most common cause (14.5%), followed by neurotuberculosis (tuberculoma 7.2%, tuberculous meningoencephalitis 1.5%). Among CVA, ischemic strokes were the most common cause. Metabolic derangements were seen in 13% overall

(men and women) with uremia and hypoglycemia being the most common. There is a slight variation in the percentages probably because the figures in their study are for the combined, male and female population and not gender specific.

Bhatia et al (8), from Chandigarh (North India), in their study, 45.6% of the cases were females and overall etiology (inclusive of both males and females) stroke was the most common cause (40%), followed by metabolic causes (12.2%) such as hypoglycemia, hypocalcemia and hyponatremia. Amongst the infective etiologies, tubercular meningitis followed by viral meningoencephalitis were the most common causes overall, with not a single case of neurocysticercoses in their study. In this study , which also happens to be from North India , as our study, there is a marked difference in the etiological profile which can be explained by the fact that firstly there study population involves urban population, where because of adequate hygiene and sanitary conditions and health measures taken by the community, the factors responsible for propagating the infective etiologies such as neurocysticercosis and tuberculosis have been eliminated , secondly these figures are again not gender specific.

Ashwin et al (9) in their study from a tertiary care center (Pondicherry) reported that the most common cause of seizure was stroke followed by infection followed by metabolic cause. Stroke was leading cause of seizures (21%). Infection was next leading cause of seizures (17%), followed by metabolic cause (15%). They also reported alcohol withdrawal as a cause in 5% of cases and brain tumors in 6%. In comparison to our study, the study population was urban population and therefore, as seen in other studies from India, stroke seems to be the most common cause, compared to rural area where infections predominate as the most common cause. Alcohol use amongst women in semi urban population is probably not very prevalent and therefore we didn't have any cases of alcohol withdrawal presenting as AWAOSS, although we had 6 cases of Organophosphorus poisoning.

An etiological pattern similar to our study has been reported by Sailaja et al (10) in their study from Guntur, a semi-rural population, in which neuroinfections was the leading cause of seizure, which accounted for 34%, followed by cerebrovascular accidents (29%) and metabolic (9%). Neurocysticercosis was also most common cause in neuroinfections (35%), followed by meningitis (29%) and cerebral malaria (17%). 8% of seizures were because of CVT. 14% of seizures were pregnancy related. In cases with cerebrovascular diseases, aged less than 40 years, cerebral venous thrombosis accounted for 79%. We had excluded pregnant women from our study population; therefore, we did not have any pregnancy related seizures.

**Table Number 11: Comparison of type of Seizures**

| Type Of Seizure | Our Study (Bareilly) Rural | | Vemulapalli *et al* (Bangalore) Urban | | Bhatia *et al* (Chandigarh) Urban | | Ashwin *et al* (Pondicherry) Urban | |
|---|---|---|---|---|---|---|---|---|
| | N=100 | % | N=138 | % | N=90 | % | N=100 | % |
| Primary Generalized | 67 | 67 | 97 | 70.2% | 89 | 98.9% | 57 | 57 |
| Simple Partial | 22 | 22 | 14 | 10.1% | 0 | 0 | 30 | 30 |
| Complex Partial | 4 | 4 | 0 | 0 | 1 | 1.1% | 4 | 4 |
| Simple Partial with secondary generalization | 7 | 7 | 22 | 15.9% | 0 | 0 | 9 | 9 |

In our study the most common presentation was of generalized tonic- clonic seizures (67%) followed by simple partial seizures (22%) and least common presentation was of complex partial seizures. This can be explained by the etiological factors manifesting as acute symptomatic seizures.

In the study by Bhatia et al(8), generalized tonic-clonic seizure was also the most common presentation (98.9%), followed by complex partial seizures(1.1%).
In all the study by Vemulapalli et al (8), Bhatia et al and Ashwin et al, generalized tonic-clonic seizure was the most common presentation of acute symptomatic seizures. There were differences in the number of cases presenting with simple partial seizure, complex partial seizure and simple partial with secondary generalization due to differences in the etiological profiles.

**Conclusion**

It is important to understand that the incidence and etiological profile of AWAOSS are different for men and women. We compared the etiological profile of our study with other studies from the Indian subcontinent, with emphasis on both- North and South India and urban compared to semi-urban/ rural population and we observed that the geographical distribution ( North/ South India) and most importantly the population under study, such as the semi urban /rural/ urban population play an important role in determining the hierarchy of the etiological factors. In most of the rural areas, neuroinfections were the predominant cause of AWAOSS, the etiology varied from NCC, cerebral malaria to meningoencephalitis depending on the most prevalent suitable environmental factors for the transmission of the infective agents, as compared to the urban centers where life style diseases leading to obesity, diabetes and hypertension leading to increased incidence of cerebrovascular accidents, presenting as AWAOSS. The study was focused on the etiological factors associated with women as they constitute a significant part of the population not only in numbers, but also as a major workforce as a homemaker and as a professional, contributing to the economy of the  to the society. Unfortunately, there are very limited studies from the Indian subcontinent which have focused on the female population, who not only have to bear the burden of the disease, but also face the consequences of the social stigma attached to seizure disorders. Understanding the difference between acute symptomatic seizure and epilepsy and the etiological factors associated with AWAOSS will enable the primary care physician and the Health Authorities to take preventive steps in the correct direction and  will definitely assist in elimination of these infective risk factors, thereby assisting the primary care physician to serve the community in a more effective manner.

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