

# Depressive Symptoms and Its Correlate Among Children with Epilepsy at Single-center Study in Oman

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## ABSTRACT

**Objectives:** Epilepsy is the most common neurological disorder in children and comorbid depression is common. This study aimed to assess the frequency of depressive symptoms along with demographic and clinical factors in children diagnosed with epilepsy in a tertiary care institution in Oman. **Methods:** This cross-sectional study was conducted between June 2016 and August 2018 and included children (n = 75) aged 6–12 years old attending the epilepsy clinic at Sultan Qaboos University Hospital, Oman. The cohort constituted of children with epilepsy (CWE) following up at a dedicated unit. We used the Center for Epidemiologic Studies Depression Scale for Children to assess the presence of depressive symptoms. Associated factors, including history of seizure in the last three months, compliance with antiepileptic medications, and type of epilepsy were also examined. **Results:** Depressive symptoms were endorsed in 52.0% of CWE and 96.0% were compliant to medications. Recurrent seizures were present in the last three months among 48.0% of the CWE. The type of epilepsy was significantly associated with the presence of depressive symptoms. **Conclusions:** Depression is prevalent among Omani CWE. Certain clinical factors appeared to increase the risk of depression among this population. The findings of this study fill a gap in the existing literature and call for further work aiming to explore possible tailored recognition and CWE.

Epilepsy is the most common neurological disorder in children affecting approximately 41–187/100 000.<sup>1</sup> Children with epilepsy (CWE) exhibit a wide range of psychosocial deficits. Depression is the most prevalent psychiatric manifestation in CWE varying from 10% to 30%.<sup>2,3</sup> A meta-analysis revealed an overall prevalence of 13.5%<sup>4</sup> which exceeds that typically found in children. Depressive symptoms may lead to poor seizure control, reduced quality of life, and suicide.<sup>5,6</sup> Examining epilepsy-specific risk factors revealed that patients who are adolescents have early-onset epilepsy, take two or more antiepileptic drug (AED), and have frequent seizures show an increased risk of developing depressive symptoms.<sup>6</sup> As a result, the UK National Institute for Health and Clinical Excellence guidelines recommend that the psychological needs of CWE should be considered as part of routine care.<sup>7</sup> The relationship between epilepsy and depression is complex and

potentially bidirectional, thereby suggesting common underlying pathophysiology between these conditions.<sup>8–11</sup> While rates of epilepsy appear to be waning in high-income countries, the reverse trend appears to be common in the Eastern Mediterranean Region (EMR).<sup>12</sup> A study compared CWE in Northern Jordan with children without epilepsy and found that depressive symptoms were observed in approximately 23% of CWE compared to 11% of children without epilepsy.<sup>13</sup> As the magnitude of epilepsy tends to strongly hinge on ethnicity.<sup>14</sup> There is a dearth of studies examining comorbid depressive symptoms among CWE in the EMR; therefore, our study explored the frequency of depressive symptoms along with its correlates in children diagnosed with epilepsy in a tertiary care institution in Oman. The covariates in the variation of depressive symptoms were also examined. It is hypothesized that the frequency of depressive symptoms in CWE is higher than in other regions. Additionally, it is expected

that sociodemographic factors such as gender and epilepsy-specific risk factors such as the amount of AED taken will be highly associated with depressive symptoms. This will likely lay the groundwork for the routine and periodic screening of depressive symptoms among CWE for early detection and appropriate management.

## METHODS

We conducted an analytical cross-sectional study between June 2016 and August 2018 at the Pediatric Neurology Clinic, Sultan Qaboos University Hospital (SQUH). Oman has a universal free healthcare system for all citizens and its healthcare structure is divided into primary, secondary, and tertiary care. In Oman, epilepsy clinics are available across all governorates.

The data collection took place while patients waited to see their doctor in the epilepsy clinic at SQUH. The study included 75 CWE ranging from 6–12 years old. Patients were excluded if they were diagnosed with an intellectual disability based on Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria,<sup>15</sup> already known to have mental illnesses, aged below six years, those who decline to participate, and forms with missing data. The caregivers were informed that their children's participation was voluntary and would not affect their clinical care. They were also informed of their right to withdraw at any time. To ensure privacy and avoid feeling coerced to participate, the principal investigator and co-investigators explained the purpose of the study to the participants and the consent to participate was obtained in a private room.

The Center for Epidemiologic Studies Depression Scale for Children (CES-DC)<sup>16</sup> was used to measure depressive symptoms. CES-DC is a validated and widely used scale to assess the level of depressive symptoms among children from different clinical populations and across many languages.<sup>17,18</sup> The CES-DC is a 20 item self-report inventory that measures the intensity of depressive symptoms during the past week. It is used for children aged 6–12 years old. Children who struggled to read and understand the questionnaire were assisted by their parents. The questionnaire is scored between 0–60 with a cut-off score of  $\geq 15$  indicative of depression.<sup>16</sup> To date, there is no publicly available Arabic version

of CES-DC. Therefore, it was necessary to translate it into Arabic. The standard protocol for back translation was utilized as described elsewhere.<sup>19</sup> The final Arabic-version of CES-DC had adequate internal consistency (Cronbach's  $\alpha = 0.8$ ).

In addition to CES-DC, various covariates were sought from the accompanying caregivers including gender (male, female) and age group (6–8 and 9–12 years). Medical records were screened to document the following clinical risk factors including seizure history in the last three months (absent or present), compliance to medication (compliant or non-compliant), and type of epilepsy according to the electroencephalogram record (generalized, focal, and unclassified).

This study adheres to the American Association for Public Opinion Research reporting guidelines.<sup>20</sup> The study was vetted by the local institutional review board, Medical Research, and Ethical committee at the College of Medicine, Sultan Qaboos University (Ref. No. SQU-EC/148/16, MREC # 1337).

The statistical analysis was carried out based on the description, distribution, and categorization of variables included in the study. The significant differences between the presence or absence of depressive symptoms groups for various categorical variables were explored by univariate analysis using the chi-square test. The analyses were performed using SPSS Statistics (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). A  $p < 0.050$  (two-tailed tests) was considered statistically significant.

## RESULTS

Table 1 reveals the sociodemographic profile of CWE ( $n = 75$ ) aged 6–12 years. The study included 45 males (60.0%) and 30 females (40.0%); 96.0% of CWE were compliant with treatment. Over half (52.0%,  $n = 39$ ) reported no seizure in the past three months while 48.0% ( $n = 36$ ) reported having at least one seizure episode in the last three months.

Regarding the type of epilepsy, 34 (45.3%) participants were having generalized epilepsy, 32 (42.7%) were having localized epilepsy, and 12.0% ( $n = 9$ ) had unclassified epilepsy. There was a significant association between the type of epilepsy and depressive symptoms. Furthermore, children with localized epilepsy reported higher depressive symptoms. The study found that 52.0% ( $n = 39$ ) of

**Table 1:** Sociodemographic profile and association of depressive symptoms within specific categories among 75 children diagnosed with epilepsy.

Variables	Depressive symptoms		p-value
	Present n = 39 n (%)	Absent n = 36 n (%)	
<b>Age group, years</b>			
6–8	29 (38.7)	14 (18.7)	NS
9–12	46 (61.3)	25 (33.3)	
<b>Gender</b>			
Male	45 (60.0)	26 (34.7)	NS
Female	30 (40.0)	13 (17.3)	
<b>Seizure in the last three months</b>			
Present	36 (48.0)	22 (29.3)	0.090
Absent	39 (52.0)	17 (22.7)	
<b>Epilepsy type</b>			
Generalized	34 (45.3)	10 (13.3)	0.002
Focal	32 (42.7)	23 (30.7)	
Unclassified	9 (12.0)	6 (8.0)	
<b>Compliance to medications</b>			
Compliant	72 (96.0)	39 (52.0)	0.106
Non-compliant	3 (4.0)	0 (0.0)	

NS: not significant.

CWE reported the presence of depressive symptoms. However, there was no association between the presence/absence of depressive symptoms with age, gender, and presence/absence of seizure in the last three months [Table 1].

## DISCUSSION

To the best of our knowledge, this is the first study that examined the prevalence of depressive symptoms and covariates among CWE in Oman. The main finding suggests that 52.0% of the sample endorsed depressive symptoms. One way to test the veracity of depressive symptoms is to compare them with other typical developing children. A study from Istanbul, Turkey reported that CWE attending a tertiary-care setting have higher scores of depressive symptoms using Kovac Child Depression Inventory compared with typically developing children.<sup>21</sup> The Children's Depression Inventory among children presenting with a first seizure in Alberta, Canada, found the rate of depressive symptoms was 20% among their cohort.<sup>22</sup> The rate of depressive symptoms appears to be independent of the age of the child.<sup>23,24</sup> A prospective longitudinal cohort study of CWE at six Canadian tertiary care centers followed children

for over 28 months with repeated assessments using the Children's Depression Inventory Short-Form.<sup>25</sup> The picture that emerged was stark; depressive symptoms remained persistent and pervasive and independent of age, types, and severity of the seizure. Although there is no study on the outcome of resective surgery among CWE, at least in the adult population, resective surgery initially appears to have kick started improvement in depressive symptoms, the improvement after resective surgery was more robust among those with superior seizure control.

The prevalence of depressive symptoms among children tends to vary according to the case ascertainment and measures used to solicit the presence of depressive symptoms. Our study found 52.0% of depressive symptoms appear to be in the higher range from previous literature.<sup>26</sup> More studies are therefore warranted to examine the factors that contribute to the wider disparity of the rate of depressive symptoms among CWE.

The second aim of this study was to explore the link between covariates and depressive symptoms, the results revealed a significant association between the type of epilepsy and variation in depressive symptoms. This suggests that children with localized epilepsy are more likely to experience depressive symptoms. This finding echoes previous research that found strong correlations between focal seizures and comorbid psychiatric disorders, specifically depression<sup>3,27,28</sup> but there are dissent views.<sup>29</sup> The findings revealed that children ranging from 9–12 years reported more depressive symptoms and females experienced fewer symptoms of depression, however, the associations were insignificant. Our finding that the female gender has lower depressive symptoms appears to contradict previous studies where depressive symptoms are common in females in the general population as well as those with chronic conditions.<sup>30,31</sup> Future studies should examine whether there are sociocultural factors that contribute to the present finding. More studies are therefore warranted.

It is expected that younger children report fewer depressive symptoms because they are not yet capable to introspect and verbalizes emotional state. For example, depressed children fail to express their sadness, instead, their symptoms may appear as anger, irritability, and more importantly changes in their sleeping and eating patterns.<sup>32</sup> Our findings are in agreement with what has been found in previous

studies that females and older age groups with epilepsy were more likely to have depression.<sup>3,33</sup> Moreover, studies done among children and adolescents attending pediatric outpatient departments of tertiary hospitals found that emotional disorders were 15% among the younger group.<sup>34</sup> Alternatively, parents may be unaware of their children's depressive nature and may underreport such symptoms. This could explain the non-significant association as younger participants were assisted by their parents when completing the questionnaire. Because children with depression are often undiagnosed and untreated, it is important to raise awareness and discuss the likelihood of experiencing depression within CWE. Eastern society assumes that children are mature enough to be afflicted with emotional disorders; this has generally hampered the examination of mood disorders in CWE.<sup>7</sup> Instead, the presence of internalization behavior problems is attributed to immaturity, sibling rivalry, or simply attention-seeking rather than psychiatric disorders. This may explain the lacking data on mood disorders among CWE in the EMR. The magnitude of depressive symptoms in referral hospitals is higher than the global range, 5.2% and 39.6%, respectively.<sup>35</sup> Asadi-Pooya et al,<sup>36</sup> reviewed studies in Asia that indicated that a high prevalence of depression exists across the continent. This review is limited by the fact that it did not focus on children or adolescents. Within the EMR, Al-Khateeb and his colleague also reported similar findings, however, the study was limited to the adult population.<sup>37</sup> Therefore, our study intended to fill the gap in the literature by studying CWE and examining comorbid depressive symptoms among CWE.

Our study has some limitations. Firstly, this study did not include all CWE, only included children up to 12 years rather than up to 18 years, and was hospital-based. Secondly, the scale for screening depression was without the gold-standard face-to-face clinical assessment. Thirdly, AEDs are known to induce dysphoria and negativistic behavior and our study did not consider the relationship between AED and depressive symptoms. Finally, depressive symptoms are strongly associated with the period between seizures.<sup>38</sup> Future studies should include studies that control the period between seizures and the types of AED.

## CONCLUSION

Despite the aforementioned limitations, our study showed that almost half of the CWE have depressive symptoms. Focal epilepsies are associated with an increased risk of depressive symptoms. Our results suggest that early identification, appropriate referral to child psychiatry for subsequent management are needed. Despite the small sample size, this study is one of the few studies that explored comorbid depression in CWE in Oman.

### Disclosure

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