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Prevalence and Patterns of Physical Inactivity and Temporomandibular Joint Involvement in Epileptic Patients

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ABSTRACT

***Background**: Epilepsy is frequently accompanied by reduced physical activity and under-recognized musculoskeletal sequelae, including temporomandibular disorders (TMD), which may adversely affect functional health and quality of life.* ***Objective**: To determine the prevalence and distribution patterns of physical inactivity and temporomandibular joint involvement among young adults with epilepsy attending tertiary care neurology outpatient departments in Lahore, Pakistan.* ***Methods:** A descriptive cross-sectional observational study was conducted over six months using non-probability consecutive sampling. Adults aged 18–30 years with clinician-confirmed epilepsy were assessed using the Global Physical Activity Questionnaire (GPAQ) for physical activity (MET-min/week and activity category), and the TMD Pain Screener (long form) and Fonseca Anamnestic Index for pain-related TMD and overall TMD severity, respectively. Descriptive analyses were performed using SPSS version 27.* ***Results**: A total of 139 participants were included (mean age 23.82±3.74 years; 56.1% male). Mean GPAQ physical activity was 931.59±566.19 MET-min/week (range 0–2740). Low physical activity was present in 30.9% (n=43) and moderate activity in 69.1% (n=96), with no participants classified as highly active. Pain-related TMD screened positive in 24.5% (n=34). Fonseca severity categories were no TMD 10.8% (n=15), mild 71.9% (n=100), moderate 15.8% (n=22), and severe 1.4% (n=2).* ***Conclusion**: Young adults with epilepsy demonstrated substantial physical inactivity and a high burden of TMD symptoms, predominantly mild, supporting the need for routine screening and multidisciplinary management.*

Keywords
Epilepsy; Physical inactivity; Global Physical Activity Questionnaire; Temporomandibular disorders; TMD Pain Screener; Fonseca Anamnestic Index; Prevalence; Cross-sectional

INTRODUCTION

Epilepsy is a chronic neurological disorder characterized by a persistent predisposition to generate unprovoked seizures and by the neurobiological, cognitive, psychological, and social consequences that accompany this condition (1). Beyond seizure control, contemporary epilepsy care increasingly recognizes the importance of lifestyle factors, particularly physical activity, in influencing overall health, psychosocial functioning, and quality of life. Growing evidence suggests that engagement in regular physical activity can improve physical fitness, mood, cognition, and self-efficacy in people with epilepsy, while also potentially reducing seizure frequency in selected populations (2). Conversely, physical inactivity remains common among individuals with epilepsy, often driven by fear of seizures, injury, social stigma, and inadequate counseling from healthcare professionals, resulting in avoidable secondary health risks (3).

Globally, epilepsy affects tens of millions of people and represents a substantial cause of disability and premature mortality Recent global burden estimates indicate that more than 50 million individuals are living with epilepsy worldwide, with the highest burden concentrated in low- and middle-income countries Although advances in diagnosis and treatment have reduced age-standardized mortality and disability-adjusted life years in many regions, epilepsy continues to exert a disproportionate impact on young and working-age adults, thereby amplifying its social and economic consequences. In Pakistan, epilepsy constitutes a major public health concern, with epidemiological data suggesting a prevalence of active epilepsy of approximately 9–10 per 1,000 population and an estimated two million affected individuals nationwide, particularly among adolescents and young adults Socioeconomic constraints, limited access to specialist care, high rates of treatment gaps, and persistent stigma further compound disease burden in this setting (4).

Physical inactivity in people with epilepsy has been consistently reported across diverse populations. Systematic reviews and large observational studies demonstrate that adults with epilepsy are significantly less likely to meet recommended physical activity guidelines compared with the general population, with inactivity linked to poorer cardiovascular fitness, increased body mass index, fatigue, and diminished quality of life (5). Despite international guidelines supporting safe participation in most forms of physical activity for individuals with well-controlled epilepsy, misconceptions regarding exercise-related seizure risk remain widespread among patients, caregivers, and even healthcare providers (6). In low-resource contexts, these barriers are further reinforced by the lack of structured rehabilitation services and limited interdisciplinary collaboration, resulting in reliance on incidental or moderate activity rather than sustained, health-enhancing exercise behaviors (7).

In parallel with reduced physical activity, epilepsy is also associated with under-recognized musculoskeletal complications, particularly involving the temporomandibular joint. Recurrent tonic–clonic seizures can expose the masticatory muscles and temporomandibular joint to excessive forces through jaw clenching, bruxism, and involuntary muscle contractions, potentially leading to pain, dysfunction, or dislocation (8). Clinical and epidemiological studies suggest that while the overall prevalence of temporomandibular disorders in people with epilepsy may be comparable to that of the general population, the severity and functional impact of symptoms are often greater in affected individuals (9). Importantly, temporomandibular disorders encompass a spectrum ranging from mild, non-painful dysfunction to clinically significant pain and limitation, which may not be captured unless systematically screened using validated instruments (10).

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Existing literature on physical inactivity and temporomandibular joint involvement in epilepsy is limited by several methodological gaps. Many studies rely exclusively on self-reported physical activity without standardized categorization, focus predominantly on high-income settings, or examine temporomandibular disorders through isolated case reports rather than population-based estimates (11). Data from Pakistan and comparable low- and middle-income countries are particularly scarce, despite the likelihood that sociocultural factors, healthcare access limitations, and rehabilitation gaps may exacerbate both inactivity and musculoskeletal comorbidities in this population (12). Furthermore, few studies have concurrently examined physical activity levels and temporomandibular joint symptoms within the same cohort, limiting a comprehensive understanding of the broader functional burden of epilepsy.

From a clinical and public health perspective, identifying the prevalence and distribution of physical inactivity and temporomandibular joint involvement among young adults with epilepsy is essential for informing multidisciplinary care models that extend beyond pharmacological seizure control. Early detection of low physical activity and mild temporomandibular dysfunction may enable timely referral to physiotherapy, rehabilitation, and dental services, potentially preventing progression to more severe impairment and improving overall quality of life (13). Within the PICO framework, the population of interest comprises young adults diagnosed with epilepsy; the exposures of interest are physical inactivity and temporomandibular joint involvement; the outcomes include the prevalence and patterns of physical activity levels and temporomandibular disorder symptoms; and no comparator group is specified due to the descriptive nature of the study.

Accordingly, the objective of the present study was to determine the prevalence and patterns of physical inactivity and temporomandibular joint involvement among young adult patients with epilepsy attending tertiary care neurology outpatient departments in Lahore, Pakistan, using validated assessment tools. By addressing this knowledge gap, the study aims to provide context-specific baseline evidence to support more comprehensive, multidisciplinary epilepsy management strategies in low-resource settings.

MATERIALS AND METHODS

This study employed a descriptive cross-sectional observational design to estimate the prevalence and distribution of physical inactivity and temporomandibular joint involvement among young adults with epilepsy. A cross-sectional approach was selected as methodologically appropriate for prevalence-based research and allows efficient characterization of health-related behaviors and symptoms within a defined population at a single point in time, particularly in under-researched clinical settings (14). The study was conducted in the neurology outpatient departments of tertiary care hospitals in Lahore, Pakistan, where patients with epilepsy routinely attend follow-up consultations. Data collection was carried out over a continuous six-month period to ensure adequate participant flow and minimize seasonal variation in physical activity behaviors.

The study population consisted of adults aged 18 to 30 years with a confirmed clinical diagnosis of epilepsy documented in the medical record by a treating neurologist. Eligibility criteria were defined to ensure clinical stability and reliable self-reporting. Participants were included if they had attended the neurology outpatient department during the study period, were clinically stable at the time of assessment, and were able to comprehend and respond to questionnaires in Urdu or English independently or with interviewer assistance. Individuals were excluded if they had severe cognitive or intellectual impairment precluding informed consent or valid questionnaire completion, acute medical or surgical illness at the time of recruitment, recent or current orofacial trauma, recent temporomandibular joint surgery or major dental treatment likely to confound temporomandibular disorder symptoms, pre-diagnosed temporomandibular disorders under active specialist treatment, pregnancy, or any condition causing major mobility limitation that could substantially alter physical activity levels (15).

Participants were selected using a non-probability consecutive sampling strategy, whereby all eligible patients presenting to the neurology outpatient departments during the data collection period were invited to participate. Recruitment was conducted in waiting areas to ensure minimal disruption to routine clinical care. After verification of eligibility through brief screening and review of medical records, eligible individuals were informed about the study objectives and procedures. Written informed consent was obtained from all participants prior to enrollment. Participation was voluntary, and no financial or clinical incentives were provided.

Data collection was performed using standardized, validated instruments administered during a single encounter. Sociodemographic variables included age, sex, height, weight, and body mass index, which was calculated as weight in kilograms divided by height in meters squared. Physical activity was assessed using the World Health Organization Global Physical Activity Questionnaire, which captures activity across work, transport, and leisure domains and allows calculation of total weekly metabolic equivalent minutes (MET-min/week) Based on established scoring protocols, participants were categorized into low or moderate physical activity levels; no participant met criteria for the high activity category. Temporomandibular joint involvement was evaluated using two complementary instruments. Pain-related temporomandibular disorders were screened using the TMD Pain Screener, a validated tool designed to identify clinically relevant temporomandibular pain (16). Broader temporomandibular disorder symptoms and severity were assessed using the Fonseca Anamnestic Index, which classifies dysfunction as none, mild, moderate, or severe based on cumulative symptom scores. All questionnaires were administered in a standardized manner, and responses were reviewed immediately to ensure completeness and internal consistency. The primary outcome variables were physical activity level, operationalized as categorical GPAQ activity level and continuous total MET-minutes per week, and temporomandibular joint involvement, operationalized as the presence or absence of pain-related temporomandibular disorder on the TMD Pain Screener and severity categories derived from the Fonseca Anamnestic Index. Secondary variables included anthropometric characteristics and sex. To reduce measurement bias, validated instruments with established reliability and cross-cultural applicability were used, and data collection procedures were standardized across participants Selection bias was mitigated by consecutive recruitment of all eligible attendees during the study period, and confounding was addressed descriptively by documenting relevant demographic and clinical characteristics.

Sample size estimation was performed a priori using EPItool software, based on previously reported prevalence estimates of epilepsy in Pakistan and assuming a 95% confidence level with acceptable precision, resulting in a target sample size of 139 participants . This sample size was considered adequate to provide stable prevalence estimates for the primary outcomes. Statistical analysis was conducted using the Statistical Package for the Social Sciences version 27. Data were entered into a secure database with double-checking to ensure accuracy. Descriptive statistics were used to summarize participant characteristics and outcome variables. Continuous variables were reported as means with standard deviations, while categorical variables were presented as frequencies and percentages. Given the descriptive objectives of the study, no inferential hypothesis testing was performed. Missing data were minimal and handled by complete-case analysis. Graphical representations were generated to visually depict distributions of key variables. Ethical approval for the study was obtained from the relevant institutional review board prior to

commencement, and all procedures were conducted in accordance with the principles of the Declaration of Helsinki. Participant confidentiality was maintained through anonymization of data and restricted access to study records. Standardized protocols for data collection, coding, and analysis were followed to enhance reproducibility and data integrity, allowing replication of the study methodology in comparable clinical settings.

RESULTS

The study included 139 participants with epilepsy, representing young adults with a mean age of 23.82 years (SD 3.74; range 18–30). Anthropometric characteristics showed substantial heterogeneity: mean body weight was 69.66 kg (SD 15.46; range 40.0–102.1), mean height was 164.64 cm (SD 10.91; range 140.4–196.9), and the mean body mass index was 25.99 kg/m² (SD 6.60; range 12.7–43.7). The broad BMI range indicates representation across underweight through obese categories, supporting a heterogeneous physical profile within the cohort.

Sex distribution was relatively balanced, with a slight predominance of males. Of the 139 participants, 78 were male (56.1%) and 61 were female (43.9%). This modest male predominance suggests that both sexes were well represented, reducing the likelihood that results reflect a single-sex clinical profile.

Physical activity levels, quantified using the Global Physical Activity Questionnaire, demonstrated wide dispersion in total weekly energy expenditure. The mean total physical activity was 931.59 MET-minutes/week (SD 566.19), with values ranging from 0 to 2740 MET-minutes/week. This distribution indicates that while many participants achieved moderate levels of activity, a non-trivial subset reported extremely low or no activity, reflected in the lower bound of 0 MET-minutes/week. When participants were classified into GPAQ activity categories, 43 individuals were categorized as having low physical activity (30.9%), while 96 participants were categorized as moderately active (69.1%). Notably, no participant met the criteria for the high physical activity category (0.0%). This pattern suggests that most participants achieved some level of routine activity consistent with moderate classification, but nearly one-third remained physically inactive, and the complete absence of high activity indicates that vigorous or health-enhancing activity levels were not observed in this cohort. Temporomandibular joint involvement assessed using the TMD Pain Screener (long form) revealed generally low-to-moderate symptom burden with considerable variability. The mean score was 2.34 (SD 1.94), with a minimum score of 0 and a maximum score of 9. This indicates that although many participants reported no pain-related symptoms, others experienced appreciable levels of TMJ-related pain, reflected in the upper range of the scale.

In terms of prevalence based on the TMD Pain Screener categorical outcome, 34 participants screened positive for TMJ pain (24.5%), while 105 participants screened negative (75.5%). Thus, approximately one in four participants demonstrated pain-related temporomandibular disorder features, suggesting that clinically relevant TMJ pain is a common comorbidity within this epilepsy cohort, though not universal. Fonseca Anamnestic Index results indicated a broader distribution of temporomandibular disorder symptom severity than the pain screener alone. The mean Fonseca score was 34.10 (SD 13.78), with scores ranging from 5 to 80, indicating that while many participants clustered in the mild range, a smaller subset exhibited substantially higher symptom burden consistent with moderate-to-severe dysfunction. Severity categorization showed that only 15 participants (10.8%) had no temporomandibular disorder symptoms, whereas 100 participants (71.9%) had mild dysfunction, 22 participants (15.8%) had moderate dysfunction, and 2 participants (1.4%) had severe dysfunction. Collectively, 124 participants (89.2%) fell into at least the mild temporomandibular disorder category, indicating that non-painful or subclinical dysfunction symptoms were widespread, even though pain-related TMD affected a smaller proportion. Taken together, the tables demonstrate a cohort characterized by moderate average activity but a sizeable inactive subgroup (30.9%), no representation of high physical activity, and a meaningful burden of temporomandibular involvement. Pain-related TMD was present in 24.5%, while broader dysfunction symptoms measured by the Fonseca index were observed in 89.2%, predominantly mild (71.9%), with moderate-to-severe dysfunction present in 17.2% combined (15.8% moderate; 1.4% severe). These results highlight that temporomandibular symptoms extend beyond pain alone and may represent an under-recognized comorbidity profile in young adults living with epilepsy.

Table 1. Demographic and Anthropometric Characteristics of Participants (N = 139)

Variable	Mean ± SD	Minimum	Maximum	p-value*
Age (years)	23.82 ± 3.74	18	30	NA
Weight (kg)	69.66 ± 15.46	40.0	102.1	NA
Height (cm)	164.64 ± 10.91	140.4	196.9	NA
Body Mass Index (kg/m²)	25.99 ± 6.60	12.7	43.7	NA

Table 2. Sex Distribution of Study Participants

Sex	Frequency (n)	Percentage (%)	p-value*
Male	78	56.1	NA
Female	61	43.9	NA
Total	139	100.0	—

Table 3. Overall Physical Activity Level (GPAQ MET minutes/week)

Variable	Mean ± SD	Minimum	Maximum	p-value*
Total GPAQ MET-min/week	931.59 ± 566.19	0	2740	NA

Table 4. Distribution of Physical Activity Categories (GPAQ)

GPAQ Activity Category	Frequency (n)	Percentage (%)	p-value*
Low physical activity	43	30.9	NA
Moderate physical activity	96	69.1	NA
High physical activity	0	0.0	NA
Total	139	100.0	—

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Table 5. TMJ Pain Screener (Long Form) Scores

Statistic	Value
Mean ± SD	2.34 ± 1.94
Minimum	0
Maximum	9

Table 6. Prevalence of Pain-Related Temporomandibular Disorders (TMD Pain Screener)

TMJ Pain Screener Result	Frequency (n)	Percentage (%)	p-value*
Positive for TMJ pain	34	24.5	NA
Negative for TMJ pain	105	75.5	NA
Total	139	100.0	—

Table 7. Fonseca Anamnestic Index Scores

Statistic	Value
Mean ± SD	34.10 ± 13.78
Minimum	5
Maximum	80

Table 8. Severity Distribution of Temporomandibular Disorders (Fonseca Anamnestic Index)

TMD Severity Category	Frequency (n)	Percentage (%)	p-value*
No TMD	15	10.8	NA
Mild TMD	100	71.9	NA
Moderate TMD	22	15.8	NA
Severe TMD	2	1.4	NA
Total	139	100.0	—

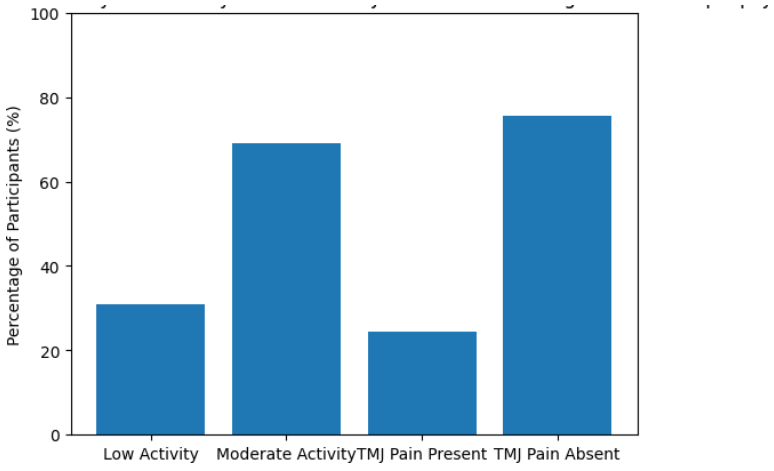

Figure 1 Distribution of Physical Activity Levels and TMJ Pain Status in Young Adults with Epilepsy

The figure illustrates a clinically informative contrast between physical activity patterns and pain-related temporomandibular joint (TMJ) involvement within the study cohort. Nearly one-third of participants were classified as physically inactive (30.9%), while the majority demonstrated only moderate physical activity levels (69.1%), underscoring the complete absence of high activity engagement in this population. In parallel, pain-related TMJ involvement was identified in 24.5% of participants, whereas 75.5% did not report TMJ pain. The juxtaposition of these aggregated outcomes highlights an important clinical gradient: while moderate physical activity is relatively common, a substantial inactive subgroup coexists with a notable burden of TMJ pain. This pattern suggests that functional and musculoskeletal comorbidities may cluster within subsets of young adults with epilepsy, reinforcing the need for integrated screening and rehabilitation strategies that address both physical inactivity and orofacial pain as part of routine epilepsy care.

DISCUSSION

The present study provides a focused description of physical activity patterns and temporomandibular joint involvement among young adults with epilepsy attending tertiary care neurology outpatient departments in Lahore, Pakistan. The findings highlight that epilepsy in this population is accompanied by clinically relevant functional and musculoskeletal concerns that extend beyond seizure control. Nearly one-third of participants were physically inactive, and none achieved high levels of physical activity, while temporomandibular disorder symptoms—particularly mild dysfunction—were highly prevalent. These results reinforce the growing recognition that epilepsy should be managed within a broader biopsychosocial framework rather than as an isolated neurological condition (17).

The observed prevalence of physical inactivity (30.9%) aligns with international evidence indicating that adults with epilepsy are less likely to meet recommended physical activity levels compared with the general population . Although the majority of participants were categorized as

moderately active, the absence of high physical activity suggests that engagement in structured or vigorous exercise remains limited. This pattern is clinically important, as moderate activity in this context may largely reflect incidental daily movement rather than purposeful exercise sufficient to confer optimal cardiovascular and metabolic benefits. Similar trends have been reported in both high-income and low- and middle-income settings, where fear of seizure provocation, injury, and social embarrassment persist as major barriers to exercise participation . In Pakistan, these concerns are further compounded by stigma, limited access to physiotherapy services, and a lack of consistent counseling on safe physical activity during routine neurological care (18).

The relatively young age of the cohort underscores the potential long-term implications of sustained physical inactivity. Reduced activity in early adulthood may increase the risk of secondary comorbidities, including obesity, cardiovascular disease, fatigue, and poorer mental health outcomes, which have been consistently associated with inactivity in people with epilepsy (19). Although the present study did not assess these downstream outcomes, the physical activity distribution observed suggests a need for early preventive interventions. Integrating tailored physical activity counseling and rehabilitation into epilepsy care could help counteract sedentary behavior and improve long-term health trajectories in this population.

Temporomandibular joint involvement emerged as another notable finding. Approximately one-quarter of participants screened positive for pain-related temporomandibular disorders, while a much larger proportion demonstrated at least mild temporomandibular dysfunction on the Fonseca Anamnestic Index. This discrepancy between pain-related TMD prevalence (24.5%) and overall dysfunction prevalence (89.2%) is clinically meaningful rather than contradictory. The TMD Pain Screener specifically identifies pain-related conditions, whereas the Fonseca index captures a broader range of symptoms, including joint sounds, fatigue, stiffness, and functional limitation that may occur in the absence of pain (20). Similar patterns have been reported in previous studies, where mild or subclinical temporomandibular dysfunction was common among individuals with epilepsy but often overlooked in routine care

Several mechanisms may explain the high burden of temporomandibular symptoms observed. Recurrent seizures, particularly those involving tonic–clonic activity, can expose the masticatory system to excessive mechanical stress through jaw clenching, involuntary muscle contractions, and bruxism, potentially leading to cumulative joint and muscle strain . Psychological factors such as anxiety and stress, which are highly prevalent in epilepsy, may further exacerbate masticatory muscle tension and contribute to temporomandibular dysfunction (21). The predominance of mild dysfunction in the present study suggests that many patients may be in an early or subclinical stage, offering a critical window for preventive intervention before progression to more severe or chronic pain states.

From a clinical perspective, the coexistence of physical inactivity and temporomandibular dysfunction highlights the need for multidisciplinary epilepsy management. Neurologists, physiotherapists, and dental or orofacial pain specialists each have a role in addressing these comorbidities. Early screening for low physical activity and temporomandibular symptoms using brief, validated tools—as employed in this study—may facilitate timely referral and targeted intervention Such an approach is particularly relevant in low-resource settings, where optimizing function and quality of life without substantial additional cost is a key public health priority (22).

The study's findings should be interpreted in light of certain limitations. The cross-sectional design precludes inference about causal relationships between epilepsy, physical inactivity, and temporomandibular joint involvement. Physical activity was assessed using self-reported measures, which may be subject to recall or social desirability bias, although validated instruments were used to mitigate this limitation (6). The restriction of the sample to young adults attending tertiary care facilities may limit generalizability to older age groups or community-based populations. Nevertheless, the study provides valuable baseline data from a context where empirical evidence on these issues remains limited.

Overall, this research contributes region-specific evidence demonstrating that functional and musculoskeletal concerns are common among young adults with epilepsy in Pakistan. By documenting both physical inactivity and temporomandibular joint involvement within the same cohort, the study adds to the literature by emphasizing the multifaceted burden of epilepsy and the importance of comprehensive, patient-centered care strategies.

CONCLUSION

In conclusion, this study demonstrates that physical inactivity and temporomandibular joint involvement are common among young adults with epilepsy, with nearly one-third exhibiting low physical activity levels and the majority showing at least mild temporomandibular dysfunction. Although pain-related temporomandibular disorders affected a smaller proportion, the widespread presence of subclinical symptoms underscores the need for routine screening beyond seizure management alone. These findings highlight the importance of integrating physical activity promotion and temporomandibular joint assessment into standard epilepsy care to support functional health and quality of life, particularly in low- and middle-income settings where such comorbidities are frequently under-recognized.

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