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Original Research Article

A STUDY TO DETERMINE THE PREVALENCE OF METABOLIC SYNDROME AMONG PATIENTS WITH EPILEPSY ON ANTIEPILEPTIC DRUGS AND IDENTIFY ASSOCIATED RISK FACTORS

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ABSTRACT

Background: Metabolic syndrome (MetS) is a cluster of conditions that increase the risk of cardiovascular diseases and diabetes. Patients with epilepsy (PWE) on long-term antiepileptic drugs (AEDs) may be at higher risk due to drug-induced metabolic alterations. **Objective**: To determine the prevalence of MetS among PWE on AEDs and identify associated risk factors.
Materials and Methods: A cross-sectional study was conducted in KBN Teaching and General hospital, Kalaburagi and Basaveshwara Teaching and General hospital, Kalaburagi on **110 PWE** aged **18–65 years** receiving AEDs for **8 months**. MetS was diagnosed using the **International Diabetes Federation (IDF) criteria** (central obesity plus two of: elevated triglycerides, reduced HDL, hypertension, or elevated fasting glucose). Demographic, anthropometric, and biochemical data were analyzed.
Results: The prevalence of MetS was **34.5% (n=38)**. The most common AEDs associated with MetS were **valproate (45%) and carbamazepine (30%)**. Central obesity (**72.6%**) and dyslipidemia (**58.3%**) were the most frequent components. MetS showed significant associations with **age >40 years (p=0.01), AED duration >5 years (p=0.03), and valproate use (p=0.02)**.
Conclusion: Over **one-third of PWE** on AEDs developed MetS, with valproate and carbamazepine posing the highest risk. Regular metabolic monitoring and lifestyle interventions are recommended for this population.
Keywords: PWE, MetS, IDF.

INTRODUCTION

Epilepsy is a chronic neurological disorder characterized by recurrent seizures, affecting approximately 50 million people worldwide.[1] Despite advancements in treatment, a significant proportion of patients continue to rely on long-term antiepileptic drug (AED) therapy for seizure control. While AEDs are effective in managing epilepsy, their prolonged use has been associated with various metabolic disturbances, raising concerns about their impact on overall health.[2]
Metabolic syndrome (MetS) is a cluster of interrelated risk factors, including central obesity, hypertension, dyslipidemia, and insulin resistance, that significantly increase the risk of cardiovascular diseases (CVD) and type 2 diabetes mellitus.[3] The global prevalence of MetS is estimated to be 20-30% in the general adult population4, but emerging evidence suggests that patients with epilepsy (PWE) may be at a higher risk due to the metabolic effects of AEDs.[5]
Certain AEDs, such as valproate and carbamazepine, have been implicated in weight gain, dyslipidemia, and insulin resistance.[6] Valproate, in particular, is associated with a higher incidence of obesity and polycystic ovary syndrome (PCOS) in women.[7] Enzyme-inducing AEDs, like phenytoin and carbamazepine, alter lipid metabolism, leading to elevated cholesterol and triglyceride levels.8 In

contrast, newer AEDs, such as levetiracetam and lamotrigine, appear to have a more favorable metabolic profile, though long-term data are limited.[9]

Despite these risks, metabolic monitoring is not routinely integrated into epilepsy management, leaving many patients vulnerable to undiagnosed MetS and its complications.[10] Cardiovascular diseases remain a leading cause of premature mortality in PWE,[11] underscoring the need for early detection and intervention. However, most studies on AED-induced metabolic effects have been conducted in Western populations, and data from other regions, including developing countries, are scarce.[12]

This study aims to assess the prevalence of MetS in PWE receiving AED therapy and identify the associated risk factors. By using standardized diagnostic criteria, we seek to provide actionable insights that can guide clinical practice, improve patient outcomes, and reduce the burden of metabolic complications in this high-risk population.

MATERIALS AND METHODS

This study employed a **hospital-based, cross-sectional descriptive design** to assess the prevalence of metabolic syndrome (MetS) among patients with epilepsy (PWE) on antiepileptic drugs (AEDs). The study was conducted in the Department **of Medicine,** KBN Teaching and General hospital, Kalaburagi and Basaveshwara Teaching and General hospital, Kalaburagi, a tertiary care referral center in [City, Country]. Data collection took place over **8 months**, ensuring adequate patient enrollment.

Inclusion Criteria

- Age **18–65 years**.
- Confirmed diagnosis of epilepsy (based on **ILAE criteria**).
- On AED therapy for **≥6 months**.
- Willing to provide informed consent.

Exclusion Criteria

- Pregnant or lactating women.
- Known **diabetes mellitus, hypertension, or dyslipidemia prior to AED initiation**.
- Chronic use of **steroids, hormonal therapy, or weight-modifying drugs**.
- **Active liver/kidney disease** (may alter drug metabolism).

Sample Size Calculation

- **Formula**: Based on the prevalence of MetS in epilepsy patients (estimated **30% from prior studies**), with a **95% confidence interval** and **10% margin of error**.
- **Adjustment**: Accounting for **10% attrition/non-response**, the final sample size was **110 participants**.

Procedure for Data Collection

1. **Patient Recruitment**: Consecutive sampling from the epilepsy clinic.
2. **Informed Consent**: Written consent obtained before enrollment.
3. **Clinical Assessment**:
   - **Anthropometry**: Weight, height, waist circumference.
   - **Blood Pressure**: Measured twice (seated, 5-min rest).
4. **Laboratory Tests**:
   - **Fasting blood samples** for glucose and lipid profile.
5. **Data Recording**:
   - AED type, duration, dose recorded from prescriptions.
   - MetS components documented per **IDF criteria**.

Statistical Analysis:

Descriptive statistics (mean, percentages). Chi-square/t-tests for associations. Multivariate regression for confounding adjustment. Software used was SPSS version 22.

RESULTS

Table 1: Demographic and Clinical Characteristics of Study Participants (N=110)

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	18-30	32	29.1
	31-45	45	40.9
	46-65	33	30.0
Gender	Male	52	47.3
	Female	58	52.7
BMI (kg/m²)	<25 (Normal)	41	37.3
	25-29.9 (Overweight)	39	35.5
	≥30 (Obese)	30	27.3
Duration of AED Use	<2 years	28	25.5
	2-5 years	43	39.1
	>5 years	39	35.5

The study included 110 patients with epilepsy (52 males, 58 females), with a mean age of 42.5 ± 12.3 years. The majority (40.9%) were aged 31–45 years, and over 60% were overweight or obese (BMI ≥25). Notably, 35.5% had been on AEDs for >5 years, suggesting a cohort with long-term drug exposure.

Table 2: Prevalence of Metabolic Syndrome (IDF Criteria) and Its Components

Parameter	Frequency (n)	Percentage (%)	95% CI
MetS (Overall)	38	34.5	25.8–43.2
Individual Components:			
- Central Obesity	80	72.7	64.1–81.3
- Elevated Triglycerides	48	43.6	34.3–52.9
- Reduced HDL	64	58.2	49.0–67.4
- Hypertension	42	38.2	29.1–47.3
- Elevated Fasting Glucose	36	32.7	23.9–41.5

Metabolic syndrome (MetS) was identified in 34.5% (n=38) of participants. Central obesity (72.7%) and reduced HDL (58.2%) were the most prevalent components, followed by elevated triglycerides (43.6%) and hypertension (38.2%). Fasting hyperglycemia was observed in 32.7% of patients.

Table 3: Association Between AED Type and Metabolic Syndrome

AED Type	Total Patients (n)	MetS Cases (n)	MetS Prevalence (%)	p-value
Valproate	40	18	45.0	0.02*
Carbamazepine	35	12	34.3	0.04*
Levetiracetam	20	4	20.0	0.18
Phenytoin	15	4	26.7	0.32

Statistically significant (p<0.05).

Valproate demonstrated the strongest association with MetS (45% prevalence, p=0.02), followed by carbamazepine (34.3%, p=0.04). In contrast, newer AEDs like levetiracetam (20%) and phenytoin (26.7%) showed lower MetS prevalence, though statistical significance was not reached (p>0.05).

Table 4: Risk Factors for Metabolic Syndrome (Multivariate Regression)

Variable	Adjusted OR	95% CI	p-value
Age >40 years	2.1	1.2–3.8	0.01*
Female Gender	1.5	0.8–2.9	0.21
Valproate Use	2.8	1.4–5.6	0.003*
AED Duration >5 yrs	2.3	1.3–4.1	0.005*
BMI ≥30	3.5	1.9–6.4	<0.001*

OR = Odds Ratio; CI = Confidence Interval.

Multivariate regression identified **age >40 years (OR=2.1, p=0.01)**, **valproate use (OR=2.8, p=0.003)**, **AED duration >5 years (OR=2.3, p=0.005)**, and **obesity (BMI ≥30, OR=3.5, p<0.001)** as independent risk factors for MetS. Female gender showed a trend but lacked statistical significance (OR=1.5, p=0.21).

DISCUSSION

The 34.5% prevalence of metabolic syndrome (MetS) found in our study population is significantly higher than the 20-25% reported in the general population[3]. This elevated prevalence aligns with previous epilepsy-specific studies, though with notable variations. For instance, Hamed et al,[5] reported a 32% MetS prevalence in Egyptian epilepsy patients, while Luef et al,[8] found 28% in an Austrian cohort. The higher rate in our study may reflect regional differences in genetic predisposition, dietary habits, or healthcare access. Importantly, our findings confirm that epilepsy patients on long-term AED therapy constitute a high-risk group for metabolic complications that requires targeted monitoring.4

Our results demonstrate clear differences in metabolic risk profiles among various AEDs. Valproate showed the strongest association with MetS (45% prevalence), consistent with its well-documented effects on weight gain and insulin resistance.6 This aligns with Isojärvi et al.'s,[7] landmark study showing valproate's particular metabolic impact in women. Carbamazepine, while less detrimental than valproate, still showed significant metabolic effects (34.3% MetS prevalence), likely due to its enzyme-inducing properties that alter lipid metabolism.8 In contrast, newer AEDs like levetiracetam appeared metabolically neutral, supporting their use in high-risk patients.[9]

The identified risk factors provide important clinical insights. The strong association between long-term AED use (>5 years) and MetS (OR=2.3) suggests a cumulative metabolic burden, reinforcing findings from Hamed and Hussein's,[12] longitudinal study. Obesity (BMI ≥30) emerged as the strongest predictor (OR=3.5), highlighting the critical need for weight management in this population.10 While age >40 years was significantly associated with MetS, the lack of gender difference contrasts with some previous studies, possibly due to our sample characteristics or regional factors.[11]

Several limitations should be acknowledged. The two-center design may limit generalizability, and the cross-sectional nature prevents causal inferences. Lack of dietary and physical activity data represents another constraint. Future research should include longitudinal designs to establish temporal relationships and investigate the impact of specific interventions. Multicenter studies would help clarify regional variations in metabolic risk profiles among epilepsy patients.

CONCLUSION

This study provides compelling evidence that epilepsy patients on long-term AED therapy face substantially increased risks of developing metabolic syndrome. The findings emphasize the need for heightened clinical vigilance, individualized AED selection, and comprehensive metabolic management in this vulnerable population. By addressing these metabolic complications proactively, clinicians can potentially reduce cardiovascular morbidity and improve long-term outcomes for people with epilepsy.

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